

## ORIGINAL ARTICLE

# Sociodemographic Predictors of Food Insecurity Among Malay University Students

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## ABSTRACT

**Introduction:** Food insecurity is currently a problem faced by both developing and developed nations. Issues of food insecurity reflect both social and economic challenges, posing a significant policy dilemma. Although there has been various research on food insecurity, very little has been done to better understand what are the sociodemographic factors that can predict food insecurity within a Malaysian context, especially amongst the unique community of Malay university students, which makes up the largest group of students in tertiary education. Therefore, this study examined the prevalence of food insecurity and its associated factors among Malay university students.

**Methods:** Conducted in Universiti Teknologi MARA, Selangor Campus, conveniently sampled participants (n = 181) completed a pre-tested English version of the US Adult Food Security Survey Module (AFSSM) questions in 2015, which measures their level of food security status. Binary logistic regression analysis was carried out to determine the sociodemographic predictors of food insecurity among the sampled population. **Results:** More than one-third of participants (42.5%) reported food insecurity within the past year with 22.1% experiencing very low food insecurity. Additionally, of those who experienced food security, 5.4% reported a low food security status. However, no significant predictors were observed positively related to food insecurity. **Conclusion:** Data indicates that food insecurity is a significant problem among university students and additional research is needed to better understand and address food insecurity in higher education.

**Keywords:** Food insecurity, Sociodemographic, University students

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## INTRODUCTION

Food insecurity, which is defined as a limited or uncertain ability to acquire good nutritious food using socially acceptable means, is currently an important public health issue. In fact, food insecurity is a critical problem, especially in this era of climate change and pandemic, that plagues both developed and developing nations (1). The risk of food insecurity can be influenced by various factors such as socioeconomic status (2,3), ethnicity (4), and educational status (5). Not only that, food insecurity has also been observed among indigenous people (3,6) as well as those living in the city and rural areas (7,8).

In the current context, food insecurity poses a significant policy dilemma that can undermine the government's strategy for improving socioeconomic development. This is because food insecurity is not just an economic challenge, but also a social one, as it affects the capability of individuals, families, and communities (9) in contributing towards national development. Capability here refers to Sen's capability approach, which means the freedom a person has that allows them to achieve well-being (10). Due to this, governments worldwide have taken various initiatives to address the long-term challenges of food insecurity. One initiative is the improvement of educational attainment, as food insecurity issues are found to be particularly prevalent among students from low income households (11) and those with low level of education (3). A focus on education is critical, as education can serve as a jumping board to

improve poor family's economies, especially among the younger generation. In fact, several studies carried out in universities both in Malaysia and in the Global North had found that food insecurity among university students was particularly high, especially when measured against the level of food insecurity among the general public (3, 12, 13). Additionally, Hispanic and Black students were found to be more likely to experience food insecurity compared to Caucasians (13), highlighting a possible connection between race and food insecurity. In a more recent research, students with food insecurity problems were reported to live in off-campus housing and receive financial aid (14). Even worse, students who experience food insecurity were often observed to lack the capability in managing their limited resources (15). Notwithstanding the issue of physical hunger, the effect of food insecurity goes beyond socioeconomic status and capability, as it may also ignite feelings of shame and isolation (16) among those experiencing it.

In Malaysia, studies on food insecurity started to increase during the late 1990s. These initial studies mainly focussed on children and women residing in rural and urban areas (17, 8), as well as indigenous groups or Orang Asli (18). More recently, research on food insecurity has focused on Malaysian university students, highlighting how food insecurity is affecting more than half of the sampled university students (19, 20, 21). Regardless, despite all this recent information, very little practical change has been done to address food insecurity among university students. It is critical then, that more evidence is needed, particularly due to the complex interplay of various social and economic factors that are unique to students in tertiary education. University students, in general, are faced with economic challenges similar to that of working adults, which includes accommodations, transportation, and food. However, when taking into account other financial burdens such as tuition fees, educational materials as well as the fact that students are not earning a formal income, the burden on university students, especially those from poorer families (21) is much higher than one might initially assume (19). One particular survey carried out in Malaysia showed that the main source of pocket money among university students were largely from a government education loan (23), also known as Perbadanan Tabung Pendidikan Tinggi Nasional (PTPTN) (87.5%) and less so from parents (7.3%) and scholarship (5.2%). This indicates a high reliance on government financial aids for tertiary education and less on parental units (23). While this research did not focus on food insecurity, it could highlight the possible financial issues faced by university students in Malaysia, assuming that those who relied on government financial aid are those from poorer backgrounds.

