

# Knowledge and Consumption of Fruits and Vegetables of Selected Public and Private Senior High School Students in Imus City, Cavite

Georgia N. Gonzales,<sup>1</sup> Aimee Sheree A. Barrion, RND, PhD<sup>1</sup> and Ma. Cristina L. Lanorio, RND, MSc<sup>2</sup>

<sup>1</sup>*Institute of Human Nutrition and Food, College of Human Ecology, University of the Philippines Los Baños, Los Baños, Laguna, Philippines*

<sup>2</sup>*Science Education Institute, Department of Science and Technology, Bicutan, Taguig City, Philippines*

## ABSTRACT

**Background.** The 2019 Expanded National Nutrition Survey results showed that the contribution of fruits and vegetables (FV) in the one-day food intake of adolescents only accounted for 2.6% and 5.9%, respectively. Numerous literatures also stated that insufficient intake of FV is associated with the development of most non-communicable diseases.

**Objectives.** This study was undertaken to compare the knowledge and consumption of FV between selected respondents from public and private SHS in Imus City.

**Methods.** The study used a descriptive research design, and convenience sampling was done to gather respondents. A self-administered questionnaire was developed and the level of knowledge on FV was classified into low, fair, and good. In the evaluation of FV amount consumption, the Daily Nutrition Guide Pyramid for Teens was used. The data were reported in mean, mode, and percentages.

**Results.** More public SHS (49%) obtained a good level of knowledge on nutrient contents of FV, and consumed fruits (61%) more than the recommended daily serving. While more private SHS (96%) had a good level of knowledge of its health benefits but consumed vegetables (67%) less than the recommended daily serving. Their most consumed vegetables were *dahon ng sili* and garlic. The most consumed fruits were Indian mango and pear. Squash (47%) was the most liked vegetable by both groups. The majority of public SHS identified banana (37%) as their most liked fruit while it was mango (22%) for the majority of private SHS. Public SHS respondents were also recorded to have a lower average estimated family expenditure on FV.

**Conclusion.** The study concluded that both public and private SHS do not consume adequate amounts of FV despite their good level of knowledge of its nutrients and health benefits.

**Keywords:** nutrition, knowledge, consumption, fruits, vegetables

## INTRODUCTION

Fruits and vegetables (FV) are considered to be an essential part of a healthy diet as they contain many vitamins and minerals that are beneficial to the body including vitamins A, C and E, magnesium, zinc, phosphorus, and folic acid.<sup>1</sup> It was also found that diets abundant in FV help in lowering blood pressure, preventing diabetes, and reducing the risk of heart disease and eye problems.<sup>2</sup> When consumed, these may also aid in digestion as they are one of the main sources of dietary fiber.<sup>3</sup> Numerous literatures stated that insufficient intake of FV is associated with the development of cardiovascular diseases, some types of cancer, and osteoporosis which are examples of non-



eISSN 2094-9278 (Online)  
Published: February 15, 2024  
<https://doi.org/10.47895/amp.vi0.6487>

Corresponding author: Ma. Cristina L. Lanorio, RND, MSc  
Science Education Institute  
Department of Science and Technology  
Bicutan, Taguig City 1631, Philippines  
Email: [mllanorio@up.edu.ph](mailto:mllanorio@up.edu.ph)  
ORCID: <https://orcid.org/0009-0009-9587-8767>

communicable diseases (NCDs).<sup>4</sup> According to the World Health Organization, noncommunicable diseases account for 41 million deaths or 71% of all deaths globally each year and inadequate FV consumption was attributed to the estimated 3.9 million deaths worldwide in 2017.<sup>5</sup> One of the predictors of FV intake is nutrition knowledge aside from age, income, presence of elders, and nutrition attitudes.<sup>6</sup> It is also considered an important pathway to dietary intervention.<sup>6</sup> A study in 2018 also showed that low intake of FV among students was associated with their low knowledge of the recommended daily intake of these food items.<sup>7</sup> Among Filipinos, FV consumption is being held back for several reasons including their lack of knowledge of its benefits.<sup>8</sup> Socioeconomic factors also affect FV intake as evidence stated that consumption of these food items varied across neighborhoods with lower consumption recorded among socioeconomically disadvantaged ones probably because of, at least, poorer access in these neighborhoods to FV stores.<sup>9</sup> These socioeconomic factors have been usually measured in previous studies in terms of income, education, and occupation as these add up to inequalities in health and nutrition among all age groups.<sup>10</sup> It was also found that Filipino schoolchildren and adolescents belonging to low-income families and residing in rural areas have highly inadequate nutrient intake and were consuming substantially fewer servings of vegetables.<sup>10,11</sup> However, these results were not consistent with other studies since Ferreira et al. (2019) found that students from public schools, who mostly came from less privileged families, in Uberlândia, Minas Gerais, Brazil have higher energy intake from fresh/minimally processed foods, which included many FV, compared to students from private schools whose energy intake mostly came from ultra-processed foods and sugar.<sup>12</sup>

Awareness and adherence to a healthier diet are still evidently a challenge. In an explorative study conducted among college students in the US common barriers mentioned were time constraints, unhealthy snacking, convenience, high-calorie food, stress, high prices of healthy food, and easy access to junk food.<sup>13</sup> In the Philippines, an unhealthy diet was reflected in the result of the 2019 Expanded National Nutrition Survey wherein stunting among adolescents was still of medium prevalence at 26.8% while there was a serious wasting prevalence at 11.7% of individuals under the said age group.<sup>14</sup> It was also found that the Filipino diet lacks nutrient-dense foods such as FV among young adults and adults based on the 2013 Philippines National Nutrition Survey.<sup>10</sup> Filipino adolescents consume more fat, sweetened beverages, and not enough FV which results in inadequate intake of fiber and some nutrients.<sup>10</sup> It is also during this critical period that their dietary practices can serve as the foundation of their lifestyle and dietary habits as they age.<sup>11</sup>

Characterized by its population and industrialization, Imus City is considered as one of the fastest-developing towns in Cavite.<sup>15</sup> According to the 2015 Census of Population, this town is home to 403,785 people and was proclaimed as a city

in 2012 as it became the accelerating point of commercial, trading, and industrial activities in the locality.<sup>15,16</sup> It was found that urbanized areas, such as Imus City, experiencing rapid development and an increase in population are facing a “nutrition transition” process which may affect the lifestyle and dietary practices of the people, accordingly.<sup>17</sup> During this process, the pattern of food intake migrates from traditional diets towards high intakes of fatty, sugary foods, and highly processed food products thus, people are at higher risk of having non-communicable diseases.<sup>18</sup> This was reflected in the top ten leading causes of mortality among adolescents in Cavite last 2018 which included heart diseases, a preventable disease through lifestyle modifications such as having a healthy diet rich in FV.<sup>19,20</sup> Current issues on such matters were aggravated by the occurrence of the COVID-19 pandemic that affected almost all aspects of human life leading to a dramatic loss of lives and challenges to public health, food systems, and livelihood while economic and social damages of this global crisis resulted to tens of millions of people at risk of belonging into extreme poverty and probable increase of undernourished individuals up to 132 million by the end of 2020.<sup>21</sup> As reflected in the Philippines, local transport restrictions created supply-chain bottlenecks specifically for production inputs and product distribution especially of perishable foods like FV that affected food accessibility in areas where social mobility was strictly reduced.<sup>22</sup>

The increasing prevalence of unhealthy diets involve low consumption of FV among adolescents demanded further study to offer additional knowledge on the issue. This study can provide information on adolescents from Imus City about their FV consumption in consideration of their socioeconomic status. This can be a basis for the development of interventions to educate and promote its consumption in Imus City. This is vital for the growth and development of adolescents enabling them to meet their nutritional requirements and establish proper diet practices during this period. Thus, lowering their risks of developing adverse health conditions related to low consumption of FV such as non-communicable diseases.

