

**ANALYSIS ON THE PREVALENCE OF OVERWEIGHT AND OBESITY
AMONG SCHOOL CHILDREN IN BALIWAG, BULACAN: A MODEL OF
PUBLIC HEALTH POLICY AND NUTRITION PROGRAMS**

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Abstract

The rising prevalence and trends of overweight and obesity cases in children had been reported by the World Health Organization (WHO) globally. This was also confirmed by the United Nations' (UN) report on the increasing prevalence of overweight and obesity among children worldwide. WHO added that even in a developing country like the Philippines, the increasing trends in overweight and obesity cases among school children were also prevalent. What is critical in those reports is that childhood obesity had been associated with serious health problems and other illnesses. Thus, a three-year longitudinal data gathered from public elementary schools was utilized to investigate the prevalence of overweight and obesity in Baliwag, Bulacan. Furthermore, the method involves collaborative school-based survey among the four select public schools with severe cases of overweight or obesity in the Municipality of Baliuag. Risk exposures to contributory factors among school children with obesity cases in public schools had been analyzed using sequential approach. Findings of this study are backed by the literature that dietary behaviors and physical activities explain the increasing prevalence of overweight and obesity among school children. Moreover, this study reveals that there are no significant differences found in the dietary behaviors and physical activities of children with obesity. This is evidenced by the uniformity of findings which showed that obese children were exposed to foods high in carbohydrates, sugar and fats that are available in their home, school, and favorite fast-food environment. Implications of the study are imperative for effective sustainable public health policy and nutrition programs of the local government unit.

Keywords: Prevalence, overweight and obesity, school children, dietary behaviors, physical activity, public health policy, nutrition programs

The prevalence of overweight and obesity had been reported worldwide (De Onis et al., 2010; WHO, 2018). Alarming, obesity threatens to become the foremost cause of chronic disorders in the world. Unfortunately, prevalence of obesity is increasing in any country. Thus, a major public health effort is urgently needed to control the increasing frequency (Grundy, 2004).

The World Health Organization (WHO) defines *overweight and obesity* as the condition of “abnormal and excessive fat accumulation” vulnerable to health risks. A number of reports on the increasing trends of overweight and obesity must be addressed worldwide (White et al., 2010; WHO, 2018).

An earlier study (Grundy, 1998) had foreseen the possibilities that obesity will become a leading health problem in the 21st century. Obesity turned out to be an epidemic internationally affecting all age groups since 1948 as reported in a study of Kipping et al. (2008). Just recently, the Center for Diseases Control reported that over 40 million of children are overweight. The alarming prevalence of overweight and obesity worldwide is continuously increasing as the latest study confirms obesity to increase the risks of heart and pulmonary diseases, diabetes, kidney and liver-related diseases (Censin et al., 2019).

The literature showed varied factors that have been associated with overweight and obesity. This phenomenon was explained as an outcome of an urbanized system, an increased availability of food, and a reduction in physical activity (Grundy, 2004). Causes of overweight and obesity were believed to be influenced by a number of environmental and physiological factors such as consumption of high fat diets, social and cultural factors, and genetic factors (Hoffman, 2001 & Grundy 2004). However, a number of scholars claimed that factors such as increased availability or access to food, reduced physical activity and the consumption of “western” diets predispose people to becoming overweight or obese. Hence, the rising prevalence of overweight and obesity is confirmed by scholars (Popkin, 1993; Cavalli-Sforza et al., 1996; Drewnowski & Popkin, 1997 as cited in Hoffman, 2001).

In a developing country like the Philippines, there should be an initiative to create methods to prevent and control the rising prevalence especially for communities that are “not normally accustomed to dealing with over-nutrition and chronic diseases.” (Hoffman, 2001; Kipping, 2008; Censin et al., 2019).

Studies on the increasing prevalence of obesity in developing countries are becoming imperative that needs immediate attention from public health providers and local government leaders. Scholars reported that in medical and health research, obesity was found to be associated with many serious health problems (Hoffman, 2001; Kipping, 2008; Censin et al., 2019). This paper was inspired by a “systematic public education” required to increase awareness of both parents and children on the threats of moderate obesity and effective ways

of avoiding weight gain in their early age (Grundy, 2004). To create a “healthy world” and to achieve the “universal goal of development,” children should undergo screening for obesity because this threatens a developing economy (Kipping, 2008). Moreover, this paper is responsive to the call of UN (2016) and WHO (2018) for public health officials to act on the rising occurrence of childhood obesity.

Furthermore, this study explored those explanatory factors contributory to the increasing prevalence of overweight and obesity. The threats, in reality, are the health consequences which could be responded immediately by the public health providers. The Philippines is not exempted from the global report on rising prevalence of obesity (WHO, 2017). This current study aims to help the Municipality of Baliwag particularly the Nutrition and Health Office to review the policies and programs that will address prevalence of overweight and obesity among school children. Findings of the study could be utilized by the Municipality for project evaluation of the existing health and nutrition programs.

Implications of this study are vital for school heads and nutrition coordinators of the public schools who undertake health and nutrition education programs that will benefit school children.

The Research Problem

The literature review presents alarming number of reports on increasing prevalence of overweight and obesity around the world (White et al., 2010; WHO, 2018). Competing notions indicate that overweight and obesity have been influenced by multifactorial elements other than genetic factors. Scholars believe that the rising prevalence of overweight and obesity come from dietary behaviors and reduced physical activities (Hoffman, 2001; Grundy, 2004; Martinez-Vizcaino et al., 2015). Furthermore, previous studies argued that the increasing prevalence is caused by a number of environmental and physiological factors, such as high-fat diets and or decreased physical activity. Consequently, those varied factors should be given attention by the public health sectors and a strategy must be developed to address the increasing prevalence in overweight and obesity (Grundy, 1998; Hoffman, 2001; Hoffman, 2016).

It is of particular importance to explore those determining factors that would substantiate the rationale for the increasing prevalence of obesity in developing countries which are known to inadequately address under-nutrition and obesity (Hoffman, 2001).