Apart from Malaysia, the burden of food insecurity among university students has also been demonstrated in developed countries such as the United States (24)

and Australia (25). Not only that, food insecurity has also been shown to be negatively associated with dietary intake (26), self-rated health (27), mental health (28), and academic performance (29) among university students. However, while the findings of these studies provide critical data on food insecurity among university students, these studies are carried out in developed countries or the Global North, whose situations may not necessarily be generalizable to a Malaysian context. Therefore, this highlights the need for more contextualized data that focuses on sociodemographic predictors of food insecurity within a Malay university student population. In particular, those in public universities.

In Malaysia, the management of food insecurity still requires improvements, especially in terms of public policy implementation. Additionally, given that food insecurity has been linked to sub-optimal health conditions as well as low academic performance, refining our understanding of food insecurities among university students is prudent, especially if the aim is for long-term management of food insecurity among those at high risk of experiencing it. To address this issue, this study aimed to determine the potential relationship between students' demographic factors (sociodemographic predictors) and experiences of food insecurity in Malaysia's largest public university system. Understanding the students' characteristics that are associated with increased risk of food insecurity is a prerequisite to identifying the determinants of health within this particular population. Additionally, the findings of this study may be particularly useful to university management and policymakers as it has the potential to inform strategies and improve policies to address food insecurity in higher education so that this effort could ultimately lead to high academic success and better quality of life.

## **MATERIALS AND METHODS**

This study was conducted at Universiti Teknologi MARA (UiTM) Kampus Selangor, a site chosen because of its large population compared to other UiTM campuses in Malaysia. This campus sits on 1,085 acres of land located just about 5 km from Bandar Baru Puncak Alam. UiTM is a nation-wide public university system and in 2015 alone, had a student enrolment of 168,865, where the majority of them were undergraduates. Students of UiTM are largely Bumiputras, most of whom identify as Malay and attend a 4-year university system in which English is the medium for teaching and communication. Within the Selangor campus itself, there are three main faculties; 1] the Faculty of Pharmacy, 2] Faculty of Business, and 3] Faculty of Health Sciences. At the time of study commencement, nearly 5000 students were studying here.

Using a cross-sectional study design, data were collected in UiTM Selangor Campus between March and April of

2016. Sample size calculation, based on expected food insecurity prevalence of 21% (24) was estimated using a single proportion formula, with 20% expected non-response rate, precision was set at  $\pm 0.07$  and confidence level was set at 95%, the minimum sample size for this study was 164 students (30). Consequently, 236 students were conveniently sampled and then invited to participate in this study. The number of recruits was purposely obtained beyond the pre-calculated sample size in order to make sure the calculated prevalence will give a good estimate of this problem in the Selangor campus. Initially the students were approached at a strategic mix of locations within the Selangor campus in order to incorporate a broad range of participants. The locations include canteen, library, and main corridor where a majority of the students can be found at all times. Once consents were obtained from interested students, self-rated questionnaires were distributed. The questions revolved around the topic of food insecurity and demographic. Participating students were given food as a token of appreciation, and this was found to effectively increase student survey participation.

Of the 236 total student participants only 181 students were included in the final analysis. Survey participants were included if they were an undergraduate Malay student with age between 18 to 25 years. Participants were excluded from the analysis due to incomplete data on food security and demographic variables. Participants were also excluded if they reported the following; 1] students with stress injuries such as infection, burn or trauma, 2] smoker, and 3] pregnant. Smokers were excluded to ensure the food insecurity status that was measured from study participants was solely due to lack of money to buy foods and not financial stress induced by smoking behavior (31).

