Correlation of Food Insecurity and Academic Performance in University-Belt Students Around Metro Manila, Philippines

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Abstract

One of the problems faced in the Philippines is the rise and long-term stay of Food Insecurity among Filipinos. 54.9 million Filipinos are food insecure according to the 2020 Integrated Food Security Phase Classification. Inconsistent access to food is related to students' poor physical, psychological, and emotional well-being. Students who experience food insecurity exhibit increased stress, worsening sleeping, irregular eating habits, and worse academic success. The main objective of this study is to determine the correlation of food insecurity indicators and academic performance of college students among University Belt Manila in the academic year 2022-2023. This study focuses on the correlation between Food Insecurity Indicators and Academic Performance, the four Food Insecurity Indicators are Food Insecurity Prevalence, Food Insecurity Severity, Meal Totality, and Food Budget. Academic Performance Dependent Variables will be General Weighted Average (GWA), Class Participation, and Class Attentiveness. Structural Equation Modeling or SEM statistical analysis is used in this study, upon conducting a 300-sample statistical analysis on SPSS Basic and AMOS, the results shows that Food Insecurity Prevalence has correlation to Class Attentiveness, Food Insecurity Severity has correlation to both GWA and Class Participation, and Food Budget has correlation with Class Attentiveness. In conclusion, there is a correlation between Food Insecurity indicators and Academic Performance among University-Belt students staying in dormitories in the academic year 2022 - 2023. Widening the knowledge on Food Insecurity on its possible effects on student's academic performance would be more beneficial to the community. These outcomes enable future researchers to carry out this study by providing or seeking government solutions to affected individuals within Manila.

Keywords:
Food Insecurity, Prevalence, Severity, Academic Performance, SEM statistical analysis, SPSS.

1. Introduction
Add introduction here including motivation of the research (why this research is important / why this research is needed), and problem statements. (10 font)

The Philippines is under a social crisis, once again, and in this age, Filipinos are facing Food Insecurity. Studies show that the Philippines is ranked 67th overall out of 113 countries in the Global Food Security Index 2022 (GFSI, 2022). Ranking high in the list translates to better food security while getting a low rank among the 113 countries shows the least food secure country. Food insecurity is a lack of consistent access to enough food for an active and healthy life (U.S Department of Agriculture, 2020). Among many of the Philippines' social crises, food insecurity is a widely evident phenomenon. According to Social Weather Stations, hunger rose from 11.8% to 12.2% in the first quarter of 2022 based on the Social Weather survey. Approximately 3.1 million Filipinos experience involuntary hunger (Social Weather Stations, 2022), and 64% of the Philippines population or approximately 54.9 million Filipinos are chronically food insecure (Integrated Food Security Phase Classification, 2020).

To widen on the crisus, the study will tackle the academic performance effects of food insecurity among University-Belt college students within Manila. Food insecurity has been linked to low wages, adverse social and economic conditions, and limited access to healthy foods (Drewnowski, 2022), and according to the USDA in 2020, food insecurity is the lack of consistent access to enough food for an active and healthy life (U.S. Department of Agriculture, 2020). One of the aspects for young Filipino students to choose their college or university is within Manila, particularly in the University Belt, because there are more opportunities available in terms of gaining knowledge and offers after academic completion. According to the Philippine DepEd, dormitories are described as large bedrooms for several people in a school or institution (Fuentebella 2021); generally, these students who are in dormitories are who live away from home from their families (Micevski, 2013). College students frequently have difficult financial conditions, which can cause stress and anxiety. The cost of tuition for students is increasing more quickly than general inflation, substantial debt, and uncertain employment opportunities during the early stages of adulthood. (Worthy, Jonkman, & Blinn-Pike, 2010). According to the American College Health Association (2018) college, students listed finances as the second (next to academics) most traumatic or difficult challenge they have faced in their college experience. Financial stress has been discovered to be strongly connected to anxiety, and many college students report handling the burden of tuition alone (P. J. Jones, Park, & LeFevour 2018).