## METHODS

### Research setting

Data gathering was done in Imus City, Cavite from April 27 to June 2 2021. The recruitment of participants was from April 27 to June 1, 2021. Recruitment was immediately closed after the required number of participants was achieved. Online social media platforms were used as data-gathering sites.

### Research design

This comparative study used a quantitative descriptive design as the knowledge and consumption of FV of selected respondents from public and private Senior High School (SHS) were described and compared.

## Respondents and sampling technique

The respondents of this study included 100 SHS students from all public (n= 49) and private (n= 51) SHS in Imus City, Cavite enrolled for S.Y. 2020-2021. Convenience sampling was used as a nonprobability sampling technique to collect respondents efficiently as this study was conducted during the lockdown. The total number of grades 11 and 12 students enrolled for S.Y. 2020-2021 was 11,435. The number of respondents was based on a 95% confidence level and a 10% margin of error.<sup>23</sup>

## Inclusion criteria

Respondents must be currently enrolled as either grade 11 or grade 12 students in any SHS in Imus City, Cavite for S.Y. 2020-2021, adolescents aged 10 to 19 years old, and residents of Imus City who agreed and signed the informed assent forms.

## Exclusion criteria

SHS students who transferred schools or dropped out during S.Y. 2020-2021, moved residences outside Imus City, Cavite, and/or did not sign in the informed assent forms were not included in the study.

## Materials

The materials used in the study included a digital survey questionnaire made in Google forms to describe respondents' knowledge and socioeconomic status, and a semi-quantitative food frequency questionnaire (FFQ) to assess the amount, kind, and frequency of their consumption of FV. The first part contained a total of eight questions where one of which was about the nutrient contents for a maximum score of ten, and two for the health benefits of FV for a maximum score of also ten. Four questions were about the respondents' socioeconomic status based on their monthly family income, their usual FV sources, and estimated monthly family expenditure on these food groups. The semi-quantitative FFQ included respondents' commonly consumed vegetables and fruits. The FFQ was also used to measure the amounts and frequencies of the respondents' intakes of their commonly consumed FV for the past year. Other questions related to FV consumption such as their most liked FV were asked as open-ended questions. All of these were validated by assistant professor Dr. Aimee Sheree A. Barrion and underwent participating pretests to a small portion of the target population.

## Data collection procedure

Validated and pre-tested questionnaires were disseminated through social media platforms including Facebook, Messenger, and Twitter to maximize its reach. Important details of the study such as the inclusion were initially presented to the public to filter out those who were willing to answer the survey but did not fit those criteria.

**Table 1.** Classification on the Level of Knowledge of FV<sup>25</sup>

Level of knowledge	Score
Poor ( $\leq 50\%$ )	0-10
Fair (51%-69%)	11-14
Good ( $> 70\%$ )	15-20

Informed assent forms were then given to the respondents before allowing them to answer the survey and the FFQ. Both of these were self-administered. After gathering all data needed from the respondents, data organization, analysis, and interpretations were conducted.

## Data processing and analysis

Results gathered from respondents from public schools were separately presented from the results obtained from private school students to show a comparison. Descriptive statistics such as frequencies, means, and percentages were used to describe the respondents' socioeconomic status and knowledge of the nutrients and health benefits of FV. Respondents' family monthly income was the basis for classifying their socioeconomic status and was interpreted based on the income cluster classifications from the Philippine Institute for Developmental Studies.<sup>24</sup>

The socioeconomic statuses of respondents from public and private schools were compared using percentages and modes. To describe the respondents' knowledge of FV based on its nutrient components and health benefits, a classification in the study of Rohin et al. was used.<sup>25</sup> Only the 20 questions involving these topics were scored and the respondents' scores were interpreted based on the classifications on the level of knowledge in Table 1.

Results regarding the knowledge of respondents from public and private schools were then compared to each other using percentages. The amount of FV consumption was evaluated by comparing the respondents' total consumption of these food groups per day to their recommended intakes based on the Daily Nutritional Guide Pyramid for Teens which was both recommended to be at three servings per day<sup>26</sup> and the proportions of the respondents who met and did not meet the recommended daily serving intake were obtained. The kind of FV consumed by the respondents was then analyzed using a measure of central tendency, which is mean, to determine their most consumed FV and their corresponding average amount of consumption per day. Afterward, the usual consumption pattern of the most consumed FV was presented as well. The mode was also used to present the most liked vegetable and fruit of the respondents while the reasons for such were coded, classified, and analyzed using mode. Usual sources of FV among respondents who belong to households that consume these food groups were identified using percentages while their families' estimated amount of monthly expenditure on FV was presented using percentages and mean.

**Ethical considerations**

Informed assent forms were given to the respondents before conducting the survey. Through this, the respondents were given a gist of the background, objectives, significance, and data gathering procedure of the study. They were also informed that they would not be harmed throughout the process and that they may voluntarily withdraw or choose not to participate in the study. All of the respondents' information will remain confidential and were only used for research purposes.

**RESULTS**

**Respondents' profile**

This study involved 100 respondents composed of 49 public SHS students and 51 private SHS students from Imus City, Cavite. They were further classified based on their socioeconomic status with respect to their monthly family income. The majority of public SHS students belonged to the poor (51%) income cluster. On the other hand, private SHS students mostly belonged to the lower middle-income class (24%) and middle middle-income class (24%). There were also some private SHS students who were classified under upper middle-income class (10%), upper-income class (2%),

and rich-income (4%) clusters. This supports the knowledge that students from public schools mostly come from less privileged families than those from private schools.<sup>27</sup>

**Knowledge on nutrients and health benefits of FV**

All respondents from both public and private SHS (100%) said they eat fruits and vegetables. Nineteen (39%) of public and 15 (29%) of private SHS respondents identified all of the nutrients commonly found in FV. On the other hand, 37 (76%) of public and 35 (69%) of private SHS respondents were able to identify all the health benefits of consuming FV.

Table 2 shows that 98% of respondents from public SHS know that FV has vitamin C, while vitamin A (88%), vitamin E (84%), potassium (82%), and dietary fiber (69%) were also among the nutrient components of FV that they know. None from public SHS answered "Do not know" and "None of the above." The majority of respondents from private SHS also know that vitamin C (96%) is found in FV aside from other nutrients commonly identified as well which include vitamin A (84%), potassium (76%), dietary fiber (71%), and vitamin E (71%). One respondent from private SHS answered, "Do not Know."