Objectives of the Study

The present study has an objective of analyzing the prevalence of overweight and obesity among school children. With overweight and obesity becoming prevalent this study defines the following specific objectives:

1. Assess' the prevalence of overweight and obesity among public school children
2. Analyze the explanatory/contributory factors for the increasing prevalence of overweight and obesity among school children
3. Draw a *model* of public health strategies for policy development and nutrition intervention programs based on relevant findings of the study

Research Questions

In response to the literature's showcasing of several reports on the rising prevalence of overweight and obesity, this paper addresses the following research questions:

1. What is the prevalent assessment of overweight and obesity among public school children in Baliuag?
2. How may health and nutrition lifestyles of obese children be described in terms of *dietary behaviors* and *physical activity patterns*?

Null Hypothesis

H₁: There are no statistically significant differences in the population mean/median scores when grouped according to demographic factors and in terms of the following contributory factors:

- a. Dietary behaviors
 1. Eating Preference and Habits
 2. Quality of Foods consumed
 3. Quantity of Foods consumed
- b. Physical activity patterns
 1. Mobility behavior
 2. Sedentary behavior

Formulation of hypotheses emanated from the review of literature. The literature summarizes underlying behavioral risk factors that were hypothesized to be present in foods high in carbohydrates, too much sweet foods and beverages, high quantity of consumed foods, more of sedentary behaviors than physical activities and eating habits. There have been inconsistencies in the cross sectional studies' results. Flannelly et al. (2014, as cited in Wilson, 2019, p.84) suggest that "an extraneous variable or control variable can be incorporated as an independent variable in the statistical analysis to establish the effect on the relationship between IV and DV."

The extraneous variables or control variables such as school, age, gender, and grade levels were utilized as independent variables to validate the hypothesis of differences among groups of children with obesity. Thus, in attaining the goals of change in behavior and in preventing more weight gains among children, Rennie et al. (2005) urged to have relevant prospective studies on bodily exposures and outcomes that are needed to provide more robust evidence on which to base public health policy and intervention strategies.

The cause of the increasing prevalence was explained in an earlier study of Grundy (1998) in two-folds of urbanization. First, food is more accessible to people, and the physical activity is reduced.

Dietary Behaviors. To understand the genetic basis of obesity, attention focused on the endogenous variables of weight gain, however, the socioeconomic factors are thought to be the bigger influence worldwide (1998). Grundy (2004) asserted that increase in food intake is primarily affecting prevalence of overweight and obesity.

The contemporary study of Clark (2018) explored associations between diets, human health and environment. The “diet-health-environment trilemma” explains what can be done to reduce the future impact of humanity’s dietary choices on human and environmental health. Dietary patterns are shifting to include more calories, processed foods, and animal products as populations become more well off and urbanized. These dietary transitions have driven increases in diet-related diseases and environmental impact (2018).

Eating Habits and Preferences. The study of White et al. (2010) revealed the following eating habits and preferences of children:

1. Only few kids ensure to drink real fruit juice in a day or have at least 1 piece of fruit in a day. About half of youths have one serving of vegetables.
2. Some kids have one glass of milk per day but they also have one serving of soda a day. Majority eats breakfast but some don’t eat breakfast.
3. More than half of students buy lunch at school. Among those who buy lunch at school, 54% usually choose the standard meal option and the remaining students usually choose fast food options and healthy a la carte items.

Good Nutrition and Quality Foods. Good nutrition in the US recommends that appropriate amount of food should include fruits and vegetables, whole wheat bread and wheat rice, low fat dairy foods such as milk, cheese and yogurt; and proteins acquired from lean meat and poultry products (HasPa, 2012).

Non-nutritious Foods. Based on the study of Amini et al. (2007) there was no association between eating junk foods and body mass index, but the link between consumption of junk foods and overweight was confirmed in the study of Cullen and Zakeri (2004). Increased sugar-sweetened drinks intake among middle age school children contributed to weight gains according to Ludwig (2001). Thus, consumption of sugar-sweetened drinks could be a main contributor to obesity. On the contrary, a different result showed no significant association between consumption of sweet foods and overweight/obesity among preschool children (Ludwig, 2001, as cited in Yosefi, 2011).

H₂: There are no significant relationships between dietary behaviors and physical activity patterns of school children.

Formulation of the above null hypothesis was based on claims in the literature that physical activity is said to be the controllable component of total energy expenditure. A reduction in total energy expenditure should be accompanied by a reduced energy intake, otherwise, this may result in overweight and obesity. However, in many developed countries, a low level of physical activity showed an indirect association to overweight and obesity. (Hoffman, 2001).

Grundy (2004), likewise, confirmed that major causes of weight gain include reduction in mobility or physical activity and decline in resting metabolic rate. There are specific groups of youth which seem to be at risk particularly those who have poor diets and have a regular consumption of fast foods (White et al., 2010). They are less likely to engage in physical activity and more likely to engage in sedentary activities such as watching TV and playing video games. Interventions designed to improve overall weight, fitness, and diet should include a special focus on these population (2010).

The literature shows an increasing obesity is a major concern in developing countries that used to combat the problems of malnutrition (Hoffman, 2001; Dabone et al., 2011; Martínez-Vizcaíno et al., 2015). This study has an assumption that the school children's families are classified to have a low socio-economic status. Thus, the current study aims primarily to determine the prevalence of overweight and obesity amongst children in the public schools and seeks underlying explanations to the rising prevalence in the weight gains and obesity.

Theoretical Framework

The theory of nutrition is as ancient as the time of Aristotle and Galen where nutrition was treated as an important part of health, disease, and performance (Tanaka, 2017).

Both nutrition theory and cognitive development theory are fundamentals to the development of this study. Piaget's theory of cognitive development plays crucial role in children's age development particularly in the preschool age where the children develop behaviors and many habits that are likely to continue in later years of development (Baskale et al., 2009). Hence, dietary behaviors and physical activity patterns could be explained by Cognitive theory that adaptation happens from the first stage of cognitive development. The child adapts to the environment and eventually experience changes by interacting with the environment. This is explained by the determining factors affecting cognitive development maturation, experience, and social transmission (Baskale et al., 2009).

Conceptual Framework

The rising prevalence of overweight and obesity was assessed, and this study traced the determining factors in the literature that are deemed contributory which include dietary behaviors and physical activities. These behavioral patterns operationally explain the prevalence of obesity among public school children. Thus, the aforementioned determining factors which are *dietary behaviors* consist of eating habits and preferences; quality and quantity of foods consumed. Hence, the *physical activities* comprising of mobility and sedentary behaviors are all accounted for which add illumination to clearly explain the prevalence of overweight and obesity among school children.