### **Food Security Assessment**

For the assessment of food security status, a pre-tested English version of the US Adult Food Security Survey Module (AFSSM) (32), which is a subset of the US Household Food Security Survey Module (HFSSM) was used to assess individual student's status over the past 12 months. Compared to HFSSM, AFSSM was more appropriate to use among households without children and therefore it is used in this present study where students were the main study subject. Usually, most undergraduate university students are living alone with roommates and if they are living with family, they seldom have children. AFSSM consists of 11 items and has been shown to be valid and reliable (33). The first item of the questionnaire was not used to calculate food security scale, but used as a preliminary screener for high-income individuals. The next 10 items were used for the determination of food security status. The questions are ordered based on the severity range of food security status of the participants. These involve questions on attributes related to experience, behaviour and frequencies of insufficient resources to buy food.

The AFSSM constructed a 12-month food security scale that classifies participants into four food security categories. Briefly, AFSSM was summarised by summing the number of affirmative responses and collapsing the results into four food security categories: food secure [0 affirmative responses], marginal food secure [1–2 affirmative responses], low food security [3–5 affirmative responses], or very low food security [6–10 affirmative responses] (33). A more meaningful sub-range of severity was calculated and identified by combining affirmative responses within these specified ranges into two categories: food secure [0–2 affirmative response], or food insecure [3–10 affirmative responses]. The four food security categories and subsequent two food categories groups were calculated based on a suggestion adapted by (34). This was performed to allow the establishment of a consistent basis for the comparison of food insecurity prevalence over time and across population groups.

### **Sociodemographic predictors**

Self-reported demographic factors, which will be assessed to identify the sociodemographic predictors, were also obtained, which includes age in years, gender (male/female), living arrangement (living on-campus/living off-campus), financial aids (none/received scholarship/obtained study loan) and participants' self-reported health. Self-reported health includes the participants' most relevant view of their current health situation during the time of answering the survey questionnaire, which categorizes themselves into either one of these four categories-(excellent/very good/good/fair). Body mass index (BMI) was calculated in metric units as weight (kg)/height<sup>2</sup>(m<sup>2</sup>) based on self-reported weight and height. Calculated BMI was then converted into four BMI categories-underweight (BMI $\leq$ 18.5), normal weight(18.5 $\leq$ BMI $\leq$ 22.9), overweight (23 $\leq$ BMI $\leq$ 24.9), and obese (BMI $\geq$ 25) (42). Apart from that, the Cumulative Grade Point Average (CGPA) grade (2.00–2.99, 3.00–4.00) of the participants is also recorded.

### **Statistical Analysis**

All data were analyzed using IBM SPSS Statistical software version 21 (IBM SPSS Statistics, Inc., Chicago, IL, USA). Prior to data analysis, continuous variable was subjected to normality testing by looking into its histogram and Kolmogorov Smirnov test, where depending on the distribution of the variable of interest, normally distributed variable was presented using mean and standard deviation. Meanwhile, for non-normal variables, the median and the interquartile range were reported instead. On the other hand, all categorical data were presented as frequencies and percentages. In order to assess the significant predictors for the binary outcome variable (food-secure versus food insecure), binary logistic regression analysis was carried out. The model fitness was assessed by looking into the Hosmer-Lemeshow test. Results with p-values < 0.05 were considered significant.

## RESULTS

A total of 181 students were included into the final data analysis, with all information tabulated in Table I. On average, students were 21.7 (SD=1.1) years old. The samples had a larger proportion of female students (87.8%) and among those sampled, almost two-third (62.4%) were living on-campus and nearly half (47.0%) reported to have normal BMI, followed by overweight, underweight and obese students at 24.3%, 16.6%, and 12.2% respectively. Most students (69.1%) also reported a CGPA score between 3.00 and 4.00 CGPA with only about a third (30.9%) reported a 2.00–2.99 range. Additionally, over half (51.4%) of these students obtained study loans with 42.0% claiming to have received scholarships. Out of the 181 students, only 6.6% of the students received neither scholarship nor loans. In terms of health, over two-thirds (69.1%) of the students reported to have good/fair health with the remaining (30.9%) declared to have excellent/very good health.