The respondents from public SHS are aware that the health benefits of FV include the reduction of risk of

**Table 2.** Knowledge of Nutrients and Health Benefits of FV

Questions	Public School (%)		Private School (%)	
	n	%	n	%
<b>What do you think are the nutrients present in fruits and vegetables?</b>				
• Dietary fiber	69		71	
• Vitamin A	88		84	
• Vitamin B complex	67		57	
• Vitamin C	98		96	
• Vitamin E	84		71	
• Vitamin K	49		51	
• Calcium	63		55	
• Magnesium	67		59	
• Potassium	82		76	
• Iron	63		59	
• None of the above	0		0	
• Do not know	0		1	
Questions	Yes (%)		No (%)	
	n	%	n	%
<b>Do you think fruits and vegetables can improve your health?</b>	100	0	100	0
<b>Do you think the following health benefits can be obtained by consuming fruits and vegetables?</b>				
• Improves gastrointestinal health	92	8	100	0
• Prevents overweight and obesity	96	4	100	0
• Reduces the risk of cardiovascular diseases	100	0	100	0
• Prevents diabetes	100	0	100	0
• Reduces risk of cancer	94	6	92	8
• Strengthens immunity	98	2	100	0
• Improves bone health	92	8	92	8
• Improves mental health	90	10	82	18
• Prevents non-communicable diseases	90	10	90	10

**Table 3.** Level of Knowledge on Nutrients and Health Benefits of FV

	Public Schools		Private Schools	
	n	%	n	%
<b>Nutrients</b>				
<b>Level of knowledge</b>				
Poor	13	27	18	35
Fair	12	24	11	22
Good	24	49	22	43
<b>Total</b>	49	100	51	100
<b>Health Benefits</b>				
<b>Level of knowledge</b>				
Poor	0	0	1	2
Fair	4	8	1	2
Good	45	92	49	96
<b>Total</b>	49	100	51	100

cardiovascular diseases (100%) (e.g., hypertension, coronary heart disease, stroke, and heart failure) and diabetes prevention (100%) aside from immunity strengthening (98%) and obesity prevention (96%). Meanwhile, it was shown that respondents from private SHS know that consuming FV can improve gastrointestinal health (100%), prevent overweight and obesity (100%), reduce the risk of cardiovascular diseases (e.g., hypertension, coronary heart disease, stroke, and heart failure) (100%), prevent diabetes (100%), and strengthen immunity (100%) (Table 2).

In Table 3, the respondents' level of knowledge of the nutrient contents and health benefits of FV was classified. Results showed that both the respondents from the public (49%) and private (43%) SHS had a good level of knowledge on its nutrients. While majority of the public (92%) and private (96%) SHS had a good level of knowledge of its health benefits.

### Consumption of FV

Table 4 shows that 51% of public and 67% of private SHS respondents consumed less than 3 servings of vegetables.

On the other hand, the majority of the respondents from public SHS were found to consume more than 3 servings per day of fruits (61%) while it was 49% for private SHS respondents.

In Table 5, it was shown that *dahon ng sili* was the most consumed vegetable by the respondents from public SHS with an average amount of consumption of 90 grams per day wherein 100% of its consumers in the group consume it usually on a daily basis. In private SHS respondents, the most consumed vegetable was garlic with an average amount of consumption of 53 grams per day and its usual consumption pattern was daily as well as stated by 72% of its consumers in the group. Other similar vegetables commonly eaten by the two groups include onion, *malunggay*, *kangkong*, and garlic.

**Table 4.** Evaluation of the Daily Amount of Intake of Fruits and Vegetables

Total Amount of Daily Intake	Public School				Private School			
	Vegetables		Fruits		Vegetables		Fruits	
	n	%	n	%	n	%	n	%
<i>Less than 3 servings</i>	25	51	10	20	34	67	18	35
<i>At 3 servings</i>	5	10	9	18	3	6	8	16
<i>More than 3 servings</i>	19	39	30	61	14	27	25	49
<b>Total</b>	49	100	49	100	51	100	51	100

**Table 5.** Consumption of FV in Public and Private SHS

	Average Amount of Consumption (grams/day)	Usual Consumption Pattern	%	Reasons
<b>Public Schools</b>				
<i>Most consumed vegetables</i>				
<i>Dahon ng sili</i>	90	Daily	100	
Onion	58	Daily	81	
<i>Most liked vegetable</i>				
Squash			29	Perceived health benefits, taste, nutrient density
<i>Most consumed fruits</i>				
Indian mango	140	Daily	100	
Banana	116	Daily	72	
<i>Most liked fruit</i>				
Banana			37	Nutrient density, perceived health benefits, taste, affordability, convenience, environment
<b>Private Schools</b>				
<i>Most consumed vegetables</i>				
Garlic	53	Daily	72	
Leeks	51	Daily	67	
<i>Most liked vegetable</i>				
Squash			18	Perceived health benefits, taste, suitable in many dishes
<i>Most consumed fruits</i>				
Pear	164	Daily	37	
Dragon fruit	134	Yearly	68	
<i>Most liked fruit</i>				
Mango			22	Taste, nutrient density, perceived health benefits, accessible



Indian mango was the most commonly consumed fruit by the respondents from public SHS wherein its average amount of consumption per day was 140 grams and all of its consumers in the group stated that it was usually consumed daily while the most commonly consumed fruit was pear for private SHS respondents with an average amount of consumption per day of 164 grams and its usual consumption pattern was also daily as stated by all of its consumers in the group. Other fruits that were similarly consumed mostly by both groups include banana, *dalandan*, mango, papaya, Indian mango, and pear. Squash was the most liked vegetable for both groups wherein 29% and 18% of respondents from public and private SHS enumerated it, respectively. The majority of the respondents from public SHS referred to their perceived health benefits of squash (43%) specifically, its effect on eyesight improvement as the leading reason for their preference for this vegetable. Banana (37%) was the most liked fruit by the majority of public SHS respondents because of its nutrient density (28%). Meanwhile, mango (22%) was the most liked fruit by private SHS respondents mostly due to its taste (64%) (Table 5).

**Level of knowledge and consumption of FV based on SES**

In Table 6, it was shown that most respondents in both public (55%) and private (73%) have less than six servings of FV per day. Only around 41% of public and 27% of private SHS consume more than six servings of FV.

The majority of the respondents in each income cluster have a good level of knowledge on the nutrients and health benefits of FV except for those under the lower middle-income class (58%) in private SHS, wherein most are classified to have a fair level of knowledge. All respondents classified under the upper middle-income class (100%), upper-income class (100%), and rich-income (100%) clusters have a good level of knowledge. In terms of FV consumption per day, an inconsistent pattern of their adequacy of intakes based on socioeconomic status was observed. The majority (73%) of private SHS respondents were recorded to have less than the recommended amount of FV intake per day despite them mostly having a good level of knowledge on the nutrients and health benefits of FV.

**Procurement and expenditure on FV**

The majority of respondents from both groups identified wet and dry markets or *palengke* as their usual source of FV. Specifically, 42% of respondents from public SHS and 56% from private.

Table 7 shows that public SHS respondents were recorded to have a lower average of estimated monthly family expenditure on FV. Among respondents from public SHS, PhP 0-500 (35%) and PhP 501-1000 (35%) were the most common estimated monthly family expenditure on vegetables with an average of PhP 1420.20 which was lower than that of respondents from private SHS which amounted to PhP 1998.04. PhP 501-1000 (31%) was also the most common estimated monthly family expenditure on vegetables of the latter group.