Humans must eat nutritious foods to maintain bodily operations and handle daily duties. The nutrients from meals support the human body's immunity, growth, and activity. According to Punjab Colleges, the latest developments in nutrition have made it possible to understand how important a proper diet is for increasing overall health, avoiding illnesses, and enhancing life quality. It means that people who experience food insecurity, especially students, may be affected in terms of their daily functions. It can affect students' performance in school and their overall well-being. Lack of financial resources, high tuition fees, and increasing economic activities are several reasons it is prevalent. A person is food insecure when they lack regular access to sufficient quantities of safe, nutritious food for normal growth and development, as well as an active and healthy life. This may be caused by lack of food and/or the inability to acquire meals.

In the Philippines, one of the problems it is facing is the rise and long-term stay of Food Insecurity among Filipinos. Moreover, dissecting the problem in a deductive manner starting from the stated in a worldwide study above, the Philippines is ranked 67th overall among food-secure. countries out of 113 participating countries in the data (Global Food Security Index, 2022). On a nationwide scale, 64% of the Philippines population, or approximately 54.9 million Filipinos are food insecure according to the Integrated Food Security Phase Classification or IPC in 2020.

1.1 Objectives
The objective of this study is to determine the correlation of food insecurity severity and prevalence, to academic performance of the college students among University Belt Manila. The researchers would want to know the correlation of Food Insecurity Indicators to the academic performance of University Belt college dormitories in Manila using the Structural Equation Modeling or SEM statistical analysis.

Specific Objectives are as follows:
1. To determine Independent Variables (Food Insecurity) data from survey questionnaire
2. To determine Dependent Variables (Academic Performance) data from survey questionnaire

3. To apply Structural Equation Modeling (SEM) on Food Insecurity Indicators and Academic Performance
4. To determine the relationship of Food Insecurity Independent Variables and Academic performance Dependent Variable using SEM in SPSS Amos.
5. To determine the correlation between food insecurity indicators and academic performance among University Belt Manila College Students
6. To create strategies to resolve the correlation between food insecurity and academic performance among University Belt Manila College Students

2. Literature Review

The DOST conducted an expanded national survey in 2019 to determine the food security status of Filipino households. The methodological method used by the researchers is the House Food Insecurity Access Scale (HFIAS), the HFIAS used a 30-day recall period for the respondents. As per the results of the survey, 64.1% of Filipino households in 2019 are food insecure. Food insecurity is higher in the following aspects: rural areas, male-headed households, poor, households, households with lower educational attainment, without financial assistance from abroad, and engaged in agriculture. Overall, the Philippines is ranked 67th over 113 countries in the GFSI, (1st is most secure, 113th is least secure). The index has 4 categories, Affordability, Availability, Quality and Safety, and Sustainability and Adaptation. The highest score of the country is Affordability since the economy has steady consumer prices as of the creation of this index and a low proportion of the population under the poverty line. Moreover, the lowest score of the Philippines is sustainability and adaptation, this is affected by agricultural water supply and deterioration of land and marine biodiversity. In conclusion, the GFSI suggests that the Philippines must enhance its agricultural sector, one of which is by protecting the said sector from harmful effects of climate change, however climate change is inevitable, the Philippines has to dig deeper in order to lift its sustainability and adaptation scores through the agriculture sector.

Furthermore, according to the study of Celina, et al. (2018), it aims to determine if there is an association between food insecurity in the household with the nutritional statues of a mother to child pair or a caregiver to child pair. Furthermore, this study was also conducted to determine the food security among households using the HFIAS and FCS. As per results, with a total of 6,984 respondents, the researchers determined the socio-demographic status of the respondents, which are the following: area of residence, household size, father's age, mother or caregiver's age, father and mother's educational attainment, household wealth quintile (financial social status), household head's occupational statues, and mother's occupational status. 28% of the respondents are in poorest social class, 51.4% of household head's job is non-agriculture related and 73.2% of mothers are not working/unemployed. 75.1% of the respondents are experiencing food insecurity. As for the causes and consequences of food insecurity on campus, according to the study of Freudenberg in 2019, It summarizes. federal, state, and local changes in SNAP policies that can facilitate college student participation and retention and suggests strategies for more robust and effective university responses to food insecurity, including SNAP enrollment campaigns, a stronger role for campus food services, and a redefinition of the goals and purposes of campus food pantries.