**Table I: Sociodemographic and health characteristics of 181 students surveyed**

Variable	n(%)
Age in year, <i>M</i> ( <i>SD</i> )	21.69(1.06)
Gender	
Male	22(12.2)
Female	159(87.8)
Living arrangement	
On-campus	113(62.4)
Off-campus	66(37.6)
BMI status	
Underweight	30(16.6)
Normal	85(47.0)
Overweight	44(24.3)
Obese	22(12.2)
CGPA grade	
2.00–2.99	56(30.9)
3.00–4.00	125(69.1)
Financial aid	
None	12(6.6)
Received scholarship	76(42.0)
Obtained study loan	93(51.4)
Self reported health	
Excellent/very good	56(30.9)
Good/Fair	125(69.1)
Food security status	
Food secure	21(11.6)
Marginal food secure	56(30.9)
Low food secure	64(35.4)
Very low food security	40(22.1)
Food security	
Food secure	77(42.5)
Food insecure	104(57.5)

Data represent number (percentage) unless specified  
 \$Not all students had complete data on demographic characteristics; therefore, percentages may not add up to 100 percent.

Based on the 10 item questions within the AFSSM, only 11.6% reported to have food security with an additional 30.9% experiencing marginal food security. 35.4%, on the other hand, declared as experiencing low food security and shockingly more than one-fifth (22.1%) of these students reported experiencing very low food insecurity. However, once this four-food security status was recoded into binary categories, 57.5% of the sampled students reported to have experienced food insecurity for the past 12-months. Only a total of 42.5% of students reported experiencing food security throughout a one-year period.

However, as indicated in Table II, there were no significant associations in food security status by age, gender, living arrangement, BMI status, CGPA grades, financial aid status, and self-reported health.

**Table II: Results of binary logistic regression**

Variable	OR (95% CI)	Wald stat.(df)	P-value
Age	1.12(0.84–1.48)	0.572(1)	0.450
Gender		2.306(1)	0.129
Female	(ref.)		
Male	2.15(0.80–5.78)		
Living arrangement		0.000(1)	0.982
On-campus	(ref.)		
Off-campus	0.99(0.54–1.83)		
BMI status			
Normal	(ref.)	1.026(3)	0.795
Underweight	0.67(0.29–1.54)		
Overweight	0.96(0.46–2.02)		
Obese	0.80(0.31–2.06)		
CGPA grade			
2.00–2.99	(ref.)	2.810(1)	0.094
3.00–4.00	1.72(0.91–3.26)		
Financial aid		1.293(2)	0.524
None	(ref.)		
Received scholarship	2.03(0.59–6.99)		
Obtained study loan	1.94(5.73–6.56)		
Self reported health		0.003(1)	0.954
Excellent/very good	(ref.)		
Good/Fair	1.02(0.54–1.93)		

## DISCUSSION

Initial analysis showed that the rate of food insecurity in our sample is consistent with other research carried out among Malaysian university students, where food insecurity prevalence is much higher (19, 21, 22) compared to the overall Malaysian population (7, 35). In fact, the higher rate of food insecurity in tertiary education students was also observed in the US (13). Similar to our findings, Patton-Lopez reported that a higher rate of food insecurity could be observed among university students compared to the general US population. Not only that, the results in this study are also consistent across studies carried out in Canada, Australia and South Africa (26, 27, 36), thus indicating that food insecurity is a problem that crosses geographical borders regardless of the economic attainment of the countries.

Apart from that, our research found no significant associations with the sociodemographic predictors - age, gender, living arrangement, BMI status, CGPA grades, financial aid status, and self-reported health - highlighted in the analysis. While this is consistent with research carried out by Nadzri et. al (20), the fact that no significant associations were found could be due to the lack of a heterogeneous sample of the study participants since both these studies were carried out within a single public university. UiTM after all, is a university meant specifically for Bumiputera. In fact, in a study by Jamil et. al (22) where a significant relationship was found between food insecurity status and gender as well as financial problems, samples were taken from four different public universities, strengthening the assumption that a more heterogeneous sample is needed. However, regardless of the results, focus must be made on the bigger picture. Food insecurity, as it has been shown time and time again, is a problem among university students and while there is no significant effect on either students' quality of life or academic attainment of the students at the time of data collection, to our knowledge, very little is known about whether or not this will affect the students in the future.

