



Prevalence and Socioeconomic Determinants of Food Insecurity Among Undergraduate Students in Indonesia: A Multi-Institutional Cross-Sectional Study

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Article Info

Article history:

Received 24 June 2026

Received in revised form 17 July 2026

Accepted 3 August 2026

Keywords:

Food Insecurity

Undergraduate Students

Indonesia

Socioeconomic Determinants

Food Security

Abstract

Food insecurity among university students has become an important public-health issue, but evidence from Indonesia is lacking. This study estimated the prevalence and identified socioeconomic determinants of food insecurity among undergraduate students in Indonesia. We conducted a cross-sectional survey in November 2024 of 635 undergraduate students recruited from several higher-education institutions in Indonesia, mostly Universitas Tidar. Food insecurity was measured using the validated ten-item United States Department of Agriculture Adult Food Security Survey Module; raw scores ranged from 0–10 and were categorised into food secure, low, or very low food security, then dichotomised into food insecure (score ≥ 3) versus food secure. Sociodemographic and economic characteristics were collected through a self-administered questionnaire, and body-mass index was classified using Asia-Pacific cut-offs. Associations were examined using chi-square tests and multivariable logistic regression. The internal consistency of the food security module was good (Cronbach's $\alpha = 0.80$). Overall, 43.3% of students were food insecure (95% CI 39.5–47.2), comprising 28.7% with low and 14.6% with very low food security. In the adjusted model, students living independently in boarding houses had markedly higher odds of food insecurity than those living with parents (adjusted odds ratio 4.91; 95% CI 3.27–7.38), and a clear dose-response gradient was observed for monthly allowance, with the lowest-allowance group at greatest risk (adjusted odds ratio 4.99; 95% CI 2.82–8.83). Sex, parental education, and smoking status were not significant after adjustment.

Introduction

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life, a definition endorsed at the 1996 World Food Summit and structured around four pillars: availability, access, utilisation, and stability (FAO, 1996). Food insecurity, conversely, denotes limited or uncertain access to adequate food owing to a lack of money or other resources. Although it is often framed as a problem of low-income households, food insecurity also affects population subgroups whose access to food is constrained by transitional or precarious economic circumstances, including students in higher education (Creed et al., 2026; Martino et al., 2025; Hu et al., 2026).

University students have increasingly been recognised as a population vulnerable to food insecurity. A systematic review of postsecondary campuses reported average food insecurity

rates of 35% in the grey literature and 42% in the peer-reviewed literature, and found that food insecurity was consistently associated with financial independence, poorer health, and adverse academic outcomes (Bruening et al., 2017; Choi et al., 2025; McKay et al., 2025). Similar conclusions about the prevalence and deleterious effects of food insecurity have been drawn by a separate systematic review focused specifically on students in higher education within the United States (Nazmi et al., 2019), though a scoping review has noted large differences in reported prevalence between studies, with estimates ranging from approximately 10% to 75% (Nikolaus et al., 2020). Furthermore, food insecurity can cause harm beyond simply exacerbating hunger. Food insecurity was found to correlate with a lower GPA both independently and through mediators like poor mental health in a study with over 8,700 students at a public university system in California (Martinez et al., 2020), and food insecurity was robustly associated with increased odds of depression, anxiety, and stress in a meta-analysis of adult samples (Pourmotabbed et al., 2020; Moosavian et al., 2026; Essiam et al., 2025). International examination of food insecurity in higher-ed students has been limited, but problems have been noted outside of high-income Western countries; one study of undergraduates at a public university in Malaysia found that 62.8% of students experienced food insecurity (Ahmad et al., 2021; Ghazali et al., 2025; Öztürk et al., 2026).