A study conducted by Collado (2020) it analyzes IDP meals in the southern Philippines. This highlights food availability, accessibility, and usage as key components of family food security for people who have lost their communities and income due to conflict. The study also looks at how food insecurity affects families. Key informant interviews (KII) collected qualitative data from 10 heads of household, and 306 survey. respondents gave quantitative data via survey questionnaire. Both outcomes imply food insecurity, which affects family dynamics and requires coping strategies. The study reveals that internal relocation predicts household food poverty, mental well-being, and personal drive. IDPs need food, livelihood, and mental health care due to these realities. The study aims to persuade the Philippine state assembly to swiftly pass a law safeguarding Filipino IDPs.

In relation to effects of food insecurity to college students, an article entitled Food Insecurity and Academic Disruption Among College Students in 2018, states that the Food insecurity is a serious concern for many college students and for faculty, student affairs professionals, and other educators who work with students. Recent research suggested that hunger negatively impacts students' education. This article investigates college students' experiences of food insecurity and how food insecurity is associated with students' academic performance and academic disruptions. With many studies having focused on predictors of food insecurity, fewer studies have examined how food insecurity affects diet and diet-related outcomes among college students (Leung, et al. 2019). Moreover, a study by Payne-Sturges in 2018 states that Food insecurity is a growing public health concern among college students and can have a

significant negative impact on physical and mental health and functioning. limited or uncertain, or lack of money or other resources limits or uncertain the ability to obtain acceptable food in a socially acceptable manner." It is reported to be spreading all over the world. Maintaining good health, consuming a nutritious diet, managing an existing chronic disease, or a combination of these can be a challenge for those struggling with poverty or food insecurity for a variety of reasons, including limited finances and resources, competing priorities, and stress. In addition, neighborhoods with many poor or low-income residents often have fewer resources that promote health and have more environmental threats that harm health compared to higher-income neighborhoods. And lastly, adults living in poverty are at greater risk for a number of health issues, such as diabetes, heart disease and stroke, obesity (primarily among women),depression, disability, poor oral health, and premature mortality (Food Research and Action Center, 2017). In a study by Aseel El Zein in 2019, this study, first-year university students in the United States were examined for their frequency of food insecurity as well as its sociodemographic, health, scholastic, and food pantry correlations. According to the research, food insecurity among first-year university students is quite common and has an impact on both educational achievement and health outcomes. Institutions of higher education must conduct food insecurity screenings and undertake programmatic and policy activities to support a healthy university experience. University pantries could be helpful as a temporary measure, but the fact that only a few individuals use these points to the need for other solutions that take a rights-based approach to food poverty. Moreover, food insecurity also affects mental health (Pourmotabbed, 2020).

3. Methods

The research design that this study used Correlational research. It is defined as a mode of measurement that assesses the relationship between two variables without requiring the researcher to manipulate one of them. Its goal is to determine whether it has a positive, negative or zero correlation between both variables (McCombes 2020). Correlational research design is the best type to be used in the study since the researchers will understand and assess the effects/relationship of the chosen independent variables on the dependent variable. The researchers measured the <u>independent variables</u>, which are the 3 Food Insecurity indicators and GWA, Class Participation and Class Attentiveness are used as the researchers' <u>dependent variable</u> (Academic Performance). The researchers learned and assessed the effects/relationship of the chosen independent variables on the dependent variable using SPSS. The variables were analyzed through SEM analysis via SPSS Basic and AMOS. As illustrated in the conceptual framework, the study aims to determine the correlation between food insecurity and academic performance.