University students, it seems, require a more directed approach towards mitigating experiences of food insecurity. While our research found no evidence of significant associations, significant associations had been demonstrated between food insecurity and time constraints, spending on books, parents' financial status as well as the type of scholarship they received (19). Other research, on the other hand, highlighted that risk factors for food insecurity among university students include students of colour (13), students who were from low-income background, those living independently in off-campus housing, student whose received financial aid (37), renting (27), students who reported being employed (13), those receiving food assistance (15), as well as asking others for money in order to buy food (36). All these risk factors put the students at increased

risk of experiencing food insecurity throughout their study period. In addition, students who experienced food insecurity were found to lack proper skills related to money and time management (25). This makes it more difficult to organize the finances, which can thus affect their ability to provide for their nutritional needs. Not only that, it has been reported that students experiencing food insecurity may also feel shame and isolation (16), and that may possibly lead to suicidal ideations (38).

In terms of health, students who reported having food insecurity were found more likely to report weight loss, and poorer health (25) as well as lower overall self-reported health (26). Higher fat mass index was also found to be higher among those who are food insecure (39). In fact, in a study by Lin et al. (40), substance use and conflict with partners were positively associated with food insecurity. These are all incriminating evidence that highlights how much food security status affects one's physical and mental health. This shows just how important it is for policy to target food insecurity issues among university students, and to ensure they receive adequate nutritious food. These students, after all, are the foundation on which the future of the country stands on, apart from the fact that poor physical and mental health among the youth will only burden the medical and financial capacity of a nation.

Another important reason why food insecurity needs to be addressed is that this problem may in fact even extend to beyond academic life, as issues such as poor academic performance, health and skills affect their capability to function well in society beyond academia. In fact, as mentioned earlier, little is known regarding the effect food insecurity has on students' future capabilities. In essence, this study highlights not only the issue of food insecurity, but also the fact that the problem of food insecurity goes beyond not having any nutritious food. It is a societal problem that can create a cycle of issues among the affected students, affecting more than just their academic life.

While this research is similar to various other recent researches on food insecurity among university students in Malaysia, we believe more evidence is necessary to promote a more targeted policy approach to alleviating food insecurity among this population. As important as it is for research to aim for generalization, a research on food insecurity among certain populations needs to also look at context, as there are various other factors that might affect the results, especially in a multi-cultural society that has had a history of racial disparity divided along economic lines. However, we are aware of our limitations, especially in terms of the cross-sectional design, which cannot determine cause and effect, or directionality. Not only that, convenient sampling was carried out, which also means the results cannot be generalized. Finally, freshmen were asked to report on food insecurity in the last 12 months, so

their food insecurity experience could have occurred prior to attending this university. Additionally, the food insecurity questionnaire that was used in this study need to be interpreted cautiously since it does not adequately represent all important domains that supposedly to be measured especially when used beyond North America in which it is developed from (41).

## CONCLUSION

High prevalence of food insecurity among university students is an important issue to consider, as it might impact academic performance and success, which will then further affect their future life. It is an exciting time for food security study in this population, but more work is left undone. As of now, despite the fact that no significant associations were found between food security status and other variables, the fact remains that over 50% of the participants have experienced food insecurity in the last 12 month of data collection. This indicates that further scrutiny is needed, not necessarily in more similar research, but rather on trying to find solutions to address this problem. In fact, we believe further high-quality longitudinal studies that focus on the impact of food insecurity on the future capabilities of students as well as innovative intervention that aims towards eliminating food insecurity may be also worth considering so that these may lead us closer to the day where food insecurity is no longer an issue for so many university students. We hope these findings can be used to inform university management on the urgency of the food security situations among university students, especially since it could potentially affect their capabilities in the future. The responsibility of university management is vast, especially if it aims to educate and produce the future leaders of our nation. Therefore, university management should devise strategies to assist students in need by providing campus services that compliment federal, state and local programs.