**Table 6.** Socioeconomic Status, Level of Knowledge, and Consumption of Fruits and Vegetables of Respondents from Public and Private Senior High School

Income Cluster	Level of knowledge			Total Consumption		
	Poor	Fair	Good	<6 servings	At 6 servings	>6 servings
Frequency (%)						
<b>Public</b>						
Poor	0	7 (28%)	18 (72%)	14 (56%)	1 (4%)	10 (40%)
Low-income class (but not poor)	0	4 (44%)	5 (56%)	4 (44%)	0	5 (56%)
Lower middle-income class	0	3 (23%)	10 (77%)	8 (62%)	1 (8%)	4 (31%)
Middle middle-income class	0	0	2 (100%)	1 (50%)	0	1 (50%)
Upper middle-income class	0	0	0	0	0	0
Upper-income class (but not rich)	0	0	0	0	0	0
Rich	0	0	0	0	0	0
<b>Total</b>	0	14 (29%)	35 (71%)	27 (55%)	2 (4%)	20 (41%)
<b>Private</b>						
Poor	1 (11%)	2 (22%)	6 (67%)	5 (56%)	0	4 (44%)
Low-income class (but not poor)	0	1 (10%)	9 (90%)	8 (80%)	0	2 (20%)
Lower middle-income class	0	7 (58%)	5 (42%)	9 (75%)	0	3 (25%)
Middle middle-income class	0	4 (33%)	8 (67%)	10 (83%)	0	2 (17%)
Upper middle-income class	0	0	5 (100%)	4 (80%)	0	1 (20%)
Upper-income class (but not rich)	0	0	1 (100%)	0 (0%)	0	1 (100%)
Rich	0	0	2 (100%)	1 (50%)	0	1 (50%)
<b>Total</b>	1 (2%)	14 (27%)	36 (71%)	37 (73%)	0	14 (27%)

**Table 7.** Estimated Monthly Family Expenditure on FV

Monthly Family Expenditure in Range (in PhP)	Vegetables		Fruits	
	Public	Private	Public	Private
	Frequency (%)			
0-500	17 (35%)	12 (24%)	20 (41%)	19 (37%)
501-1000	17 (35%)	16 (31%)	14 (29%)	15 (29%)
1001-1500	3 (6%)	4 (8%)	7 (14%)	3 (6%)
1501-2000	5 (10%)	4 (8%)	5 (10%)	3 (6%)
2001-2500	1 (2%)	2 (4%)	1 (2%)	0 (0%)
2501-3000	2 (4%)	2 (4%)	0 (0%)	4 (8%)
3001-3500	0 (0%)	0 (0%)	0 (0%)	0 (0%)
3501-4000	0 (0%)	2 (4%)	0 (0%)	0 (0%)
4001 and above	4 (8%)	9 (18%)	2 (4%)	7 (14%)
<b>Average (in PhP)</b>	<b>1420.20</b>	<b>1998.04</b>	<b>1167.35</b>	<b>1698.04</b>

## DISCUSSION

All selected participants consume FV. The majority of the respondents from the public (86%) and private (96%) SHS stated that vitamin C can be found in FV. Vitamin C or ascorbic acid is an essential nutrient found in variable amounts in many natural sources such as fruits, vegetables, and organ meats. It plays various important roles in the body including the repair of tissues, aiding in iron absorption, as an antioxidant, and in disease prevention.<sup>28</sup> It has special relevance to adolescent health as iron deficiency is also prevalent among this age group, especially in girls.<sup>29</sup> Anemia also was still found to be a problem of mild public health significance among females aged 13 to 19 years.<sup>30</sup> Vitamin C has also become more common than before, as claims and beliefs about its effectiveness against COVID-19 turned into a known topic.<sup>31</sup> One respondent from private SHS answered “Do not know” in the question about nutrients present in FV. This gap in the knowledge of food content, specifically on FV, may affect one’s overall nutrition since adolescence is a time of transition and when habits are formed.<sup>32</sup>

On the question of whether the selected participants think that fruits and vegetables can improve their health, all of them answered yes. Their awareness is a good sign as a healthy diet and eating habits that are developed during childhood and adolescence can help reduce the risk of developing diseases like type 2 diabetes, high blood pressure, and heart disease, as well as decrease the likelihood of becoming overweight or obese.<sup>33</sup> This is in parallel with the study conducted in rural Terengganu, Malaysia wherein the majority of adolescents had good knowledge regarding the health benefits of vegetable consumption.<sup>25</sup>

A higher percentage of public SHS (49%) respondents relatively had a good level of knowledge in terms of the nutrient contents of FV. This is in line with the findings from the University of York that individuals who belong to low-income families have a high awareness of healthy diets.<sup>34</sup> Their possible exposure to classroom-based nutrition education in schools and access to FV might have been

some of the factors in their increased nutrition knowledge.<sup>35</sup> More private SHS (96%) respondents had a good level of knowledge of the health benefits of FV. In a study conducted by Gonzales et al., they also found that most adolescents perceive FV to bring a positive effect on their bodies which includes making an individual healthy and strong, heightening resistance to infections, and bringing more nutrition.<sup>11</sup> Health benefits of FV obtained an increasing focus among nutrition education interventions in many countries<sup>4</sup> to which the respondents may have been exposed to before the study was conducted hence, their good level of knowledge on the topic.

The majority of both public (51%) and private (67%) SHS respondents consume less than three servings of vegetables per day. However, most respondents from both public (61%) and private (49%) SHS consume fruits more than three servings per day. It is recommended in a study that FV should be introduced as early as infancy to facilitate the mitigation of adolescents’ unhealthy behavior and inadequate FV consumption.<sup>36</sup> In a study conducted in the US, few adolescents or adults are consuming the recommended amount of FV despite the recommendations based on MyPyramid.<sup>37</sup> Gonzales et al., also found that adolescent students in Manila have a mean vegetable consumption that was below the recommended 170 grams per day and mean fruit intake that was more than the recommended 200 grams of fruits per day.<sup>11</sup> In the same study, Filipino adolescents were noted to seldom eat vegetables as they do not like the taste, texture, perishability, and time-consuming preparation.<sup>11</sup> Several studies suggested that increasing the consumption of whole, fresh fruit promotes weight maintenance or modest weight loss and may have a role in the prevention and management of excess adiposity.<sup>38</sup> A study testing the effects of a diet very high in fiber from fruits and vegetables also reported no adverse effects and it reduces the risk factors for cardiovascular diseases and possibly colon cancer.<sup>39</sup>

*Dabon ng sili* is the most consumed vegetable of public SHS respondents. It is a significant source of micronutrients that could satisfy one’s requirement for optimal health and nutrition and can be cooked as greens in chicken soup.<sup>40</sup> It is also easy to grow in gardens,<sup>41</sup> which may have increased its accessibility to public SHS respondents. On the other hand, garlic is the most consumed vegetable among private SHS respondents. It has been found to have anti-inflammatory, anti-oxidative, antibacterial, and anticancer properties due to its allicin content.<sup>42</sup> It is also considered an essential ingredient in many different types of cooking, as it is widely used as a flavoring.<sup>43,44</sup> *Malunggay*, one of the mentioned vegetables commonly eaten by both public and private SHS respondents, was also recorded to be the second most commonly consumed vegetable by Filipino households in 2015.<sup>45</sup> However, it must be noted that respondents’ inaccuracy in the estimation of the amounts of these vegetables might have affected the results. Garlic for example is often used in minimal amounts as flavoring, consuming it excessively may cause upset stomach, bloating, diarrhea, body odor, and bad breath.<sup>44,46</sup>