- Study Population: University Belt Manila college students
- Sample population: College students in dormitories
- Sampling method: purposive sampling
- Instruments: online survey questionnaire through Google Forms (includes 4-point likert scale)
- Data analysis: Structural Equation Modeling (SEM) analysis via SPSS Basic and AMOS

4. Data Collection

The researchers developed an online questionnaire based on literature reviews to measure each factor in the study. The 3-part questionnaire includes demographics of the respondents as the first section, which includes, gender, age, year level, course program, weekly food allowance and social status if working or non-working. All necessary information about each respondent is gathered and the 2nd section includes 4-point likert scales to determine Food Insecurity Prevalence(13 questions), Food Insecurity Severity(13 questions), Food Budget, Meal totality per day. Included in the 2nd section is the House Food Insecurity Access Scale (HFIAS) to determine food insecurity prevalence among the respondents. Furthermore, the 3rd section of the questionnaire includes determining Academic Performance by asking the student's GWA, and Class participation(8 questions) and Class attentiveness(8 questions) through likert scale. With a total of 300 respondents, 250 was used for SPSS basic and amos since it is the minimum requirement for the tool. Moreover, the 50 remaining respondents are the one doing intermittent diet that is why the are excluded from the study.

5. Results and Discussion

5.1 Numerical Results

Hypotheses	Path coefficient	SE	p-value	Effect size	Remark
FIP → GWA	-0.278	0.061	0.000	0.100	Significant
FIP → CP	0.202	0.062	0.000	0.094	Significant
FIP → CA	0.226	0.061	0.000	0.076	Significant
FIS → GWA	-0.096	0.063	0.065	0.029	Nonsignificant
FIS → CP	0.203	0.062	0.000	0.096	Significant
FIS → CA	0.117	0.063	0.031	0.037	Significant
Meal Totality → GWA	0.000	0.064	0.499	0.000	Nonsignificant
Meal Totality → CP	-0.126	0.063	0.023	0.041	Significant
Meal Totality → CA	0.125	0.063	0.024	0.029	Significant
Food Budget → GWA	-0.030	0.064	0.320	0.005	Nonsignificant
Food Budget → CP	0.163	0.062	0.005	0.057	Significant
Food Budget → CA	0.036	0.063	0.284	0.005	Nonsignificant

Figure 1. Correlation of Independent Variables to Dependent Variables

Results shown above are the Correlation of Independent Variables to Dependent Variables. In order to identify the correlation between Independent Variables and Dependent Variables, the p-value must be considered, if the p-value is less than the alpha used then it is significant. In this case, the alpha value used is 0.05 since the confidence level is 95%, with that, the outcome shows that there are 8 significant relationships out of the 12. This shows that each Food Insecurity Indicator is significant to Academic Performance, however, there are just specific relationships between the two. The significant relationships are, FIP to GWA (1), FIP to CP (2), FIP to CA(3) FIS to CP (4), FIS to CA (5), Meal Totality to CP (6), Meal Totality to CA (7) and Food Budget to CP (8). All these relationships has a p-value less than alpha 0.05, since the confidence level used is 95%.