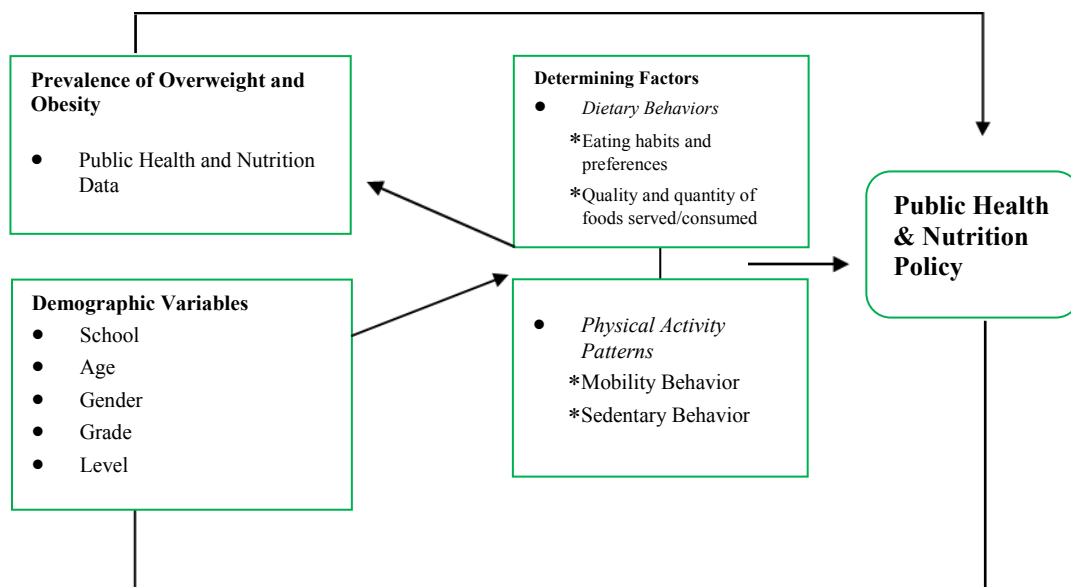


Figure 1. Conceptual framework of the study.

Figure 1 presents the research model. This current study offers substantial reviews of literature *vis-a-vis* the observable rising cases of overweight and obesity worldwide. An analysis of the prevalence of this phenomenon among public school children was performed. The behavioral elements of health and nutrition lifestyles such as *dietary behaviors* and *physical activity patterns* were investigated using the sequential approach encompassing *children's demographic factors* are extraneous or control variables that tells information about the findings of the study. Those extraneous demographic variables may have not been controlled fully, so possible influence should be tested in the analysis model. Hence, the extent of effect of the control variable can be established (Wilson, 2019).

As presented in the conceptual framework of this study, determining factors such as dietary behaviors and physical activity patterns were analyzed for possible risk contributory to the nutritional and health outcomes (overweight and obesity) among school children.

Dietary behaviors include eating habits and eating preferences. Another form of dietary behavior is the quality of foods which can be classified as healthy and unhealthy foods (Grundy, 2004; Philippi et al., 2016). Finally, quantity of foods that is consumed in larger quantities or more servings per meal.

Physical activities consist of *mobility behaviors* which refer to the active physical activities of schoolchildren such as playing sports, doing household chores, exercise and other activities. On the other hand, *sedentary activities* include behaviours of children spending more time in watching TV, using laptop, computer and other gadgets for longer period or hours (White et al., 2010).

Cross-sectional studies had been conducted on the increasing prevalence of overweight and obesity among children, hence, this study justifies scholarly efforts needed to understand the possible contributory factors that are explanatory of this increasing prevalence. In this paper, the prevalence of overweight and obesity in the Municipality of Baliwag is described and the health and nutrition implications to improve public health policies are discussed. A model of public health and nutrition policy and strategies for intervention programs is a byproduct of the relevant findings of this study.

Method

Research Design

A descriptive study was used to analyze the prevalence of overweight and obesity in the public schools of Baliuag, Bulacan. The mixed-method sequential explanatory study design was employed to analyze critically this prevalence of overweight and obesity (Ivankova, 2006). Quantitative data followed by

qualitative data collection are justified a sequential approach in this study (Creswell, 2006). Moreover, to establish associations between explanatory factors and prevalence condition (Salkin, 2010), researchers coded qualitative data, analyzed patterns/relationships, and further summarized the findings into themes.

Respondents of the Study

This study utilized purposive sampling technique where participants were all taken from the four public elementary schools which were found to have higher cases of obesity in 2019.

Subjects of the study include public school children with obesity cases from the Municipality of Baliuag, Bulacan. There were 70 out of the 86 school children (Grade1-6 levels; 6-12 years old) respondents of the study. Despite the global pandemic during the conduct of this study, 81.4% of the population from the four public elementary schools in Baliuag participated prior to the declaration of enhanced community quarantine in the country.

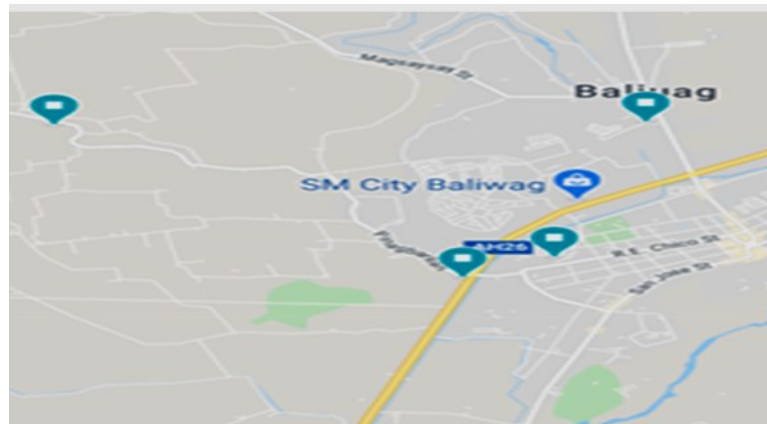


Figure 2. Map of the public schools in Baliuag (by Google Map).

Figure 2 shows the map of the four public elementary schools considered as subjects of this current study. Figure 2 presents the location map of the four (4) schools with obesity cases among school children.