The popularity of mango among SHS respondents was parallel with the information from the Department of Agriculture (DA) which stated that it is the fifth most consumed fruit after citrus, banana, grapes, and apple.<sup>47</sup> The result might have also been affected by the timing of the data-gathering period which was conducted during the summer. In the Philippines, Indian mangoes were found to be more abundant in the country during this season<sup>48</sup> thus, the respondents from public SHS were able to emphasize their consumption of it. Mangoes, in general, were also found to have various health benefits such as improved immunity, digestive health, and eyesight and the ability to lower the risk of certain cancers.<sup>49</sup> Meanwhile, pear is largely produced in temperate and subtropical regions thus, most of its supply in the country is imported from countries such as China and the United States of America.<sup>50</sup> Higher consumption of this fruit among others by the private SHS respondents may be a reflection of their access to imported goods such as pears which are more expensive in the Philippines<sup>51</sup> as most of them were also found to belong in higher income clusters and have higher estimated monthly family expenditure on fruits. Pears also provide a significant amount of fiber and other essential nutrients and were found to aid in reducing the risk of heart disease, diabetes, and some gut conditions like diverticulosis.<sup>52</sup>

Squash is the most liked vegetable for both public and private SHS respondents. The majority of public SHS referred to their perceived health benefits of squash specifically, its effect on eyesight improvement as the leading reason for their preference for this vegetable. This was also the leading reason for respondents from private SHS which was supported by the findings of a study that implied that outcome expectation can be one of the determinants of improving vegetable preference in adolescents.<sup>53</sup> It may also be observed that the public and private SHS respondents' most consumed vegetables, which were *dahon ng sili* and garlic, respectively, did not reflect their most liked vegetable. In the study of Al-Otaibi, it was stated that other factors can influence the FV intake of adolescents such as individual factors (gender, age, knowledge, etc.), social factors (parents' intake and modeling, parents and family support, etc.), and environmental factors (income, parents' occupational status, parents' education, etc.).<sup>54</sup> Sensory characteristics such as texture, color, and taste were also found to be a major factor in school-aged children's acceptance or rejection of vegetables aside from the habits of consumption in the family environment.<sup>55</sup> Other barriers to the consumption of vegetables may also include their lack of knowledge on how to prepare these in ways that tasted good.<sup>11</sup>

Banana (37%) was the most liked fruit by the majority of public SHS respondents because of its nutrient density (28%) wherein respondents described it to be rich in protein and potassium. Meanwhile, mango (22%) was the most liked fruit by private SHS respondents mostly due to its taste (64%) described by respondents to be sweet. In a study by Brug et al., it was stated that taste preference and liking are important

for motivation to eat certain foods but other factors such as social-cultural, physical environment, nutrition knowledge, and abilities should also be considered.<sup>56</sup> In a study conducted in the US, it was found that those who participated in youth gardening programs were more willing to eat nutritious food and try ethnic and unfamiliar food.<sup>57</sup>

Most respondents belonging to each income cluster have a good level of knowledge of the nutrients and health benefits of FV. However, in terms of fruit and vegetable consumption, an inconsistent pattern in the adequacy of intakes according to income clusters was observed. About 55% of public and 73% of private SHS have less than six servings of FV per day which might have been either or less than three servings each. In the study of Croll et al. among senior and junior HS students, wherein the study found that there is a significant amount of knowledge regarding healthy foods among adolescents but interventions are still needed to translate knowledge into healthy behaviors.<sup>58</sup> In another study conducted in the Philippines, results showed that adolescents have a good perception of fruits and vegetables, however, they consume substantially lower servings of vegetables than the recommended daily allowances but fruit intake was higher than the recommended.<sup>11</sup> This may imply that there are other barriers to adequate consumption of FV, other factors may include age, sex, availability, food preference, and time.<sup>11</sup>

As answered by the majority of both groups, wet and dry markets or *palengke* remained popular as traditional food retail in the Philippines still dominates the food retail market.<sup>59</sup> In urban China, traditional market also maintained popularity, as the wet market creates a sense of freshness.<sup>60</sup> As countries become urbanized, modern shops like supermarkets replace traditional markets; this also exposed consumers to more marketing and different food choices (processed, new, and imported foods).<sup>61</sup> Having a backyard garden or doing home gardening was found to be one of the new coping strategies during the COVID-19 pandemic practiced by Filipinos including students, teachers, and older adults. Even during pre-pandemic times, home gardening has already been initiated to address problems in different aspects such as food security, health, hunger, and malnutrition.<sup>62</sup>

Lower food expenditure was found to be a probable key contributor to less-healthy food choices among individuals belonging to lower socioeconomic groups and an increase in monthly vegetable budget was reported to be positively associated with the increase in income level.<sup>63</sup> A study conducted by Jack et al. showed that higher socioeconomic status (SES) is associated with higher consumption of fruits and vegetables, which probably explains why the average family monthly expenditure on FV from private SHS is higher than those in public.<sup>64</sup>

## Limitations

This study is not without limitations, including the study location being focused only on Imus City. The participants were one hundred Senior High School students that were



recruited online through convenience sampling, this might hinder the generalizability of the findings. As this was conducted online hence, there was a risk of unintentionally excluding potential participants who did not have computers or proper internet connections. Given the restrictions imposed during the lockdown, this was the most feasible location and convenient technique for the researchers. Additionally, the period of the study (July-August) might have also affected the responses of the participants.

## CONCLUSION

The majority of the selected public SHS respondents were classified under the poor income cluster while most of the selected respondents from private SHS belonged to the lower middle-income class and middle middle-income class. Furthermore, most of the respondents from both public and private SHS had a good level of knowledge of the nutrients and health benefits of FV. More public SHS respondents obtained a good level of knowledge on the nutrient contents of FV while more private SHS had a good level of knowledge on its health benefits.

Vegetable intake of the majority of both groups was inadequate, which did not reflect their good level of knowledge on FV. However, fruits were consumed more than the recommended daily serving by most respondents from both groups. The most consumed vegetables by public and private SHS respondents were *dahon ng sili* and garlic, respectively, while their most consumed fruits were Indian mango and pear. Squash was the most liked vegetable by both groups with the leading reason of its perceived health benefits. The majority of public SHS respondents identified banana as their most liked fruit due to its nutrient density while it was mango for the majority of private SHS respondents because of its sweet taste. More respondents from private SHS respondents had an FV intake of fewer than six servings per day.

The majority of respondents from both groups identified wet and dry markets or *palengke* as their most usual source of FV. Moreover, public SHS respondents were reported to have lower average estimated monthly expenditures on FV. Since FV intakes were still low in both groups despite their good level of knowledge of FV, other factors might have affected the respondent's FV consumption aside from their knowledge of nutrient contents and health benefits of FV, and socio-economic status as well. Several studies suggested that other factors that may affect the respondents' FV consumption are age, income, presence of elders, nutrition attitudes, lack of knowledge on the recommended daily servings of FV, availability, accessibility, and convenience of FV.

## Recommendations

Enhancing and mainstreaming the nutrition education programs in the country through various digital media platforms is recommended to increase the knowledge of senior high school students and adolescents, in general, on the

nutrient contents and health benefits of consuming vegetables. Other information such as recommended daily servings of these based on their age group and appropriate measurement of food servings may also be helpful so they will have an idea regarding the adequacy of their intakes. Along with these, simple and convenient recipes may be demonstrated. Popular local and international dishes may be fortified with the addition or replacement of main ingredients with vegetables. The roles of families and educational institutions in encouraging adequate consumption of vegetables and maintaining a healthy diet by adolescents must be highlighted as well. They are recommended to serve as models for adolescents to improve their liking among the recorded least liked vegetables. The government may also provide aid for households and individuals who have lower spending capacity to procure foods such as FV while they may also create more programs that will increase the existence of community stores, community and backyard gardens, and grocery stores to increase the accessibility of the said food items so as to help in improving citizens' diet and nutritional status.