Research from several countries has identified socioeconomic and living circumstances as key correlates of student food insecurity (Dehove et al., 2025; Galseku et al., 2026; Mposula et al., 2026). Among Australian university students, those living in rental accommodation had more than twice the odds of food insecurity compared with students living in their parents' home (odds ratio 2.39), and undergraduate students were at higher risk than postgraduate students (Whatnall et al., 2020). In a study of Lebanese college students, low household income and low maternal education were among the factors associated with food insecurity (Itani et al., 2022). The United States Department of Agriculture (USDA) food security survey modules are validated, multi-item instruments that classify households along a continuum of severity and are widely regarded as the standard for measuring food insecurity (Bickel et al., 2000; Abasilim et al., 2026; Maitra, 2025).

In Indonesia, evidence on food insecurity has historically focused on households and younger adolescents; for example, a longitudinal study in Yogyakarta found that higher food insecurity was associated with more depressive symptoms among adolescents (Asrullah et al., 2024; Sarfika et al., 2026; Prasetya et al., 2025). Comparatively little is known about the prevalence and determinants of food insecurity among Indonesian undergraduate students, and multi-institutional data using comprehensive, validated instruments are scarce (Trinh & Nhieu, 2026; Khusun et al., 2026; Hmimou et al., 2026). Understanding how socioeconomic factors shape food insecurity in this group is a necessary first step for designing campus-level support. This study therefore aimed to estimate the prevalence of food insecurity, and to identify its socioeconomic determinants, among undergraduate students in Indonesia.

Methods

Study Design, Setting, and Participants

This cross-sectional study involved undergraduate students at several Indonesian higher-education institutions and was conducted in November 2024. Of these students, 635 completed all questionnaire items. Most students were recruited from Universitas Tidar, Magelang, Central Java (432 participants; 68.0%), and the remainder came from Universitas Negeri Makassar, Universitas Pendidikan Indonesia, and several other institutions. Participation was entirely voluntary and all participants provided informed consent after which they completed the self-administered online questionnaire. Ethics approval was obtained from the Health Research Ethics Committee, Faculty of Medicine, Universitas Jenderal Soedirman (KEPK FK UNSOED; Research Ethic Approval Number: 100/KEPK/PE/X/2024).

Sampling and Eligibility

Participants were recruited using non-probability convenience sampling supplemented by snowball referral. Because data collection originated from the research team's home institution (Universitas Tidar) and was subsequently extended to other institutions through academic and peer networks, most respondents were students of Universitas Tidar; this over-representation reflects the recruitment strategy rather than a representative multi-institutional sampling frame, and the findings are therefore interpreted as describing the participating students rather than Indonesian undergraduates in general. Eligible participants were students actively enrolled in an undergraduate (Diploma/S1) programme at one of the participating institutions who were willing to provide informed consent; postgraduate students and incomplete or invalid submissions were excluded. Only respondents who completed all questionnaire items were retained (complete-case analysis), yielding the final analytic sample of 635.

Data Collection Procedure

The questionnaire was self-administered and completed online using Google Forms during 1–18 November 2024. It was distributed through student and peer networks at the participating institutions, primarily through study-programme and class messaging groups and social media. To limit duplicate submissions, respondent email addresses were collected as identifiers and the dataset was screened for duplicate submissions; no duplicate email addresses were present in the final dataset.

Sample Size

A formal a priori power calculation was not used to drive recruitment; nonetheless, the achieved sample of 635 exceeds the minimum of approximately 385 respondents required to estimate a population proportion of 50% with 95% confidence and an absolute precision of $\pm 5\%$, and it provided roughly 30 outcome events per estimated parameter in the logistic regression model, well above the conventional minimum of ten events per variable.

Measurement of Food Insecurity

Food insecurity in the past 12 months was measured using the ten-item USDA Adult Food Security Survey Module. All items were coded as affirmative responses using the standard response options: “often true” or “sometimes true” for items 1–3 (the screener items), “yes” for items 4–5 (occurrence items), and “almost every month” or “some months but not every month” for items 6–10 (frequency follow-up items). The affirmative responses were summed to create a raw score ranging from 0–10. Following the USDA agency guide (Bickel et al., 2000), we categorised participants into food secure (raw score 0–2), low food security (score 3–5) or very low food security (score 6–10). However, for the purpose of determinant analysis, food security status was dichotomised as food insecure (raw score ≥ 3) versus food secure (raw score 0–2).