Instruments of the study

The instruments of the study are divided into two parts. The first part of the questionnaire deals with profile and characteristics of children. In establishing face validity of instruments, the nutrition experts from the Municipality of Baliuag and Nutrition Department of Baliuag University contributed in the scrutiny of each item in the instrument validation.

The second part of the instrument was divided into two categories, *i.e.*, dietary behavioral items were developed by the team researchers, though patterns were adapted from a Filipino *eating behavior* questionnaire (Aguilar et al., 2014) and *physical activity patterns*. A 4-point Likert scale was adopted: *often* – once a day or more, 4; *sometimes*– once a week or more but less than once a day, 3; *rarely* – less than once a week, 2; and *never* - none at all, 1.

Albeit, the questionnaires were anchored on developed instruments from the literature, in general, the research tool utilized in the survey were further developed and improved by the research team to fit in the public school setting within the Philippine context.

The sequential approach was utilized in the development of instruments for this study. The two classifications of instruments were pilot-tested twice sequentially to gather more reliable and valid information on specific variables in the research tool and further subjected to reliability tests. The first pilot test covered only the Likert questionnaire, but in order to validate the responses of the children, they were asked to answer probing open-ended questions following interview protocols. Creswell (2006) affirms the application of sequential mixed method which includes gathering of quantitative data at the first step of the process and then followed by collecting qualitative data.

The second trial obtained a more improved Chronbach's values for measuring quantitative variables. Dietary behavior *food quality* has two sub-items which obtained Chronbach's value coefficient of 0.84. Sample sub-items for food quality includes *nutritious foods* (7 items) and *non-nutritious foods* (6 items) were able to yield Chronbach's value of 0.72;

Quantity of foods with 2 items got a Chronbach's value coefficient of 0.80; while *eating habits* obtained Chronbach's values of 0.63. On the other hand, *physical activity* with a total of 5 items and 1 item deleted has an alpha coefficient of 0.72. Lastly, *sedentary behaviors* (4 items) obtained a Chronbach's alpha coefficient of 0.78. All of these results imply a generally acceptable reliability and well-established internal consistencies (Middleton, 2019).

Items on *eating preferences* were used as probing questions.

Data Gathering Procedure

A three-year longitudinal data had been utilized to assess the prevalence of overweight and obesity in the public schools of Baliuag, Bulacan. Primary data collection period occurred from July-August of 2017, July-August 2018, and January 2019.

Prior to the survey, the research team coordinated with the school principal and nutrition coordinators of each public elementary school before the actual conduct of the following research activities:

1. Identify the school children with high levels of overweight or obesity by checking health records in the school clinic.
2. The participating schools provided the overweight and obesity cases based on the Department of Health (DOH) standards by grade level.

Before the structured interview with the parents and their children, the research team presented interview protocols, made observations and documented the following:

3. Select the highest levels of overweight. In the study, children with *obesity* cases were purposively selected as participants.
4. One session was devoted to the training of all researchers and assistants whose main task was to guide the school children in answering questions. The team leader provided a few minutes briefing to remind them of the strategies and techniques before the actual administration of survey. The “art of questioning” and documenting answers were adopted as methods to elicit valid responses from school children respondents.

Collaborative school-based survey had been administered in partnership with the Nutrition Office, Municipality of Baliwag. The survey conducted among participating children respondents were all guided by the team of researchers and trained research assistants.

Data Analysis

This study utilized both parametric and nonparametric inferential statistics to make inferences about the chosen samples based on the given population of overweight and obese children from public elementary schools.

Non-parametric tests relate to data that are flexible and do not assume a normal distribution. The one-way ANOVA on ranks or Kruskal-Wallis H test is a rank-based nonparametric test that can be used to determine if there are statistically significant differences among groups of school children when grouped according to their schools, age, and grade levels (Laerd Statistics).

Independent samples t-test was performed to calculate differences of two groups. Mann Whitney U test was run to compare the medians of dependent variables (dietary behaviors and physical activity behaviors) between gender groups (Laerd Statistics). The Jamovi, a free and open statistical tool, was utilized to process quantitative data for analysis (Jamovi, 2019).

Qualitative data are derived from the probing questions which provided more information for an in-depth analysis of the quantitative results. The approach was sequentially collected since the two questionnaires are related or connected (Creswell, 2006) as appended (Appendix B). The study used Likert items to measure the occurrence of dietary behaviors and physical activity patterns. This was followed by open-ended questions to validate frequencies or occurrence of the behaviors and activity patterns.

Ethical Considerations

The school-based survey was a successful collaboration between the Municipality's Health and Nutrition Office, the school principals and health and nutrition coordinators. In the conduct of the entire study, very minimal or no risk was observed by the research ethics committee. Consent forms were sent to school heads, coordinators and parents. A study protocol was explained fully to the participating school heads, parents and children.

Results and Discussion

This current study stems from the result of a school-based longitudinal data gathered by the Nutrition Office-Municipality of Baliwag in collaboration with the public elementary schools for the past three years as mandated by the Department of Health (DOH). Robust primary data from the three-year period of weighing school children were conducted for three consecutive years (2017-2019).

The Prevalence of Overweight and Obesity

From the three-year data, descriptive analysis on the prevalence of overweight and obesity was performed. Primary data on weighing school children were specifically collected in July-August 2017, July-August 2018, and January-February 2019. The figure below presents the summary of overweight

school children in the Municipality of Baliwag. Figure 1 shows the increasing prevalence of overweight children among public elementary schools. A total of 15,971 school children were weighed. Latest trends indicate that there were 719 boys and 401 girls with a total of 1,120 elementary pupils are who were overweight in the year 2019.

