

Abstract

The Children's Sight and Health project, initiated in October 2015 by expat volunteers in Chiang Mai, is a nonprofit endeavor aimed at improving the well-being of school children through vision testing and addressing nutritional needs. This study explores the prevalence of malnutrition among school children, both undernutrition and overnutrition, and highlights the importance of health education in addressing these issues. The project analyzed data from eight schools in Chiang Mai, involving 1,129 students, using the body mass index (BMI) as a standardized measure of adiposity. The findings indicate that 26.8% of children aged 13-19 were below the normal BMI range, while 16.8% were overweight or obese. Gender differences were observed, with a higher proportion of girls showing severe underweight or underweight status, and a greater number of boys being overweight or obese. The study emphasizes the critical role of early childhood nutrition in optimal growth and development and highlights the potential long-term health risks associated with malnutrition, such as chronic non-communicable diseases. Health education and regular monitoring of heights, weights, and lifestyle choices are essential in addressing these issues. The project's cooperation with schools has been promising; however, the need for continued education and intervention remains unmet. Recommendations include extending health education programs, partnering with educational institutions, and involving other agencies for long-term sustainability. The project's findings underscore the urgency of addressing underweight and overweight children through comprehensive health education initiatives and support systems.

Health Education in School Children

The Children's Sight and Health project, operational since October 2015, is a nonprofit initiative led by a small group of expat volunteers in Chiang Mai.¹ It aims to give back to the community by providing health education and support to school children. The project focuses on two primary areas: testing vision in selected schools and prescribing eyeglasses to those with visual impairments, and assessing children's nutritional needs to address the issue of malnutrition.

Malnutrition, encompassing both undernutrition and overnutrition, is a significant public health concern. Inadequate feeding during early childhood leads to subnormal growth (stunting), while overfeeding and unhealthy lifestyles (especially the junk food consumed) contribute to overweight and obesity. Although little can be done to address stunted growth in already affected children, there is hope for those at risk of abnormal weight gain.

Undernutrition not only hampers physical and intellectual development but also contributes to poor overall health. On the other hand, overnutrition is a precursor to chronic non-communicable diseases later in life, such as diabetes, heart diseases, and certain types of cancers to name a few. Disturbingly, the obesity rate among Thai children exceeds the target value of 10%, with rates of 11.8%, 13.6%, and 12.78% for school children between 2018 and 2020.² Unfortunately, stunting often receives insufficient attention, and short stature is sometimes deemed acceptable. The Thai government acknowledges the growing overweight and obesity problem and has mandated all schools to collect height and weight data

¹ www.facebook.com/chiangmaichildrensightproject/

² [link:https://www.bangkokpost.com/thailand/general/2029071/obesity-stunted-growth-in-thai-kids-spur-worries](https://www.bangkokpost.com/thailand/general/2029071/obesity-stunted-growth-in-thai-kids-spur-worries). Bangkok Post 3rd Dec.2020.

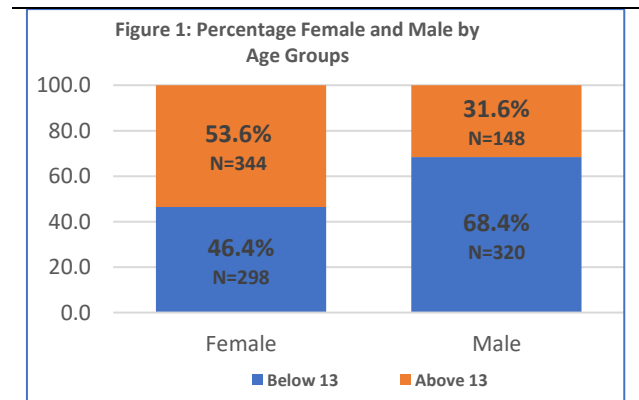
of students at regular intervals. However, it remains unclear if feedback is provided to the schools based on this data.

To standardize the measurement of growth in relation to height and weight, Body Mass Index (BMI) is utilized. BMI, calculated as weight (kg) divided by height squared (m²), is widely used as an index of relative adiposity for children, adolescents, and adults worldwide. The World Health Organization (WHO) defines a BMI of 25 kg or above as overweight and a BMI of 30+ as obese. However, the universal application of these standards has been questioned, particularly for Asian populations. WHO-sponsored seminars on Asian obesity risks suggest that overweight and obesity might be defined at BMI 23+ and 25+, respectively. Other studies, such as those conducted on Malaysians, indicate that body fat levels are higher in Asians compared to Caucasians, suggesting BMI thresholds of 23+ for overweight and 27+ for obesity.³ Considering Thailand's physique is closer to that of Malaysians, this study adopts the aforementioned BMI values. For undernutrition, WHO simplified field tables⁴ are followed, which consider a BMI above 15 as the average for both male and female children after the age of five, expecting all normal children at school entry to have a BMI of at least 15.