Instrument Adaptation

The USDA Adult Food Security Survey Module was administered in Indonesian. The standard English-language items were translated into Indonesian for administration in this study. Internal-consistency reliability in the present sample was good (Cronbach's $\alpha = 0.80$).

Sociodemographic, economic, and anthropometric variables. Questions about sex, date of birth (used to calculate age), academic year, institution, living arrangement (board/house or live independently versus living with parents/guardians), monthly allowance and monthly food expenditure (responses coded into three ordered categories), receipt of scholarship or not, maternal education and smoking status were included in the questionnaire. Self-reported height and weight were used to calculate body-mass index (BMI). BMI was categorized according to Asia-Pacific regions cut-offs as underweight (<18.5), normal (18.5–22.9), overweight (23.0–24.9), and obese (≥ 25.0 kg/m²) (WHO Expert Consultation, 2004).

Statistical Analysis

Results are expressed as prevalence with their 95% confidence intervals (CI). Differences in food insecurity according to categorical characteristics were evaluated using the chi-square test and crude odds ratios (cOR) were estimated comparing each category to a referent group. Variables were entered into a multivariable binary logistic regression model to obtain adjusted odds ratios (aOR) with their 95% CI. Cronbach's alpha was used to estimate internal-consistency reliability of the food security questionnaire. Statistical significance was set at two-sided p-value of <0.05. All analyses were performed using IBM SPSS Statistics version 26. Variables were entered into the multivariable model on the basis of their established relevance as determinants of food insecurity together with the associations observed in bivariate analysis. Prior to modelling, multicollinearity among the predictors was examined using variance inflation factors (VIF), and overall model fit was summarised with the McFadden pseudo-R².

Result and Discussion

Sample characteristics

The 635 participants had a mean age of 20.0 ± 1.3 years. The majority were female (526; 82.8%) and most were enrolled at Universitas Tidar (432; 68.0%). More than half lived independently in boarding houses (367; 57.8%) rather than with parents or guardians (268; 42.2%). A monthly allowance below IDR 500,000 was reported by 42.5% of students, and 14.2% received a scholarship. The mean BMI was 21.2 ± 4.1 kg/m², with a substantial proportion classified as underweight (24.7%) alongside overweight or obese categories (combined 25.2%). Detailed characteristics are presented in Table 1.

Table 1. Characteristics of the study participants (N = 635)

Characteristic	n	%
Age (years), mean $\pm$ SD		
Age	20.0 $\pm$ 1.3	—
Sex		
Female	526	82.8
Male	109	17.2
Institution		
Universitas Tidar	432	68.0
Other institutions	203	32.0
Living arrangement		
Boarding house / independent	367	57.8
With parents / guardian	268	42.2
Monthly allowance		
< IDR 500,000	270	42.5
IDR 500,000–1,000,000	258	40.6
> IDR 1,000,000	107	16.9
Scholarship		
Recipient	90	14.2
Non-recipient	545	85.8
Mother's education		
$\leq$ Junior high	204	32.1

Characteristic	n	%
Senior high	281	44.3
Diploma / university	150	23.6
Smoking status		
Smoker	33	5.2
Non-smoker	602	94.8
Nutritional status (BMI, Asia-Pacific)		
Underweight	157	24.7
Normal	318	50.1
Overweight	61	9.6
Obese	99	15.6
Academic year		
First year	192	30.2
Second year	241	38.0
Third year	133	20.9
Fourth year or other	69	10.9
Monthly food expenditure		
< IDR 500,000	379	59.7
IDR 500,000–1,000,000	235	37.0
> IDR 1,000,000	21	3.3
Father's education		
≤ Junior high	183	28.8
Senior high	315	49.6
Diploma / university	137	21.6