Variables/Indicators	FIP	FIS	Meal Totality	Food Budget	GWA	CP	CA	P-Value
A. Food Insecurity Prevalence (FIP)								
FIP1	**0.61**	-0.40	0.14	-0.17	-0.01	-0.09	0.15	0.000
FIP2	**0.79**	-0.03	-0.12	0.22	-0.10	-0.04	0.03	0.000
FIP4	**0.76**	0.11	-0.01	-0.07	-0.02	0.18	-0.08	0.000
FIP5	**0.78**	0.12	-0.03	-0.06	0.04	0.00	-0.08	0.000
FIP6	**0.64**	0.23	0.09	0.19	-0.12	-0.02	-0.08	0.000
FIP11	**0.67**	-0.08	-0.01	-0.13	0.23	-0.05	0.09	0.000
B. Food Insecurity Severity (FIS)								
FIS2	-0.33	**0.70**	-0.18	0.32	-0.07	-0.08	0.02	0.000
FIS4	0.18	**0.81**	-0.02	-0.10	-0.03	-0.07	-0.01	0.000
FIS5	0.15	**0.68**	0.04	0.10	0.12	-0.03	-0.03	0.000
FIS6	-0.35	**0.72**	-0.06	0.04	-0.20	-0.04	0.01	0.000
FIS11	0.36	**0.69**	-0.07	-0.19	0.23	0.12	0.00	0.000
FIS13	-0.01	**0.65**	0.32	-0.15	-0.05	0.13	0.01	0.000
C. Class Participation (CP)								
CP2	-0.08	0.04	0.02	-0.02	0.03	**0.72**	0.15	0.000
CP3	0.01	0.01	0.08	-0.05	-0.01	**0.68**	0.07	0.000
CP4	0.05	-0.09	-0.06	-0.01	-0.01	**0.78**	-0.16	0.000
CP5	-0.09	0.02	0.05	-0.03	-0.10	**0.81**	-0.07	0.000
CP6	0.01	0.11	0.06	0.06	0.12	**0.73**	-0.13	0.000
CP7	0.24	-0.26	-0.09	0.01	-0.12	**0.69**	0.25	0.000
CP8	-0.11	0.13	-0.05	0.04	0.08	**0.82**	-0.06	0.000
D. Class Attentiveness (CA)								
CA1	-0.42	0.37	-0.27	0.23	-0.06	0.20	**0.69**	0.000
CA2	-0.22	0.12	0.00	0.04	-0.14	0.21	**0.72**	0.000
CA3	0.33	-0.33	0.06	0.03	-0.06	-0.15	**0.67**	0.000
CA6	0.19	-0.08	0.07	-0.17	0.08	-0.18	**0.73**	0.000
CA7	-0.05	0.04	-0.01	-0.16	0.09	-0.02	**0.79**	0.000
CA8	0.15	-0.11	0.12	0.05	0.07	-0.06	**0.79**	0.000

Figure 2. Convergent Validity Statistics of the Variables

As seen in the table above, the values highlighted in green is the Average Variance Extracted, the last column displays the P-values of the indicator loadings. The other values are called cross-loadings. The study followed loadings-approach criteria to assess convergent validity: a) indicator loadings should be .50 or higher, b) associated P-values should be less than .05, and c) cross-loadings should be low relative to indicator loadings. Items that violated these criteria were excluded from the analysis. As a result, satisfactory convergent validity was achieved for all the latent variables. Values above 0.500 indicate that the question is a good contributor to the question group, for example FIP1 has a value of 0.610, which shows that FIP1 is a good contributor to FIP. Questions from FIP less than 0.500 standard regression weight are removed since it is not an excellent contributor to the model.

Recommendations:
For students – The study shows that food insecurity affects students' academic performance. Creating an everyday budget for meals can reduce shortage of money on every meal session. Investing in a good/healthy diet can help them to be more active in class. With that, give importance and focus on having a healthy diet and eating meals to satisfy their daily food intake and having less on purchasing non-essential things. Investing in a good, healthy diet provides

them with the necessary nutrients and energy to support their academic development, and overall well-being. One common approach to achieving balanced nutrition is through the concept of "go, grow, and glow" foods.

- For government – The research has shown that food budget is one of the significant variables that affects students' participation in class. Considering the price of the meal, the quality does not justify the price. One of the solutions is for the schools to conduct research to know what the students are eating habits and what solutions are needed to solve the issue. The government can also help by improving the approach to the agriculture sector. Reducing inefficiencies and cutting other costs such as storage, transportation. The government can also raise awareness and provide necessary education such as financial literacy, workshops and seminars to educate students about the importance of food nutrition during their college life. Monthly food allowance for Dean Lister's every semester can be a great idea and it would motivate them to pursue their best on academics.