After obtaining approval from school managements, the project reviewed the heights and weights of 1,129 students (642 girls, 468 boys) from eight schools in Chiang Mai. The data was analyzed using Epi Info software, and simplified descriptive analysis was conducted. Each school received analyzed data summarizing the prevalence of underweight, normal weight, and overweight children, along with a list of students classified as overweight for closer advice. Although the participating schools represent various backgrounds and may not be fully representative of general schools in the province, the overall findings are likely to be similar. The project includes schools in rural areas as well as special needs schools such as the School for the Deaf in Chiang Mai and Chalermprakert Girls' School in Lamphun. Additional information about the schools can be found in Table 2.

Table 1: Body Mass Index (BMI) Categories

Definition	BMI Range
Severely Underweight	Below 15
Underweight	15.0 – 17.9
NORMAL	18.0 – 22.9
Overweight	23.0 – 26.9
Obese	Over 27.0
<i>Based on Malaysian Standards³</i>	



³ Deurenberg-Yap M, Chew SK, Deurenberg P. Elevated bodyfat percentage and cardiovascular risks at low body mass index levels among Singaporean Chinese, Malays and Indians. *Obes Rev*2002; 3: 209–215

⁴ WHO Growth Reference Data. <https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators/bmi-for-age>

Table 2: Schools Surveyed

No.	School Name	Location	Gender	Surveyed 1129
1.	Chalermprakret School,	Lamphun	Girls only	269
2.	School for the Deaf	Chiang Mai	Mixed	152
3.	San Na Meng	San Sai District	Mixed	81
4.	Ban Lak Pan Total	Mae Tang	Mixed	105
5.	Wat Cho Lae	Mae Tang	Mixed	221
6.	Wat Nong On	Mae Tang	Mixed	123
7.	Pa Ji Baan Phueng	Mae Tang	Mixed	119
8.	Baan Phueng	Mae Tang	Mixed	59

The results of the data analysis align with previous findings from four-school analyses, but the inclusion of four additional schools has increased the credibility of these findings. Among school children aged 13-19, 26.8% were below the normal BMI range, 56.5% were within the normal range, and 16.8% were classified as overweight or obese. The BMI values exhibited a normal distribution, with a mean of 18.97 (SD \pm 4.26), a median of 18.19, and a mode of 17.7.

Early childhood nutrition plays a crucial role in a child's growth. WHO's Growth Reference Data indicates that the median BMI of a child before school entry should be at least 15 or higher. The study revealed that underweight children below 13 years of age were more than twice as prevalent (63%) compared to those aged 13 or older (see Table 3 and Figure 3). Interestingly, nearly half of the younger underweight children catch up in terms of BMI as they grow older (see Figure 2), suggesting the potential for improvement before reaching optimal growth. Among children older than 13, only 4% displayed severe underweight, but 23% remained underweight within the BMI range of 15-18 (Table 4).

Figure 2

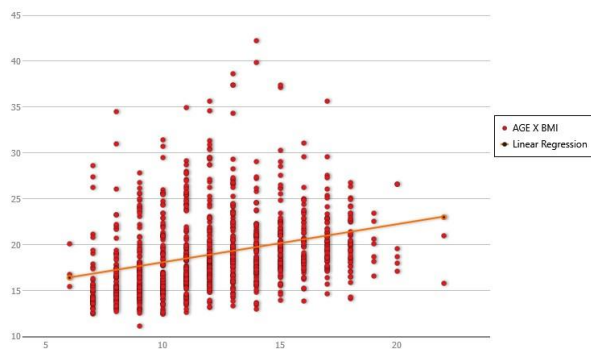


Figure 3. BMI categories by Age Grouping (Charts from Epi Info)