Source: Primary data, 2024

Prevalence of food insecurity

Overall, 43.3% of students were food insecure (95% CI 39.5–47.2). Specifically, 56.7% were food secure (95% CI 52.8–60.5), 28.7% had low food security (95% CI 25.1–32.2), and 14.6% had very low food security (95% CI 11.9–17.4); the mean raw score was 2.7 ± 2.4 out of 10. This prevalence is high but consistent with the international literature. It is comparable to the 48% reported among Australian university students using the USDA module (Whatnall et al., 2020) and to the peer-reviewed average of 42% summarised by Bruening et al. (2017), while remaining below the 62.8% reported among Malaysian undergraduates (Ahmad et al., 2021). The estimate also falls within the wide range documented across studies that use differing instruments (Nikolaus et al., 2020). That nearly one in seven students experienced very low food security, the most severe category, characterised by disrupted eating patterns and reduced food intake, indicates that food insecurity in this population is not limited to mild anxiety about food but includes genuine hardship. The full distribution of raw scores was concentrated at the lower end of the scale (score 0, 16.7%; 1, 22.4%; 2, 17.6%; 3, 16.1%; 4, 7.2%; 5, 5.4%; 6, 4.6%; 7, 3.5%; 8, 3.0%; 9, 2.5%; 10, 1.1%), confirming that although most students clustered in the food-secure range, a substantial minority reported multiple indicators of food hardship.

Socioeconomic determinants

In bivariate analysis (Table 2), food insecurity was significantly more common among students living independently in boarding houses than among those living with parents (54.2% versus 28.4%), among scholarship recipients than non-recipients (57.8% versus 40.9%), and among students with lower monthly allowances. Sex, parental education (maternal and paternal), academic year, monthly food expenditure, smoking, and nutritional status were not significantly associated with food insecurity.

Table 2. Bivariate associations with food insecurity (crude odds ratios)

Factor / category	n	Food secure / food insecure, n (%)	cOR (95% CI)
Sex (p = 0.1213)			
Male	109	54 / 55 (50.5)	1.00 (ref)
Female	526	306 / 220 (41.8)	0.71 (0.47–1.07)
Living arrangement (p < 0.001)			
With parents	268	192 / 76 (28.4)	1.00 (ref)
Boarding/independent	367	168 / 199 (54.2)	2.98 (2.13–4.16)
Scholarship (p = 0.004)			
No	545	322 / 223 (40.9)	1.00 (ref)
Yes	90	38 / 52 (57.8)	1.97 (1.26–3.08)
Monthly allowance (p = 0.0166)			
IDR 500k–1m	258	141 / 117 (45.3)	1.85 (1.15–2.97)
< IDR 500k	270	145 / 125 (46.3)	1.92 (1.20–3.08)
> IDR 1m	107	74 / 33 (30.8)	1.00 (ref)
Mother's education (p = 0.7057)			
Diploma/university	150	89 / 61 (40.7)	1.00 (ref)
Senior high	281	155 / 126 (44.8)	1.18 (0.79–1.77)
≤ Junior high	204	116 / 88 (43.1)	1.11 (0.72–1.69)
Institution (p = 0.0997)			
Other institutions	203	105 / 98 (48.3)	1.34 (0.96–1.88)
Universitas Tidar	432	255 / 177 (41)	1.00 (ref)
Smoking (p = 0.4255)			