For future researchers interested in conducting similar studies related to this topic, other factors such as sex, age, social environment, family size, and knowledge on serving portions of FV may be included using improved methodologies. Future studies may also involve the totality of Cavite or other areas in Cavite for comparison of results.

## Statement of Authorship

GNG contributed in the conceptualization of work, acquisition and analysis of data, drafting and revising of manuscript, and final approval of the version to be published. ASAB contributed in the conceptualization of research study, and provided literature reviews and guidance in the results and discussion writing. MCLL contributed in formatting and revising of manuscript.

## Author Disclosure

All authors declared no conflicts of interest.

## Funding Source

None.

## REFERENCES

1. Better Health Foundation. Key nutrients in fruits & vegetables [Internet]. 2020 [cited 2022 Jun 1]. Available from: <https://fruitsandveggies.org/stories/key-nutrients-that-protect/>
2. Harvard T.H. Chan School of Public Health. Vegetables and fruits [Internet]. 2020 [cited 2022 Jun 1]. Available from: <https://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/vegetables-and-fruits/>
3. British Nutrition Foundation. Fibre [Internet]. 2020 [cited 2022 Jun 1]. Available from: <https://www.nutrition.org.uk/healthy-sustainable-diets/starchy-foods-sugar-and-fibre/fibre/?level=Consumer#:~:text=Government%20guidance%20is%20that%20adults,of%20fibre%20are%20shown%20below.>
4. Pem D, Jeewon R. Fruit and vegetable intake: Benefits and progress of nutrition education interventions - narrative review article. Iran

- J Public Health [Internet]. 2015 Oct [cited 2022 Jun 1]; 44(10): 1309-21. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4644575/pdf/IJPH-44-1309.pdf>
5. World Health Organization. Increasing fruit and vegetable consumption to reduce the risk of noncommunicable diseases [Internet]. 2019 [cited 2022 Jun 1]. Available from: [https://www.who.int/elena/titles/fruit\\_vegetables\\_ncds/en/](https://www.who.int/elena/titles/fruit_vegetables_ncds/en/)
  6. Cannoosamy K, Pem D, Bhagwant S, Jeewon R. Is a nutrition education intervention associated with a higher intake of fruit and vegetables and improved nutritional knowledge among housewives in Mauritius? *Nutrients* [Internet]. 2016 Nov [cited 2022 Jun 1]; 8(12):723. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5188404/pdf/nutrients-08-00723.pdf>
  7. Teschl C, Nössler C, Schneider M, Carlsohn A, Lührmann P. Vegetable consumption among university students: Relationship between vegetable intake, knowledge of recommended vegetable servings and self-assessed achievement of vegetable intake recommendations. *Health Educ J* [Internet]. 2018 [cited 2022 Jun 1]; 77(4):398-411. Available from: <https://journals.sagepub.com/doi/abs/10.1177/0017896917751833>
  8. Atienza L. Filipinos need more fruits and vegetables [Internet]. *Manila Standard*. 2016 [cited 2022 Jun 1]. Available from: <https://manilastandard.net/lifestyle/wellness-environment/211700/filipinos-need-more-fruits-and-vegetables.html>
  9. Ball K, Lamb KE, Costa C, Cutumisu N, Ellaway A, Kamphuis CBM, et al. Neighbourhood socioeconomic disadvantage and fruit and vegetable consumption: a seven countries comparison. *Int J Behav Nutr Phys Act* [Internet]. 2015 May [cited 2022 Jun 1]; 12:68. Available from: [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4456793/pdf/12966\\_2015\\_Article\\_229.pdf](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4456793/pdf/12966_2015_Article_229.pdf)
  10. Angeles-Agdeppa I, Lenighan YM, Jacquier EF, Toledo MB, Capanzana MV. The impact of wealth status on food intake patterns in Filipino school-aged children and adolescents. *Nutrients* [Internet]. 2019 Dec [cited 2022 Jun 1]; 11(12):2910. Available from: <https://pubmed.ncbi.nlm.nih.gov/31810210/>
  11. Gonzales JT, Raaj JV, Narciso ZV. Consumption pattern for fruits and vegetables of some Filipino adolescents in selected public schools in the city of Manila. *J Nutr Disorders Ther* [Internet]. 2016 [cited 2022 Jun 1]; 6(4):[about 7 p.]. Available from: <https://www.walshmedicalmedia.com/open-access/consumption-pattern-for-fruits-and-vegetables-of-some-filipino-adolescents-in-selected-public-schools-in-the-city-of-manila-2161-0509-1000202.pdf>
  12. Silva-Ferreira C, Silva DA, Gontijo CA, Rinaldi AEM. Consumption of minimally processed and ultra-processed foods among students from public and private schools. *Rev Paul Pediatr* [Internet]. 2019 Apr-Jun [cited 2022 Jun 1]; 37(2):173-180. Available from: <https://doi.org/10.1590/1984-0462;2019;37;2;00010>
  13. Sogari G, Velez-Argumedo C, Gómez MI, Mora C. College students and eating habits: A study using an ecological model for healthy behavior. *Nutrients* [Internet]. 2018 Nov [cited 2022 Jun 1]; 10(12):1823. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6315356/pdf/nutrients-10-01823.pdf>
  14. Department of Science and Technology- Food and Nutrition Research Institute (DOST-FNRI), Expanded national nutrition survey: 2019 results [Internet]. 2019 [cited 2022 Jun 1]. Available from: [http://enutrition.fnri.dost.gov.ph/site/uploads/2018-2019%20ENNS%20Results%20%20Dissemination\\_Adolescents%20and%20WRA.pdf](http://enutrition.fnri.dost.gov.ph/site/uploads/2018-2019%20ENNS%20Results%20%20Dissemination_Adolescents%20and%20WRA.pdf)