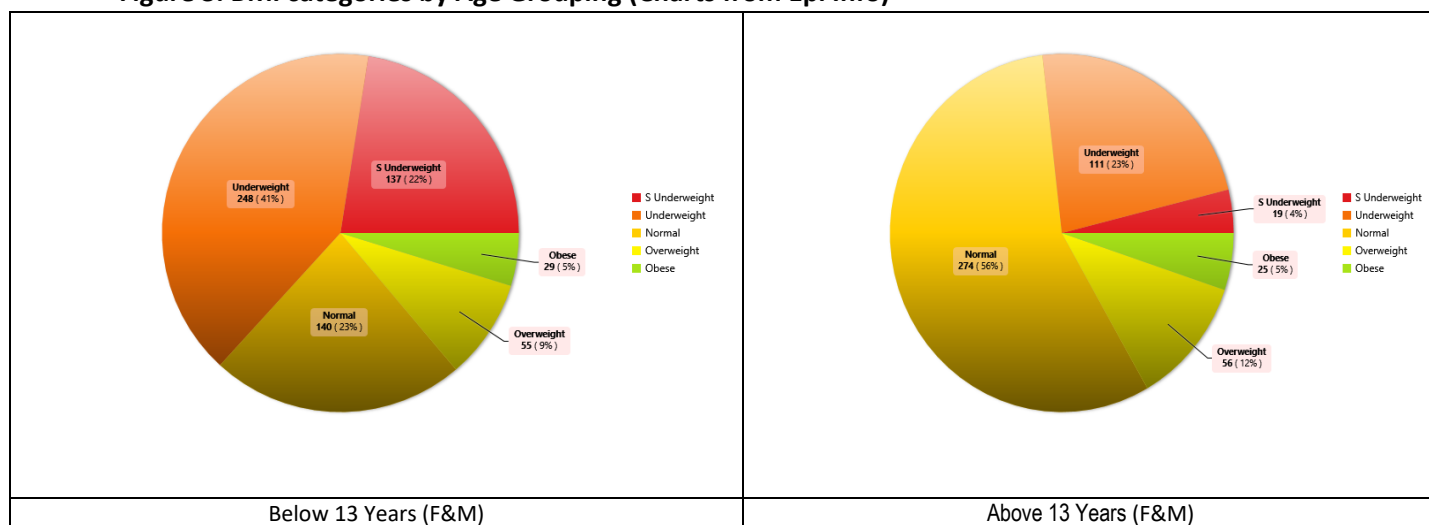


Table 4: Gender Differences

BMI Category	Female (%)	Male (%)	Total (%)
Severely Underweight	79 (12.4)	79 (17.1)	158 (14.4)
Underweight	200 (31.4)	163 (35.3)	363 (33.0)
Normal	280 (44.0)	133 (28.8)	413 (37.6)
Overweight	56 (8.8)	55 (11.9)	111 (10.1)
Obese	22 (3.5)	32 (6.9)	54 (4.9)
Total	637	462	1099

Gender differences were notable, with a higher enrollment of girls (58%) than boys (42%) in the study. This was largely due to the presence of an exclusive girls' school, Chalermapraket School in Lamphun. Excluding this school, a slightly higher percentage of girls (56.8%) were severely underweight or underweight compared to boys (52.4%). Among children with a normal BMI, girls (31.7%) fared better than boys (28.8%). Additionally, a greater number of boys (18.8%) were classified as overweight or obese compared to girls (11.5%).

Table 4: Schools covered in the study

School Name	Severely Underweight (%)	Underweight (%)	Normal (%)	Overweight (%)	Obese (%)	Total
Ban Lak Pan	8 (7.6)	47 (44.8)	31 (29.5)	13 (12.4)	6 (5.7)	105
Baan Phueng	13 (22.4)	29 (50.0)	9 (15.5)	3 (5.2)	4 (6.9)	58
Chalermapraket*	7 (2.7)	59 (22.5)	161 (61.5)	29 (11.1)	6 (2.3)	262
Paa Ji	17 (14.5)	43 (36.8)	34 (29.1)	13 (11.1)	10 (8.6)	117
School for the Deaf	13 (8.6)	52 (34.4)	64 (42.4)	17 (11.3)	5 (3.3)	151
San Na Meng	3 (3.9)	18 (23.4)	42 (54.6)	9 (11.7)	5 (6.5)	77
Wat Cho Lae	61 (28.6)	73 (34.3)	49 (23.0)	18 (8.5)	12 (5.6)	213
Wat Nong On	36 (29.3)	43 (35.0)	29 (23.6)	9 (7.3)	6 (4.9)	123
TOTAL	158 (14.3)	364 (32.9)	419 (37.9)	111 (10.0)	54 (4.9)	1106

*See description in the text above

Data analysis with Epi Info software

A notable observation was made regarding Chalermprakiet School in Lamphun (Table 4). This school exhibited the lowest percentages of severely underweight (2.7%) and obese (2.3%) children, along with the highest percentage of children with a normal BMI (61.5%) compared to other schools. However, a quarter of all children in this school were still underweight (BMI < 18). The key distinction appears to be that they are all boarders who receive reasonably balanced meals. The absence of cash transactions and restrictions on outside vendors and mobile phone use contribute to a healthier environment. In contrast, the other schools are day schools where children receive only one mid-day meal.