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## REFERENCES

1. Coleman-Jensen, A., & Nord, M. Food insecurity among households with working-age adults with disabilities. Economic Research Report. United States Department of Agriculture Economic Research Service. 2015.
2. Bocquier, A., Vieux, F., Lioret, S., Dubuisson, C., Caillavet, F., & Darmon, N. (2015). Socio-economic characteristics, living conditions and diet quality are associated with food insecurity in France. *Public Health Nutrition*. 2015;18(16):2952–2961.
3. Sulaiman, N., Yeatman, H., Russell, J., & Law, L. S.. A Food Insecurity Systematic Review: Experience from Malaysia. *Nutrients*. 2021; 13(3), 945.
4. Sharkey, J. R., Dean, W. R., & Johnson, C. M. Association of household and community characteristics with adult and child food insecurity among Mexican-origin households in Colonias along the Texas-Mexico border. *International Journal for Equity in Health*. 2011;10(1):19.
5. Belachew, T., Hadley, C., Lindstrom, D., Gebremariam, A., Lachat, C., & Kolsteren. Food Insecurity, school absenteeism and educational attainment of adolescents in Jimma Zone Southwest Ethiopia: a longitudinal study. *Nutrition Journal* 2011;10(1):29.
6. Temple, J. B., & Russell, J. Food insecurity among older Aboriginal and Torres Strait islanders. *International journal of environmental research and public health* 2018; 15(8), 1766.
7. Sharif ZM, Ang M. Assessment of food insecurity among low income households in Kuala Lumpur using the Radimer/Cornell food insecurity instrument—a validation study. *Malaysian Journal of Nutrition*. 2001;7(1 & 2):15-32.
8. Zalilah, M. S., & Khor, G. L. Indicators and nutritional outcomes of household food insecurity among a sample of rural Malaysian women. *Pakistan Journal of Nutrition* 2003;3(1):50–55.
9. Chilton M, Chyatte M, Breaux J. The negative effects of poverty & food insecurity on child development. *Indian Journal of Medical Research*. 2007;126(4):262.
10. Sen, A. Human rights and capabilities. *Journal of human development*. 2005; 6(2), 151-166
11. Rychetnik L., Webb K., Story L., & Katz T. Food security options paper: A planning framework and menu options for policy and practice interventions. Sydney, NSW Centre of Public Health Nutrition, University of Sydney. 2003
12. Micevski DA, Thornton LE, Brockington S. Food insecurity among university students in Victoria: A pilot study. *Nutrition & dietetics*. 2014; 71(4): 258-64.
13. Patton-Lopez, M. M., Lopez-Cevallos, D. F., Cancel-Tirado, D. I., & Vazquez, L. Prevalence and correlates of food insecurity among students attending a midsize rural university in Oregon. *Journal of Nutrition Education and Behavior*. 2014; 46(3): 209–214.
14. Zein, A. E., Shelnut, K. P, Colby, S., Vilaro, M. J., Zhou, W., Greene, G., Olfert, M., Riggsbee, K.m Morrell, J. S., & Mathews, A. E. Prevalence and correlates of food insecurity among U.S. college students: a multi-institutional study. *BMC Public Health* 2019; 19(1): 660.
15. Gaines, A., Robb, C. A., Knol, L. L., & Sickler, S.