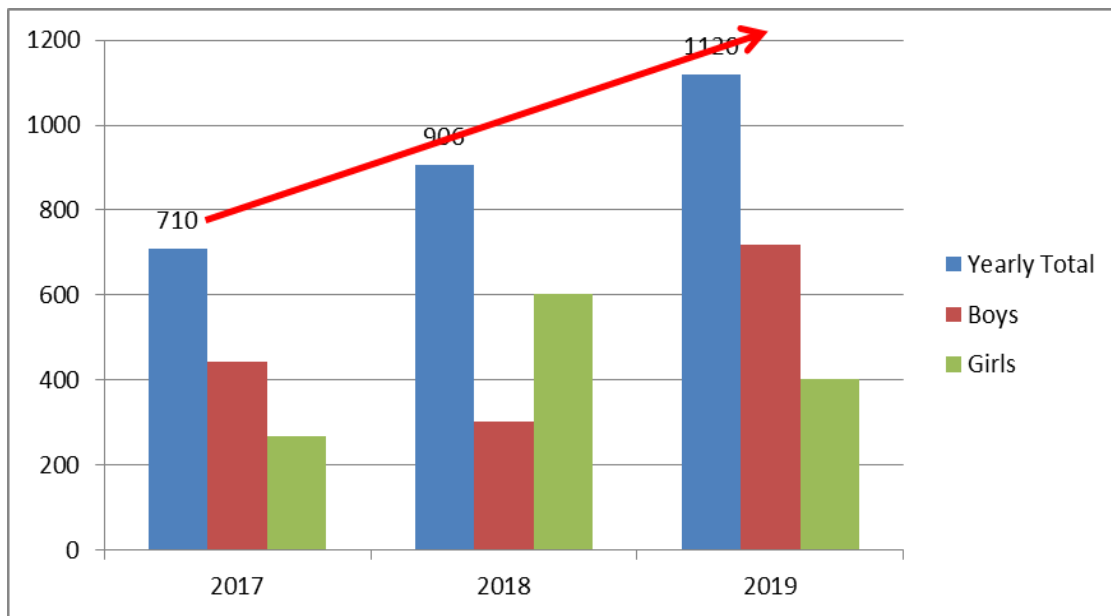


Figure 3. Prevalence of overweight and obesity among public school children from 2017 to 2019 (Nutrition Office-Municipality of Baliuag).

As shown in 2017, there were 710 overweight out of 15,930 public school children (4.5%); and 906 out of 15,362 for Year 2018 indicating 5.9% prevalence rate; and year 2019, with 1,120 over 15,971 overweight school children; the prevalence rate rose up to 7%.

This result confirms the increasing prevalence of overweight and obesity must be given serious attention in developing countries particularly by the municipality where the public school children reside. The literature focused on getting the attention of concerned public health offices to undertake preventive actions the soonest possible (Hoffman, 2016).

Table 1. Demographic profile of school children respondents

	Level	Count	%	Cumulative %	Total
SEX	F	24	34.3 %	34.3 %	70
	M	46	65.7 %	100.0 %	
SCHOOL	BNCS	25	35.7%	35.7 %	70
	Calantipay	11	15.7%	51.40%	
	Concepcion	18	25.7%	77.10%	
	Juan Ponce	16	22.9%	100.00%	
GRADE	1	12	17.1 %	17.1 %	70
	2	9	12.9 %	30.0 %	
	3	30	42.9 %	72.9 %	
	4	5	7.1 %	80.0 %	
	5	8	11.4 %	91.4 %	
	6	6	8.6 %	100.0 %	
AGE	6	9	12.90%	12.90%	70
	7	4	5.70%	18.60%	
	8	19	27.10%	45.70%	
	9	22	31.40%	77.10%	
	10	9	12.90%	90.00%	
	11	5	7.10%	97.10%	
	12	2	2.90%	100.00%	70

Table 1 shows the demographic profile of public school children in the Municipality of Baliwag. A total of 70 school children who were classified as obese participated in the survey. There were a total of 46 boys and 24 girls. Majority of the school children come from Baliwag North Central School comprising 35.7% of the sample population, while the smallest case of obesity came from Calantipay Elementary School with 15.7% of the respondents. Grade levels (1 to 6) were all represented, but the highest percentage comes from Grade 3 comprising 42.9%. Majority of the children's age ranges between 8-9 years old.

Table 2 presents descriptive results for the determining factors *food quality* which got the highest mean rating ($M=3.46$, often; $MD=3.5$; $SD=0.4$). Other two factors *sedentary behavior* ($M=2.52$, $MD=2.5$; $SD=.67$) and *quantity of food* ($M=2.5$; $MD=2.5$; $SD=1.28$) yield rare occurrence respectively. Standard deviation indicates wider spread of values for the quantity of food.

Table 2. Overall descriptive results (mean, median, standard deviation) of the different contributory factors

	FOOD QUALITY	NON- NUTRITIOUS	QUANTITY OF FOOD	EATING HABITS	PHYSICAL ACTIVITY	SEDENTARY BEHAVIOR
<i>N</i>	69	69	70	70	69	69
Missing	2	2	1	1	2	2
Mean	3.46	2.65	2.51	2.91	2.89	2.52
Median	3.50	2.60	2.50	3.00	3.00	2.50
Standard deviation	0.401	0.552	1.28	0.550	0.626	0.672
Variance	0.160	0.305	1.64	0.303	0.392	0.452
Minimum	2.25	1.40	1.00	1.25	1.50	1.00
Maximum	4.00	4.00	4.00	4.00	4.00	4.00
Shapiro-Wilk	$p < .001$	0.475	$< .001$	0.008	0.008	$< .001$

Legend: Never = 1-1.75; Rare = 1.76-2.5; Sometimes = 2.6-3.25; Often = 3.26-4.0

To treat the missing values, data cleaning was performed by averaging all values in Jamovi. Shapiro-Wilk test of normality indicates that three variables *i.e.* food quality, quantity of food consumed and sedentary movements resulted in non-normal distribution (p -values $<.001$). The descriptive statistics, however, indicated equality among variances with p -values >0.05 .

Table 3 shows consistent results with Table 1 even when split by gender. *Food quality* remains to get the highest mean rating ($M=3.47$) which means often occurrence for female children ($MD=3.5$; $SD=0.33$; $SE=0.07$) and male children respondents obtained the mean score of 3.46, likewise, indicates often occurrence ($MD=3.50$; $SD=0.44$; $SE=0.06$).