- For the college/university – To have an effective approach in addressing food insecurity among students, a combination of seminars for concessionaires, campus programs, schedule adjustments, food donation drives, collaborations with the local government, and partnerships with other organizations can help to ensure that students have access to well balanced and nutritious foods. Giving seminars to canteen concessionaires about the connection between food insecurity and academic performance will help them to understand their role in promoting student health and well-being. Universities can organize programs or activities to help students such as free snacks/meals programs, setting up water stations, and making healthy foods available at campus canteens. In addition, Colleges and Universities can also adjust the students schedule where the students can have ample time to have their breakfast, lunch and dinner. Easier workloads can also be an option for the colleges to offer to students, or create a schedule for students where they have lesser time in school.

- For the families – As the study shows that food insecurity affects student's academic performance. Parents should focus and give importance to creating a meal plan for their children with larger food portions, through this the student will not worry to eat smaller food portions (FIP7). Moreover, if possible, when they visit their children, we would suggest they bring prepared cooked foods for the students. Whenever they visit their children, they can also have a meal where everyone's present

- For the Food Institutions – Creating Food Vouchers and Discounted Prices that makes them affordable exclusively for students. Additionally, they might be able to prepare budgeted set meals for the students that consist of two courses, one of which is a meat dish and the other of which is a vegetable dish, along with rice. Creating a flexible meal plan that accommodates different budgets can help students to choose from a variety of foods without sacrificing its nutritional value.

5.2 Graphical Results
As seen from the Figure 2. SEM Model below, it is the final SEM Model used for the study. Independent Variables represented by the Food Insecurity indicators which are Food insecurity prevalence (FIP), Food insecurity severity

(FIS), Meal totality (MT) and Food budget (FB). While the dependent variables are represented by the Academic performance indicators which are GWA, Class participation (CP), and Class attentiveness (CA).
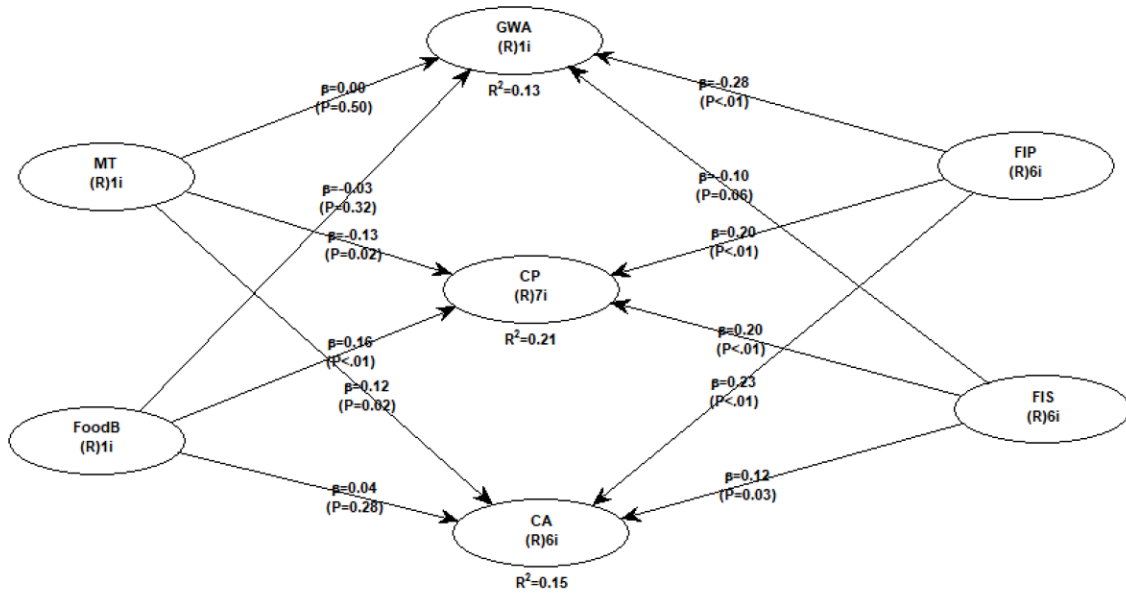

Figure 3. SEM Model

5.3 Proposed Improvements

Food Insecurity among college students has resulted in a correlation on Academic Performance. Moreover, Food Insecurity has a continuous and numerous correlations yet to be determined that affects college students. Considering the limitations identified and the findings of the study, the following are recommended as future research subjects:

1. The researchers can increase the sample size of this study. With the study focused only within the University-Belt Manila, researchers can expand the target population to the whole area of the Philippines. The larger the sample size, the more accurately it is expected to predict the behavior of the target population.