- Examining the role of financial factors, resources and skills in predicting food security status among college students. *International Journal of Consumers Studies*. 2014; 38(4): 374–384.
16. Martinez, S. M., Maynard, K., & Ritchie, L. D. Student food access and security study. Berkeley, CA: Nutrition Policy Institute. 2016
  17. Zalilah, M. S., & Ang, M. Assessment of food insecurity among low income households in Kuala Lumpur using the Radimer/Cornell food insecurity instrument—A validation study. *Malaysia Journal of Nutrition* 2001; 7(1&2): 15–32.
  18. Zalilah, M. S., & Tham, B. L. Food security and child nutritional status among Orang Asli (Temuan) households in Hulu Langat, Selangor. *Medical Journal of Malaysia*. 2002; 57(1): 36–50.
  19. Bakar, W. A. M. A., Ismail, S., Sidek, S., & Rahman, R. A.. Prevalence and factors affecting food insecurity among university students in Pahang, Malaysia. *Malaysian Journal of Nutrition*. 2019; 25(1)
  20. Nadzri, N.F.A., Shukri, N.A.M., Bakar W.A.M.A. The association of food insecurity with the quality of life, academic performance and body mass index among university students. *International Journal of Allied Health Sciences*. 2020. 4(3), 1430-1439
  21. Jamil, N. M., Sulaiman, N., Adznam, S. N. A., & Badari, S. A. Z. Financial problems associated with food insecurity among public university students in Peninsular Malaysia. *Malaysian Journal of Nutrition*. 2020 26(3).
  22. Rajikan, R., Shin, L. H., Hamid, N. I. A., & Elias, S. M. Food Insecurity, Quality of Life, and Diet Optimization of Low Income University Students in Selangor, Malaysia. *Jurnal Gizi dan Pangan*. 2019; 14(3), 107-116.
  23. Abdelnaser, O. Identifying the main factors affecting the expenditure of students at the Universiti Utara Malaysia using PTPTN. *Seria Stiinte Economice si Administrative*, 2016: 10: 33–47.
  24. Chaparro, M. P., Zaghoul, S. S., Holck, P., & Dobbs, J. Food insecurity prevalence among college students at the University of Hawai'i at Manoa. *Public Health Nutrition*, 2009; 12(11): 2097–2103.
  25. Hughes R., Serebryanikova, I., Donaldson, K., & Leveritt, M. Student food insecurity in the university closet. *Nutrition and Dietetics*. 2011; 68(1): 27–32.
  26. Farahbaksh, J., Hanbazaza, M., Ball, G. D., Farmer, A. P., Maximova, K., Willows, N. D. Food insecure students and clients of a university-based food bank have compromised health, dietary intake and academic quality. *Nutrition and Dietetics*. 2016;74(1):67–73
  27. Gallegos, D., Ramsey, R., & Ong, K. W. (2014). Food insecurity: Is it an issue among tertiary students? *Journal of Higher Education*, 2014;67(5): 497–510.
  28. Bruening, M., Brennhofer, S., van Woerden, I., Todd, M., & Laska, M. Factors related to the high rates of food insecurity among diverse, urban college freshman. *Journal of the Academy of Nutrition and Dietetics*, 2016;116(9):1450–1457.
  29. Maruto, M. E., Snelling, A., & Linck, H. Food insecurity among community college students: Prevalence and association with grade point average. *Community College Journal*, 2015;39(6):515–526
  30. Arifin, W. N. . Introduction to sample size calculation. *Education in Medicine Journal*. 2013;5(2), e89-e96.
  31. Mulder, B. C., de Bruin, M., Schreurs, H., van Ameijden, E.J.C. Stressors and resources mediate the association of socioeconomic position with health behaviours. *BMC Public Health*. 2011;11, 798.
  32. USDA (US Department of Agriculture, Economic Research Service). US Adult Food Security Survey Module: Three-Stage Design, With Screeners. (2008).US Department of Agriculture, Economic Research Service.
  33. Bickel, Gary, Mark Nord, Cristofer Price, William Hamilton, and John Cook. "Guide to measuring household food security. 2000.
  34. Nord, M. Food Security in the United States: Hunger and Food Security.(2006). Briefing Rooms
  35. Hudin, R. S., Shahar, S., Ibrahim, N., Yahaya, H. M. Influence of socio-economic and psychosocial factors on food insecurity and nutritional status of older adults in Felda settlement in Malaysia. *Journal of Clinical Gerontology and Geriatrics*, 2017;8(1):35–40
  36. Van den Berg, L., & Raubenheimer, J. Food insecurity among students at the University of the Free State, South Africa. *South Africa Journal of Clinical Nutrition*, 2015;28:160–169.
  37. Freudenberg N, Manzo L, Jones H, et al. Food insecurity at CUNY: Results from a survey of CUNY undergraduate students. Campaign for a healthy CUNY. 2011;New York: The City University of New York.
  38. Davison, K. M., Marshall-Fabien, G. L. & Tecson, A. Association of moderate and severe food insecurity with suicidal ideation in adults: national survey data from three Canadian provinces. *Social Psychiatry and Psychiatric Epidemiology*. 2015;50:963–972.
  39. Nur Atiqah, A., Norazmir, M. N., Khairil Anuar, M. I., Mohd Fahmi, M., & Norazlan Shah, H.. Food insecurity status: It's association with inflammatory marker and lipid profile among young adult. *International Food Research Journal*, 2015;22(5):1855–1863.
  40. Lin, M. T., Peters Jr., R. J., Ford, K., Meshack, A., Johnson, R. J., & Hill, M. The relationship between perceived psychological distress, behavioural indicators and African-American college student food insecurity. *American Journal of Health*

- Studies.2013: 28(3):127–133
41. Coates, J., Webb, P., & Houser, R. Measuring food insecurity: Going beyond indicators of income and antropometry. Washington, 2003:DC: FANTA
  42. WHO (World Health Organization). The Asia-Pacific perspective: redefining obesity and its treatment. (2000).World Health Organization, Western Pacific Region