Table 3. Group descriptives (mean, median, standard deviation) split by gender

	Group	Rank	N	Mean	Median	SD	SE
Food Quality (nutritious food)	F	highest	23	3.47	3.50	0.331	0.0691
	M	highest	46	3.46	3.50	0.435	0.00641
Non-nutritious food	F		23	2.72	2.60	0.590	0.1230
	M		46	2.61	2.60	0.535	0.0789
Quantity of Food	F		24	2.46	2.50	1.268	0.2588
	M	lowest	46	2.54	2.50	1.303	0.1921
Eating Habits	F		24	2.74	2.75	0.636	0.1299
	M		46	2.99	3.13	0.484	0.0714
Physical Mobility	F		23	2.90	3.00	0.616	0.1284
	M		46	2.89	3.00	0.638	0.0941
Sedentary Activities	F	lowest	23	2.28	2.50	0.704	0.1469
	M		46	2.64	2.50	0.629	0.0928

Legend: Never = 1-1.75; Rare = 1.76-2.5; Sometimes = 2.6-3.25; Often= 3.26-4.0

Another explanatory factor, *sedentary activities*, obtained lowest mean score (2.28, rare) for the female group of respondents ($MD=2.50$; $SD=0.7$; $SE=0.15$). Whereas, the male group also got the lowest rating ($M=2.54$; $MD=2.50$; $SD=1.3$; $SE=0.19$) for the factor, *quantity of food*. Albeit standard deviations showed bigger dispersion, lower SEs (<0.5) indicate that individual sample means are closer to the actual population mean/median score.

Results indicate that both male and female school children rarely engage in sedentary activities. This could be explained by their busy daily schedule of classes five days per week. However, frequent occurrence of eating nutritious foods heavy on carbohydrates and fats were revealed and proven by qualitative responses such as eating “2 to 3 servings of rice, chicken, pork, eggs...” This result supports Hoffman’s study (2001) that the risk of obesity increases in developing countries due to the continuing growth in their economies.

The study of Martinez-Vizcaino et al. (2015) coincides with the above results wherein the families of school children in public schools were classified to have a low socioeconomic status which has been associated with less participation in sports or physical activities. This case in public schools could be also attributed to energy-dense diets found to be associated with inexpensive daily food consumption which are considered economical (2015).

Test of Differences

No significant differences found when grouped by age and grade level. One-way ANOVA Rank Tests, a statistical tool appropriate for samples that follow non-normal distribution (Buthmann, n.d.) were calculated. There were no significant differences found when split by *age* and *grade levels* as reflected by all p -values > 0.05.

The above results indicate uniformity of group scores regardless of age and grade levels that in terms of dietary behaviors, school children oftentimes consume nutritious foods such as the energy giving foods rich in carbohydrates daily ($M=3.46$, often). The variable eating habits ($M=2.9$, sometimes) shows that the school children eat their snacks in the morning, afternoon and at midnight more than once a week.

Qualitative responses support the above quantitative results as evidenced by eating foods heavy on carbohydrates and calories such as “*kamote*, corn, sandwiches, pasta, biscuits, ice cream...” for their snacks.

Table 4. Kruskal-Wallis by school

	χ^2	df	p		ϵ^2
EATING HABITS	12.01	3	0.007	*	0.1767
SEDENTARY	1.14	3	0.767		0.0170
PHYSICAL ACT	2.43	3	0.489		0.0362
QF	2.21	3	0.529		0.0326
NON NUTRITIOUS	3.20	3	0.362		0.0478
FQ	8.27	3	0.041	*	0.1235

Note: *Statistically Significant at $p < 0.05$

**Statistically significant at $p < 0.01$

***Statistically highly significant at $p < 0.001$

Following the assumptions of non-normality, the one-way ANOVA on ranks or Kruskal-Wallis H nonparametric test was further calculated to determine if there are statistically significant differences (Buthmann, n.d) among groups of school children according to their schools.

Table 4 showed variables on *eating habits* exhibiting chi-square value of 12.01 ($df=3$, $p=0.007$) and *food quality* also indicated significant difference among groups (chi-square=8.27, $df=3$, $p=0.04$). Initially, both factors obtained p -values < .05 which are a good indication of rejecting the null hypothesis. This result merely implies that there is a significant difference between group scores in public schools.

Table 5. Pairwise comparisons on eating habits

		<i>W</i>	<i>p</i>	
BNCS	Calantipay Elem. School	1.990	0.495	
BNCS	Concepcion Elem. School	4.449	0.009	*
BNCS	Juan Ponce Elem. School	3.383	0.079	
Calantipay	Concepcion Elem. School	2.125	0.436	
Calantipay	Juan Ponce Elem. School	0.986	0.898	
Concepcion	Juan Ponce Elem. School	-1.129	0.855	

Note: Statistically significant at $p < 0.05^*$ and statistically highly significant at $p < 0.01^{***}$

Table 5 presents Dwass-Steel-Chritchlow-Fligner pairwise comparisons among the four schools for the variable *food quality* which showed no significant differences as evidenced by all the p -values > 0.05 . There is not enough evidence that the null hypothesis can be rejected. This implies that there are no statistically significant differences between or among schools which is simply interpreted that the population mean scores from the four schools are equal.

Thus, Dwass-Steel-Chritchlow-Fligner pairwise comparisons were done on the factor, *eating habits*. With calculated p -values < 0.05 , results suggest that the null hypothesis be rejected which means that there is a difference between two schools. This indicates that school children coming from Concepcion Elementary School scored higher ($M=2.92$, $MD=3.0$) than the school children of Baliuag North Central School (BNCS) as reflected by the scores ($M=2.64$, $MD=2.5$). However, descriptive interpretation indicated “sometimes” for all children respondents from both schools which reveals that these school children eat in-between snacks less than once a day but more frequently in a week. There may be a difference in scores but not that highly significant.

In addition, public school children’s qualitative responses supported the quantitative results as evidenced by the school children’s frequent eating in fast-food restaurants such as “Jollibee, McDonalds, Mang Inasal, and Chowking”.

This case in public schools could be attributed to energy-dense diets found to be associated with inexpensive daily food consumption which are considered economical (Martinez-Vizcaino et al., 2015).

In a developing country, the “continuing growth across all socioeconomic classes” explains the above result of the study. This already gained explanations from early studies that excessive caloric intake is linked to obesity (Popkin, 1995; Drewnowski & Popkin, 1997; WHO, 1998, as cited in Hoffman, 2001).

Educational interventions generally show a limited effect on practicing a healthy diet whereas interventions targeting habitual behavior and/or the physical environment seem more promising. In view of the large number of people who are concerned about their diets and make attempts to change their dietary patterns, deRidder et al. (2017) found that it is crucial to gain a better understanding of both the automatic and environmental influences that are responsible for people not acting upon their good intentions for diet change.