  15. City Government of Imus. About the city [Internet]. NA [cited 2022 Jun 1]. Available from: <https://imus.gov.ph/home-2/city-of-imus/>
  16. Philippine Statistics Authority (PSA). 2015 Census of population, report no. 2 – Demographic and socioeconomic characteristics Cavite [Internet]. 2017 [cited 2022 Jun 1]. Available from: [https://psa.gov.ph/sites/default/files/04A\\_Cavite.pdf](https://psa.gov.ph/sites/default/files/04A_Cavite.pdf)
  17. Mauleon CNR, Barrion ASA, Mariano RB, Yee MG. Fat consumption among school teachers in selected private schools of Barangay Don Jose, Santa Rosa, Laguna, Philippines. *EC Nutrition* [Internet]. 2019 [cited 2022 Jun 1]; 14(9):675-689. Available from: <https://www.econicon.com/ecnu/pdf/ECNU-14-00641.pdf>
  18. Breewood H. What is the nutrition transition? (Foodsource: building blocks) [Internet]. 2018 [cited 2022 Jun 1]. *Food Climate Research Network*, University of Oxford. Available from: <https://www.tabledebates.org/building-blocks/what-nutrition-transition>
  19. Cavite Government. Cavite ecological profile 2018 [Internet]. NA [cited 2022 Jun 1]. Available from: <http://cavite.gov.ph/home/wp-content/uploads/2020/01/cep2018-C3.pdf>
  20. Mayo Clinic. Heart diseases [Internet]. NA [cited 2022 Jun 1]. Available from: <https://www.mayoclinic.org/diseases-conditions/heart-disease/symptoms-causes/syc-20353118>
  21. Chriscaden K. Impact of COVID-19 on people's livelihoods, their health and our food systems [Internet]. 2020 [cited 2022 Jun 1]. *World Health Organization*. Available from: <https://www.who.int/news/item/13-10-2020-impact-of-covid-19-on-people%27s-livelihoods-their-health-and-our-food-systems>
  22. Palo AM, Rocetes MA, Cariño DP. COVID-19 and food systems in the Philippines [Internet]. NA [cited 2022 Jun 1]. *Australian Centre for International Agricultural Research (ACIAR)*. Available from: <https://www.aciar.gov.au/sites/default/files/2020-11/covid-chapter7.pdf>
  23. Israel GD. Determining sample size [Internet]. NA [cited 2022 Jun 1]. *University of Florida, IFAS Extension*. Available from: <https://www.tarleton.edu/academicassessment/wp-content/uploads/sites/119/2022/05/Samplesize.pdf>
  24. Albert JG, Abrigo MM, Quimba FA, Vizmanos JV. Poverty, the middle class, and income distribution amid COVID-19 [Internet]. *Philippine Institute for Development Studies*. 2020 Aug [cited 2022 Jun 1]. Available from: <https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidsdps2022.pdf>
  25. Rohin MAK, Hadi NA, Sariff S, Shariff SSM, Ridzwan N, Jumli MN. Knowledge, attitude and practice on vegetables intake among adolescents in rural Terengganu, Malaysia. *Mal J Med Health Sci* [Internet]. 2021 April [cited 2022 Jun 1]; 17(2):98-105. Available from: [https://medic.upm.edu.my/upload/dokumen/2021040613084314\\_MJMHS\\_0296.pdf](https://medic.upm.edu.my/upload/dokumen/2021040613084314_MJMHS_0296.pdf)
  26. Department of Science and Technology- Food and Nutrition Research Institute (DOST-FNRI), Daily nutrition guide pyramid for Filipino children (13-19 years old) [Internet]. NA [cited 2022 Jun 1]. Available from: <https://www.fnri.dost.gov.ph/index.php/tools-and-standard/nutritional-guide-pyramid/28-nutrition-statistic/nutritional-guide-pyramid/78-teen-13-19yrs-old>
  27. Dollanganger C. Philippines: The rich and poor divide in distance learning [Internet]. *The News Lens*. 2020 [cited 2022 Jun 1]. Available from: <https://international.thenewslens.com/article/142537>
  28. Devaki SJ, Raveendran RL. Vitamin C: Sources, functions, sensing and analysis [Internet]. In: Hamza AH, editor. *Vitamin C*. London: IntechOpen; 2017 [cited 2022 Jun 1]. Available from: <https://www.intechopen.com/chapters/56440>
  29. Drake VJ. Micronutrient requirements of adolescents ages 14 to 18 years. *Linus Pauling Institute, Oregon State University* [Internet]. 2012 July [cited 2022 Jun 1]. Available from: <https://lpi.oregonstate.edu/mic/life-stages/adolescents>
  30. Dasco MP. Nutritional status of Filipino adolescents, >10-19 years old [Internet]. *Food and Nutrition Research Institute, DOST*. 2018 [cited 2022 Jun 1]. Available from: [http://enutrition.fnri.dost.gov.ph/site/uploads/ADOLESCENTS\\_and\\_WRA.pdf](http://enutrition.fnri.dost.gov.ph/site/uploads/ADOLESCENTS_and_WRA.pdf)
  31. Schrottenboer B. Vitamin C by IV and an FBI raid. How hope, rather than proof, sent the antioxidant's sales soaring during COVID-19 [Internet]. *USA Today*. 2020 [cited 2022 Jun 1]. Available from: <https://www.usatoday.com/story/money/2020/07/21/coronavirus-vitamin-c-demand-surged-during-pandemic/5403847002/>
  32. Lassi Z, Moin A, Bhutta Z. Nutrition in Middle Childhood and Adolescence [Internet]. In: Bundy DAP, Silva Nd, Horton S, et al., eds. *Child and Adolescent Health and Development*, 3rd ed. Washington (DC): The International Bank for Reconstruction and Development/The World Bank; 2017 [cited 2022 Jun 1]. Chapter 11. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK525242/?report=classic>
  33. The University of Melbourne. How diet can improve teen health [Internet]. NA [cited 2022 Jun 1]. Available from: <https://study.unimelb.edu.au/discover/inside-melbourne/how-diet-can-improve-teen-health>