2. The researchers may add an additional factor that correlates Food Insecurity. They can add factors outside of Academic Performance which are likely in the Working Industry, Daily Activities, and Etc.

3. The Researchers can use health-related equipment or partner with medical professionals to identify the target subjects their Food or Diet History (1) and Nutritional Status (2).

4. The researchers can use a population from rural areas instead of urban areas in order for the local government to act upon the needs of the students.

5. The researchers can utilize the whole school year for their scope of study to see the difference between one semester into one school year.

6. Conclusion

In conclusion, there is a correlation between Food Insecurity indicators and Academic Performance among University-Belt students staying in dormitories in the academic year 2022 - 2023. Overall, all specific objectives and general objectives are met through the research and the accepted test hypotheses are as follows:

H1	Food Insecurity Prevalence has a correlation with GWA among University-Belt college students in dormitories.
H2	Food Insecurity Prevalence has a correlation with Class Participation among University-Belt college students in dormitories.
H3	Food Insecurity Prevalence has a correlation with Class Attentiveness among University-Belt college students in dormitories.
H5	Food Insecurity Severity has a correlation with Class Participation among University-Belt college students in dormitories.
H6	Food Insecurity Severity has a correlation with Class Attentiveness among University-Belt college students in dormitories.
H8	Meal Totality has a correlation with Class Participation among University-Belt college students in dormitories.
H9	Meal Totality has a correlation with Class Attentiveness among University-Belt college students in dormitories.
H11	The Food Budget has a correlation with Class Participation among University-Belt college students in dormitories.

Figure 4. Accepted Test Hypotheses

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Biography

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Jamiel Cabuang is currently a 4th year Bachelor of Science Industrial Engineering student studying in the University of Santo Tomas. He is a one of the authors of Undergraduate Research Paper "Analysis on the correlation of Food Insecurity Indicators and Academic Performance affecting city of Manila's University Belt students staying in dormitories during the Academic Year 2022-2023."

Joshua Ceñidoza is a 4th year student pursuing a degree in Industrial Engineering at the University of Santo Tomas and his academic journey has been marked by resilience and determination. Although he faced initial challenges, he persevered with unwavering resolve, emerging stronger from his struggles. In addition to his core courses in Industrial Engineering, he has taken Service Engineering as an elective, widening his horizons, and embracing the dynamic engineering world. Joshua's impact extends beyond the classroom, as he is also a co-author of the Undergraduate Research titled "Analysis on the Correlation of Food Insecurity Indicators and Academic Performance Affecting the City of Manila's University Belt Students Staying in Dormitories during the Academic Year 2022-2023." This endeavor reflects his dedication to addressing critical societal issues through his engineering expertise.

Nerick Fidelino is currently a 4th year Bachelor of Science Industrial Engineering student studying in the University of Santo Tomas. He is also majoring in Quality Engineering and engaging the discipline of engineering concerned with the principles and practice of product and service quality assurance and control. He is a part of Undergraduate Research Paper "Analysis on the correlation of Food Insecurity Indicators and Academic Performance affecting city of Manila's University Belt students staying in dormitories during the Academic Year 2022-2023."

Ira Jane Tancio is currently a 4th year Industrial Engineering student at The University of Santo Tomas, specializing in Operations Research Analysis. She's a dedicated student, who has a passion for optimizing processes and enhancing efficiency to revolutionize operations in diverse industries. She is one of the co-authors of "Analysis on the correlation of Food Insecurity Indicators and Academic Performance affecting city of Manila's University Belt students staying in dormitories during the Academic Year 2022-2023."