Factor / category	n	Food secure / food insecure, n (%)	cOR (95% CI)
No	602	344 / 258 (42.9)	1.00 (ref)
Yes	33	16 / 17 (51.5)	1.41 (0.71–2.82)
Nutritional status (p = 0.567)			
Normal	318	181 / 137 (43.1)	1.00 (ref)
Obese	99	60 / 39 (39.4)	0.86 (0.55–1.36)
Overweight	61	30 / 31 (50.8)	1.36 (0.79–2.35)
Underweight	157	89 / 68 (43.3)	1.01 (0.69–1.48)
Academic year (p = 0.655)			
First year	192	114 / 78 (40.6)	1.00 (ref)
Second year	241	135 / 106 (44.0)	1.15 (0.78–1.68)
Third year	133	76 / 57 (42.9)	1.10 (0.70–1.71)
Fourth year or other	69	35 / 34 (49.3)	1.42 (0.82–2.46)
Monthly food expenditure (p = 0.886)			
> IDR 1,000,000	21	13 / 8 (38.1)	1.00 (ref)
IDR 500,000–1,000,000	235	133 / 102 (43.4)	1.22 (0.50–2.99)
< IDR 500,000	379	214 / 165 (43.5)	1.23 (0.51–2.96)
Father's education (p = 0.572)			
Diploma/university	137	76 / 61 (44.5)	1.00 (ref)
Senior high	315	185 / 130 (41.3)	0.88 (0.58–1.31)
≤ Junior high	183	99 / 84 (45.9)	1.06 (0.68–1.65)

Note: cOR = crude odds ratio; p from chi-square test. Source: Primary data, 2024

In the multivariable logistic regression (Table 3), two factors remained strongly and independently associated with food insecurity. Students living independently in boarding houses had nearly five times the odds of food insecurity compared with those living with their parents (aOR 4.91; 95% CI 3.27–7.38). A clear dose–response gradient was evident for monthly allowance: relative to students receiving more than IDR 1,000,000 per month, the odds of food insecurity rose progressively for those receiving IDR 500,000–1,000,000 (aOR 2.77; 95% CI 1.66–4.63) and were highest for those receiving less than IDR 500,000 (aOR 4.99; 95% CI 2.82–8.83). Coming from an institution other than Universitas Tidar was associated with a borderline increase in odds (aOR 1.43; 95% CI 0.99–2.07). Sex, mother's education, scholarship status, and smoking were not statistically significant after adjustment. The model explained a modest share of variance (McFadden pseudo- $R^2 = 0.10$). Nutritional status was not retained in the multivariable model because it was not associated with food

insecurity in bivariate analysis ($p = 0.567$) and is not an established socioeconomic determinant. Academic year, monthly food expenditure, and paternal education were likewise not retained, as none was associated with food insecurity in bivariate analysis ($p = 0.66, 0.89$, and 0.57 , respectively); monthly food expenditure was, in addition, moderately collinear with monthly allowance (Cramér's $V = 0.46$; Spearman $\rho = 0.60$), so monthly allowance was retained as the more established economic determinant to avoid redundancy. No problematic multicollinearity was detected among the predictors (all $VIF < 2.6$); overall model fit and discrimination were adequate: the Hosmer–Lemeshow test showed no evidence of poor fit ($\chi^2 = 8.86$, $df = 8$, $p = 0.35$), and the model correctly classified 69.1% of cases (area under the ROC curve = 0.71).

Table 3. Multivariable logistic regression for food insecurity (adjusted odds ratios)

Variable	aOR (95% CI)	p
Female (vs male)	0.67 (0.40–1.12)	0.123
Boarding/independent (vs with parents)	4.91 (3.27–7.38)	< 0.001
Scholarship recipient (vs not)	1.52 (0.92–2.52)	0.104
Allowance IDR 500k–1m (vs > 1m)	2.77 (1.66–4.63)	< 0.001
Allowance < IDR 500k (vs > 1m)	4.99 (2.82–8.83)	< 0.001
Mother senior high (vs diploma/univ.)	1.22 (0.78–1.89)	0.380
Mother $\leq$ junior high (vs diploma/univ.)	0.80 (0.49–1.30)	0.369
Other institution (vs Univ. Tidar)	1.43 (0.99–2.07)	0.057
Smoker (vs non-smoker)	1.19 (0.50–2.82)	0.696

Note: aOR = adjusted odds ratio; $n = 635$; McFadden pseudo- $R^2 = 0.10$. Source: Primary data, 2024

Our finding that living arrangement and allowance were the predominant correlates mirrors international research and underscores the importance of access to resources. The excess risk among students without parents reinforces prior work demonstrating greater odds of food insecurity among students who rent compared with those living with parents (Whatnall et al., 2020) and is consistent with reports that financial independence is a common correlate of student food insecurity across diverse contexts (Bruening et al., 2017). Living away from parents generally requires students to pay for food, housing, and utilities from a fixed and often limited allowance, leaving little room for financial shocks. The dose–response relationship we observed with monthly allowance supports this conclusion and parallels research identifying low household income as a risk factor for food insecurity among college students (Itani et al., 2022; Wolfson et al., 2022; Woo Baidal et al., 2023).