34. University of York. Families have high awareness of healthy eating but struggle to access good food [Internet]. 2021 Feb [cited 2022 Jun 1]. Available from: <https://www.eurekalert.org/news-releases/869897>
35. Verdonschot A, de Vet E, Van Rossum J, Mesch A, Collins CE, Bucher T, et al. Education or provision? A comparison of two school-based fruit and vegetable nutrition education programs in the Netherlands. *Nutrients*. 2020 Oct;12(11):3280. doi: 10.3390/nu12113280.
36. Okagbare TE, Naidoo S. Parents' perception of their role in the prevention of inadequate consumption of FVs among adolescents in South Africa. *S Afr Dent J* [Internet]. 2020 Jun [cited 2022 Jun 1]; 75(5):235- 40. Available from: <http://www.scielo.org.za/pdf/sadj/v75n5/04.pdf>
37. Kimmons J, Gillespie C, Seymour J, Serdula M, Blanck HM. Fruit and vegetable intake among adolescents and adults in the United States: percentage meeting individualized recommendations. *Medscape J Med* [Internet]. 2009 [cited 2022 Jun 1];11(1):26. Available from: <https://pubmed.ncbi.nlm.nih.gov/19295947/>
38. Guyenet SJ. Impact of whole, fresh fruit consumption on energy intake and adiposity: a systematic review. *Front Nutr* [Internet]. 2019 May [cited 2022 Jun 1]; 6:66. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6518666/pdf/fnut-06-00066.pdf>
39. Jenkins DJ, Kendall CW, Popovich DG, Vidgen E, Mehling CC, Vuksan V, et al. Effect of a very-high-fiber vegetable, fruit, and nut diet on serum lipids and colonic function. *Metabolism* [Internet]. 2001 Apr [cited 2022 Jun 1]; 50(4):494-503. Available from: <https://pubmed.ncbi.nlm.nih.gov/11288049/>
40. Abilgos-Ramos R, Mamucod H, Corpuz G. Chili pepper leaves as alternative source of micronutrients. *Philipp J Crop Sci* [Internet]. 2012 [cited 2022 Jun 1]; 37 Suppl 1:139. Available from: <https://agris.fao.org/agris-search/search.do?recordID=PH2014000284>
41. Real Living. Yes, you can grow sili at home [Internet]. 2018 [cited 2022 Jun 1]. Available from: <https://www.realliving.com.ph/home-improvement/gardening/yes-you-can-grow-sili-at-home-a00043-20180917>
42. Radhakrishnan R. Is it okay to eat a raw garlic clove? 10 health benefits [Internet]. 2020 [cited 2022 Jun 1]. Available from: [https://www.medicinenet.com/is\\_it\\_okay\\_to\\_eat\\_a\\_raw\\_garlic\\_clove/article.htm](https://www.medicinenet.com/is_it_okay_to_eat_a_raw_garlic_clove/article.htm)
43. Kuhn Rikon. Garlic - an essential ingredient [Internet]. 2017 [cited 2022 Jun 1]. Available from: <https://www.kuhnriikon.co.uk/recipes-blog/post/garlic-an-essential-ingredient/>
44. Newman T. What are the benefits of garlic? [Internet]. *Medical News Today*. 2017 [cited 2022 Jun 1]. Available from: <https://www.medicalnewstoday.com/articles/265853>
45. Department of Science and Technology - Food and Nutrition Research Institute (DOST-FNRI). *Philippine Nutrition Facts and Figures 2015: Dietary Survey* [Internet]. 2016 [cited 2022 Jun 1]. FNRI Bldg., DOST Compound, Gen. Santos Avenue, Bicutan, Taguig City, Metro Manila, Philippines. Available from: [http://enutrition.fnri.dost.gov.ph/site/uploads/2015\\_DIETARY\\_SURVEY.pdf](http://enutrition.fnri.dost.gov.ph/site/uploads/2015_DIETARY_SURVEY.pdf)
46. Cleveland Clinic. The health benefits of garlic: Powerful smell, powerful health benefits [Internet]. 2020 [cited 2022 Jun 1]. Available from: <https://health.clevelandclinic.org/6-surprising-ways-garlic-boosts-your-health/>
47. Department of Agriculture (DA). *Philippine mango industry roadmap 2017-2022* [Internet]. 2018 [cited 2022 Jun 1]. Available from: <https://www.da.gov.ph/wp-content/uploads/2019/06/Philippine-Mango-Industry-Roadmap-2017-2022.pdf>
48. Lachica IA. #PresyoMerkado: Indian Mango [Internet]. 2019 [cited 2022 Jun 1]. *INQUIRER.net*. Available from: <https://cebudailynews.inquirer.net/262134/presyomerkado-indian-mango>
49. Raman R, Synder C. Mango: Nutrition, health benefits and how to eat it [Internet]. 2018 [cited 2022 Jun 1]. *Healthline*. Available from: <https://www.healthline.com/nutrition/mango>
50. Asia Farming. *Pear fruit growing information guide* [Internet]. 2018 [cited 2022 Jun 1]. *AsiaFarming*. Available from: <https://www.asiafarming.com/pear-fruit-growing>
51. Masigan AJ. Why are imported goods more expensive in the Philippines? [Internet]. 2021 [cited 2022 Jun 1]; *BusinessWorld*. Available from: <https://www.bworldonline.com/opinion/2021/06/06/373641/why-are-imported-goods-more-expensive-in-the-philippines/#:~:text=Unfortunately%2C%20the%20country%27s%20manufacturing%20sector,to%20expensive%20inbound%20freight%20cost>
52. Ware M. Pears: Benefits and nutrition [Internet]. 2019 [cited 2022 Jun 1]; *Medical News Today (MNT)*. Available from: <https://www.medicalnewstoday.com/articles/285430>
53. Woo T, Lee K. Factors affecting vegetable preference in adolescents: stages of change and social cognitive theory. *Nutr Res Pract* [Internet]. 2017 Aug [cited 2022 Jun 1]; 11(4):340-6. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5537544/>
54. AL-Otaibi H. In: Human health and nutrition factors influencing fruit and vegetable intake in adolescents. *ResearchGate* [Internet]. 2015 [cited 2022 Jun 1]; 183-200. Available from: [https://www.researchgate.net/publication/282502988\\_In\\_Human\\_Health\\_and\\_Nutrition\\_Factors\\_influencing\\_Fruit\\_and\\_Vegetable\\_Intake\\_in\\_Adolescents](https://www.researchgate.net/publication/282502988_In_Human_Health_and_Nutrition_Factors_influencing_Fruit_and_Vegetable_Intake_in_Adolescents)
55. Raggio L, Gámbaro A. Study of the reasons for the consumption of each type of vegetable within a population of school-aged children. *BMC Public Health* [Internet]. 2018 Oct [cited 2022 Jun 1]; 18(1):1163. Available from: <https://doi.org/10.1186/s12889-018-6067-4>
56. Brug J, Tak NI, te Velde SJ, Bere E, de Bourdeaudhuij I. Taste preferences, liking and other factors related to fruit and vegetable intakes among schoolchildren: results from observational studies. *Br J Nutr* [Internet]. 2008 Feb [cited 2022 Jun 1]; 99 Suppl 1: S7-S14. Available from: <https://pubmed.ncbi.nlm.nih.gov/18257952/>
57. Lautenschlager L, Smith C. Beliefs, knowledge, and values held by inner-city youth about gardening, nutrition, and cooking. *Agric Hum Values*. 2007 April [cited 2022 Jun 1];24(2):245-58. Available from: <https://doi.org/10.1007/s10460-006-9051-z>
58. Croll JK, Neumark-Sztainer D, Story M. Healthy eating: what does it mean to adolescents? *J Nutr Educ*. 2001 Jul-Aug;33(4):193-8. doi: 10.1016/s1499-4046(06)60031-6.
59. Rubio JC. Philippines retail foods: 2019 food retail sectoral report [Internet]. *Global Agricultural Information Network (GAIN), USDA*. 2019 [cited 2022 Jun 1]. Available from: [https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Retail%20Foods\\_Manila\\_Philippines\\_7-8-2019.pdf](https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Retail%20Foods_Manila_Philippines_7-8-2019.pdf)
60. Zhong S, Crang M, Zeng G. Constructing freshness: the vitality of wet markets in urban China. *Agric Hum Values* [Internet]. 2020 [cited 2022 Jun 1]; 37:175-85. Available from: <https://doi.org/10.1007/s10460-019-09987-2>
61. Raneri J, Wertheim-Heck S. Choosing between supermarkets and wet markets [Internet]. *Agriculture for Nutrition and Health, CGIAR*. 2020 [cited 2022 Jun 1]. Available from: <https://a4nh.cgiar.org/2020/01/08/choosing-between-supermarkets-and-wet-markets/>
62. Sunga AB, Advincula JL. The "plantito/plantita" home gardening during the pandemic. *Community Psychol Glob Perspect* [Internet]. 2021 [cited 2022 Jun 1]; 7(1):88-105. Available from: [https://www.researchgate.net/publication/350374341\\_The\\_PlantitoPlantita\\_Home\\_Gardening\\_during\\_the\\_Pandemic](https://www.researchgate.net/publication/350374341_The_PlantitoPlantita_Home_Gardening_during_the_Pandemic) DOI:10.1285/i24212113v7i1p88.
63. Pechey R, Monsivais P. Socioeconomic inequalities in the healthiness of food choices: Exploring the contributions of food expenditures. *Prev Med* [Internet]. 2016 Jul [cited 2022 Jun 1]; 88:203-9. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4910945/>
64. Jack D, Neckerman K, Schwartz-Soicher O, Lovasi GS, Quinn J, Richards C, et al. Socio-economic status, neighbourhood food environments and consumption of fruits and vegetables in New York City. *Public Health Nutr* [Internet]. 2013 Jul [cited 2022 Jun 1];16(7):1197-205. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3696996/pdf/nihms472080.pdf>