Table 6. Independent samples *t*-test

		Statistic	<i>p</i>
Food Quality	Mann-Whitney U	511	0.814
Non-Nutritious Foods	Mann-Whitney U	470	0.450
Quantity of Food	Mann-Whitney U	526	0.743
Eating Habits	Mann-Whitney U	421	0.101
Physical Activity	Mann-Whitney U	523	0.944
Sedentary	Mann-Whitney U	397	0.083

Note: *Statistically Significant at $p < 0.05$

**Statistically significant at $p < 0.01$

***Statistically highly significant at $p < 0.001$

Independent samples *t*-test was calculated employing Mann-Whitney U Test to compare male and female school children in terms of dietary behaviors and physical activity patterns. Food quality ($M=3.47$, female; $M=3.46$, male) obtained equal medians of 3.5 for both groups. This reveals the highest score for high occurrence of consumption of nutritious foods taken from the pyramid plate.

The variable, *quantity of food*, obtained the lowest population scores for females ($M=2.46$) and males ($M=2.54$) and median scores of 2.5 for both gender groups. This reflected that most children's food intake is just limited to one or two servings of rice and viands frequently every meal per day but there could be three or more servings of meals consumed once or more in a week.

Physical activity patterns of male and female school children yield median scores of 3.0. The occurrence of children's engagement in active physical activities was noted to be practiced more than once a week. Sedentary behaviors reflect that both groups have obtained 2.5 median scores which delineate rare or less than once a week engagement in inactive physical movements such as playing indoor games, computer games, and using gadgets for more than two hours.

With all the p -values $> \alpha = .05$, this result indicates that mean and median scores of both gender groups are equal for all factors. This result confirms no significant differences found between male and female groups of school children.

Independent t -test also reveals that there are no differences found between male and female school children in terms of dietary behaviors and physical activity. Both genders showed that *mobility* has a higher occurrence or frequency than sedentary activities because most of the school children's time is usually spent on almost a whole day of classes. It is interesting to learn from the school nutrition coordinators' revelation that the data on prevalence of overweight and obesity presented by each public school were all conducted at the beginning of the school year. It indicates that the data on overweight and obesity were all gathered just right after the children's school break and Christmas break. In this case, the children mostly engaged in indoor and other sedentary activities with plenty of foods served high in fats and carbohydrates.

Overall, the study concludes that there no differences in dietary behaviors and physical activities among school children as evidenced by equality of group mean and median scores for all determining factors: *food quality, food quantity, eating habits and physical activity patterns*.

Table 7. Correlation matrix

		Mean Fq (2)	Mean Non - Nut (2)	Qf Mean	Mean Eating Habits	Mean Physical Act	Mean Sedentary
FOOD QUALITY	Pearson's r	—					
	p -value	—					
	Spearman's rho	—					
	p -value	—					
NON NUTRITIOUS	Pearson's r	0.224	—				
	p -value	0.064	—				
	Spearman's rho	0.218	—				
	p -value	0.073	—				
QF	Pearson's r	0.047	-0.234	—			
	p -value	0.700	0.053	—			
	Spearman's rho	0.046	-0.240	—			
	p -value	0.710	0.047 *	—			

continued

Table 7. Continuation

EATING HABITS	Pearson's r	-0.016	0.176	0.123	—		
	p -value	0.895	0.147	0.312	—		
	Spearman's rho	-0.007	0.150	0.071	—		
	p -value	0.951	0.218	0.558	—		
PHYSICAL ACT	Pearson's r	0.182	0.029	-0.098	0.039	—	
	p -value	0.134	0.812	0.423	0.751	—	
	Spearman's rho	0.175	-0.016	-0.072	0.012	—	
	p -value	0.151	0.893	0.554	0.919	—	
MEAN SEDENTARY	Pearson's r	-0.108	-0.008	-0.001	0.174	-0.001	—
	p -value	0.382	0.947	0.994	0.153	0.997	—
	Spearman's rho	-0.000	0.017	0.017	0.106	-0.053	—
	p -value	0.998	0.892	0.891	0.388	0.669	—

Note: *Statistically Significant at $p < 0.05$

**Statistically significant at $p < 0.01$

***Statistically highly significant at $p < 0.001$

Correlation matrix in Table 8 delineates no significant correlation for both Pearson's *r* and Spearman's rho coefficients for all variables with *p*-values > 0.05 . However, Spearman's rho correlation statistics showed lower *p*-value (0.047) at .05 level of significance. This result delineates a significant correlation between *non-nutritious foods* and *quantity of foods*.

Interestingly, results reveal that there is a negative correlation between quantity of food and non-nutritious food. The more likely these school children consume non-nutritious foods, the rarely they are to consume it in higher quantity. Albeit, majority of the children claim that they like to drink sweetened beverages and eat junk foods, qualitative data validate children's less consumption of non-nutritious foods such as junk foods as revealed by rare occurrence of eating less nutritious or non-nutritious foods.

The probing questions also reveal that in terms of food quantity, the school children consume two to three servings of rice and main dishes on their table. Word frequency from qualitative responses reveals that children in public schools, also, buy foods high in sugar, carbohydrates, and fats. Word frequency highlights mainly on the following foods bought in schools such as "ice cream,

hotdogs, sandwiches, fishballs, and siomai.” Sweetened drinks like juices and *samalamig* were also highly observed to be bought frequently by these children from public schools.

The above findings were found to be linked to the framework analysis which identified that access to healthy food options in grocery stores and restaurants are limited. Parents serve as the main agents of change for children’s health and nutrition behaviors and outcomes (Van Allen et al, 2017).

The study of Dabone (2011) likewise found that dietary habits and lifestyles resulted in increasing prevalence of obesity but reiterates that the area of nutrition transition study should still be explored as this is considered to be in the premature stage.

Conclusions

This study confirms the increasing prevalence of overweight and obesity must be given serious attention in a developing country particularly by the municipality where the school children are residing. The literature focused on getting the attention of concerned public health offices to undertake preventive actions the soonest possible (Hoffman, 2014; UN, 2016; WHO, 2018).

In terms of *food quality*, this study reveals that there is high occurrence of consumption of nutritious foods taken from the pyramid plate, but those are energy-giving foods which are high in sugar, carbohydrates, and fats.

Ironically, both male and female children with obesity rarely engage in sedentary activities. This phenomenon was attributed to the school children’s time being preoccupied by the series of daily class schedules during the conduct of this study.