The quality, frequency, and quantity of food consumed significantly influence the nutritional status of children. Physical inactivity and poor dietary choices are primary factors contributing to increased levels of overweight and obesity, which are strong risk factors for non-communicable diseases (NCDs). Teenagers are particularly susceptible to these issues, and overweight and obesity have become rapidly growing health problems among this group. If left unaddressed, these children are at risk of developing chronic diseases, including diabetes, hypertension, and certain cancers, as they transition into adulthood. This risk is evident among teachers from two schools, where over 35% were found to be overweight or obese. Involvement of teachers in remedying this problem is crucial.

Health awareness and education are urgently needed in all schools. Regular monitoring of height and weight among school children serves as a valuable tool for assessing growth. Physical growth is of great interest to children themselves, as many are concerned about their height or weight and desire to be taller, shorter, fatter, or thinner. Fortunately, measuring height and weight is already a requirement in Thai schools. Linking this information to growth and development, as well as lifestyle choices, can greatly benefit children.

The project has received full cooperation from schools for this initiative. In return, the project has made efforts to engage teachers and students in understanding the impact of nutrition on growth and development. Poor nutritional choices and unhealthy lifestyles are significant contributing factors to undernutrition and overnutrition, which in turn lead to various chronic health problems later in life. While the project received cooperation during the eye testing phase, continuity in providing the required health education in schools has not been maintained.

Discussion

The most important findings from this study that highlight the need for health education are the high prevalence of underweight and overweight children.

Firstly, over one-fourth of all children were found to be underweight, indicating stunted growth primarily due to poor and inadequate nutrition during early childhood. Exclusive breastfeeding during the first six months of life is rarely followed, and weaning practices for children aged 6-36 months are inadequate. Attention must be given to the quality, quantity, and frequency of food provided to children, ensuring adequate intake of proteins, calories, and other nutrients. Early childhood nutrition not only affects physical growth but also impacts intellectual development.⁵ Once a child is stunted, there is no chance of catching up in terms of height. Therefore, educating teachers and students about the importance of proper care for children under the age of five is crucial for future generations.

⁵ How does nutrition affect the developing brain? <https://www.zerotothree.org/resource/how-does-nutrition-affect-the-developing-brain/>

Secondly, the prevalence of overweight among children is a serious and growing health problem. The schools involved in this project showed that 15% of all children were either overweight or obese. Unhealthy dietary habits (especially high intake of sugars and carbs, including junk food) and lack of physical activity contribute to this issue. If left unaddressed, overweight and obesity become significant problems in adulthood, as evidenced by the high percentage of overweight or obese teachers in some schools. The increasing prevalence of obesity is linked to numerous chronic diseases, including diabetes, hypertension, heart problems, and certain cancers. Additionally, expectant mothers who are overweight or obese experience higher levels of childbirth complications.

The Way Forward

The project had hoped that schools would welcome their assistance in providing ongoing health education to students and teachers based on the identified nutritional issues. However, apart from a few sessions during the eye testing phase, there has been limited continuity in implementing comprehensive health education programs. It is possible that teachers are overwhelmed with existing responsibilities and unable to take on additional tasks. Nonetheless, the project remains committed to offering help, but the prospects for sustained education at this stage seem uncertain. Applying alternative approaches may help. The project intends to discuss the findings with the education department and explore possibilities for partnership and official assistance. Collaborating with the education department may encourage schools to show further interest in ongoing health education for students.

Scope for Project Extension

1. The project aims to assist schools in assessing the extent of malnutrition and its impact on children's growth, seeking sustainable solutions.
2. Regular follow-up on heights and weights collected in schools, interpreting the data at least a couple of times a year, would be beneficial for children.
3. Engaging in discussions with students about healthy food choices and avoiding excessive sugars and carbohydrates. Special programs and support can be provided to overweight or obese students who wish to reduce weight.
4. Conducting periodic general health advice sessions in schools.
5. Drawing insights from the findings of Chalermprakiet School in Lamphun, providing advice and assistance in the areas of food preparation and service, with a focus on promoting a healthy diet.
6. Ensuring sustainability by involving other agencies, such as the Public Health School in Chiang Mai University, and encouraging trainee public health doctors and nurses within the department to take up this project.
7. Identifying teachers and students with weight problems and providing them with appropriate support.

By implementing these recommendations, comprehensive health education initiatives and support systems can effectively address the challenges of underweight and overweight children, ultimately improving the overall well-being of school children in Chiang Mai.