Generally, the group means and median scores were consistently equal for all factors regardless of demographic factors such as school, age, gender, and grade levels. There were no statistical differences found in the dietary behaviors and physical activities of the public school children. Furthermore, results revealed a negative correlation between quantity of food and non-nutritious foods. The school children consume sweetened beverages and junk foods but less frequently in a week.

The sequential explanatory method reveals the similarities found in the dietary behaviors and physical activities of school children. Quantitative results have been supported by qualitative responses gathered in this study that children were exposed to foods high in calories such as those that are rich in carbohydrates, sugar, and fats that are available in their home, favorite fast-food restaurants, and school environments.

Implications of the study are found essential for public health and nutrition initiatives and policies of the Municipality of Baliwag.

Proposed Model of Public Health Policy and Nutrition Programs

Overall findings of this study support the call of UN for governments to reverse the trend of childhood obesity through the promotion of healthy foods and physical activity (2016). Furthermore, this study was stimulated by the earlier claims of scholars (Grundy, 1998; Wansink & Chiney, 2005) that public health effort is an immediate need to respond to the increasing prevalence of overweight and obesity.

The figure below presents the proposed Model of Public Health Policy and Nutrition Programs. Central to the proposed model are the healthy eating lifestyle, good nutrition, and healthy physical engagements. In light of the findings, development programs and policies for health and nutrition are recommended.

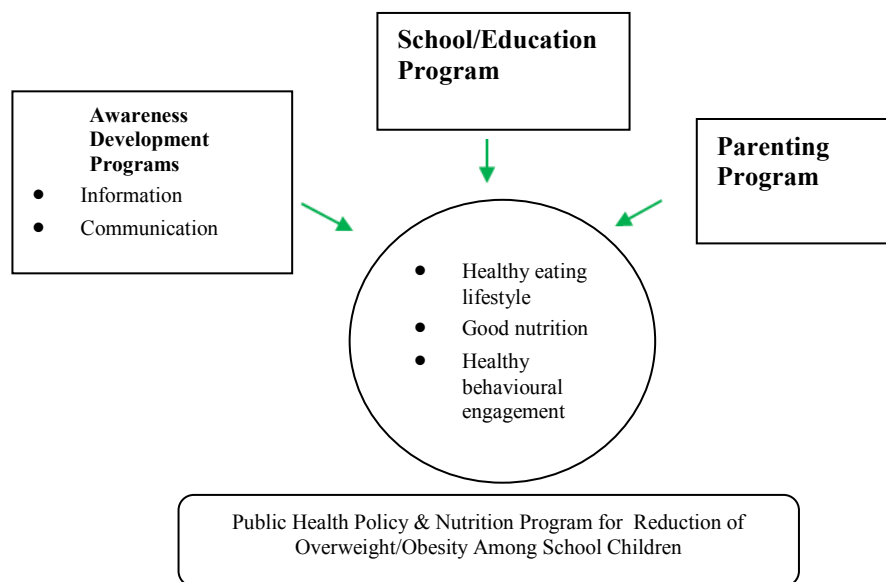


Figure 4. A proposed Model of Public Health Policy & Nutrition Programs.

1. *Awareness Development Program.* Raise awareness on the importance of good nutrition and healthy eating lifestyle to prevent childhood obesity. Utilizing different promotion and advertisement platforms such as social media and print ads to promote healthy eating lifestyle, exercise, and discourage availability and consumption of high calorie, nutrient-deficient foods.

2. Policy makers should promote knowledge in nutrition and or other health and diet lessons which significantly contribute to the success of health strategies in all countries (2005). After all, the call for governments worldwide is to address problems and prevent the bad effects of overweight and obesity among school aged children (WHO, 2018).
3. *School /Education Program.* The nutrition education program of the community should be enhanced by focusing on the preparation and serving of nutritious meals for school children. School programs, on the other hand, must be intensified by establishing availability of safe, healthy, and nutritious, but affordable meals and snacks through school canteens. It is essential to develop effective nutrition standards where foods and beverages are sold to school children. Likewise, they should heighten the engagement of school children in recreational games or sports through the physical education classes.
4. *Parenting Program.* The parenting program of the community that will make the parents become responsible for the health and wellness of their children especially in their growing years should be strengthened.

Home-community gardens and garden-based intervention projects should be encouraged to increase the availability of fruits and veggies that could improve the quality of foods being served at home. These projects are healthy for people and good for the planet earth (deRidder et al., 2017).

The study of Panchal (2009) provides information on the health benefits of a vegetarian diet which includes good health, longer lifespan, and protection from various diseases.

The information that parents and children gain from this study is crucial to their understanding of the prevalence of overweight and obesity. This offers new insights for them to be cautious of exposure to risk factors

Crucial to the success of public health strategy for preventing overweight and obesity is to bring awareness of eating behavior and exercise habits into consciousness. Weight control should be given a higher priority in the daily lives of the public. This change will require several steps of learning. First, a better understanding of the medical dangers of weight gain should enhance conscious motivation. The fact that cardiovascular risk factors can develop with only mild gains in weight, the community should be well informed. Second, the public should be brought to recognize that moderate obesity is not difficult to prevent or eliminate. (Grundy, 2004).

It is important for parents and educators who are taking good care of the children to learn the process of cognitive development in childhood as they plan health and nutrition education for children (Baskale et al., 2009). Subsequently, it is important that children not only acquire knowledge about appropriate and balanced nutrition, but also develop good eating habits (Baskale et al., 2009).

Limitations of the Study

Due to small sample size of obese children, causation analysis was rather limited. Future studies may perform further causal analysis using quantitative research design with greater population. Full participation of the parents must be encouraged by the organizing research teams and committees for an expansive retrospective cohort study.

Research initiatives in the future could focus on exploring educational programs designed to increase awareness of the health risks associated with obesity. School program's intervention may focus on the surveillance of weight and chronic disease related to over nutrition as recommended by Hoffman (2016).

For future research, scholars may conduct studies on the awareness of parents on the long-term risks of obesity and investigate if over nutrition can impair school children's academic performance. Moreover, the analysis of causal determinants of obesity is also interesting with the adoption of retrospective cohort study design and epidemiologic methods comparing overweight/obesity attributes and outcomes in bigger sample population.

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