The high prevalence we observed is troubling given prior research demonstrating the consequences of student food insecurity. Student food insecurity has been associated with poorer academic performance among university students (Weaver et al., 2020; Martinez et al., 2020). Structural-equation models further suggest that food insecurity harms grades in part through mental health pathways: among a large sample of students at California universities, Martinez et al. (2020) found that food insecurity directly predicted a lower grade point average and indirectly affected it through poorer mental health. Qualitative research has similarly demonstrated that students feel food insecurity to be not only a physical challenge but a source of shame and distraction that detracts from their ability to study (Meza et al., 2019). Meta-analytic evidence supports these findings, suggesting higher odds of depression, anxiety, and stress among food-insecure university students (Pourmotabbed et al., 2020). One multi-institutional study conducted with first-year students at eight universities across the United States similarly found that food insecure students were more likely to report high stress and had higher odds of reporting a GPA below 3.0 (El Zein et al., 2019). Food insecurity may lead to poor mental health and poor academic performance through several plausible mechanisms,

such as poor diet quality, chronic stress, and insufficient sleep (Martinez et al., 2019). Overall, these studies indicate that the socioeconomic factors identified in this study as correlates of food insecurity likely contribute to poor health outcomes and academic success among students. This relationship supports calls for early intervention to prevent food insecurity among university students.

The crude prevalence of food insecurity was higher among students who had received a scholarship compared with their peers who had not. This difference likely reflects pre-existing financial need: because Indonesian scholarships are often awarded based on economic need, students who receive scholarships may already have been at heightened risk of food insecurity prior to starting university. The attenuation of this association after adjustment for allowance and living arrangement suggests that reverse causation, not insufficient scholarship support, explains the higher prevalence of food insecurity among these students. This finding should therefore not be interpreted as suggesting that scholarship recipients have higher food insecurity due to a lack of financial support from the university.

Practical implications can be drawn from these findings. Research consistently shows that college students experiencing food insecurity often do not utilise existing food resources due to stigma or lack of awareness (Meza et al., 2019; Brownfield et al., 2026; Trumbo et al., 2025). The concentration of food insecurity among specific, modifiable factors points to clear targets for intervention. Mitigating food insecurity through allowances and housing, for example by instituting campus food-assistance programmes, subsidised meal plans, and food pantries, should help reduce inequity among students and ensure that all students have sufficient support to dedicate themselves to their studies. Universities have successfully implemented such programmes, but our finding that 43.3% of respondents were food insecure, including 14.6% with very low food security, highlights the need for universities to intervene with food-insecurity screening and provision of food support during the early phases of study. Interventions should consider students' fear of utilising food assistance when conceptualising and implementing on-campus programmes. Food insecurity screening implemented as part of university welfare services offers a promising approach to identifying students in need (Ximenes, 2025).

We did not assess the availability, awareness, or use of campus food resources in this survey. However, prior research shows that even where food pantries exist, uptake is low: only about one in five food-insecure students used their university food pantry, even when aware of it (El Zein et al., 2019). Our finding that a higher monthly allowance was protective against food insecurity suggests that existing forms of support may be reaching students who are only mildly food insecure, whereas the 14.6% of students with very low food security represent more than a mild inconvenience. Future research should assess the availability, awareness, and utilisation of food resources among Indonesian university students.

Study limitations include its cross-sectional design, which precludes causal inference. The sample included students from multiple institutions (predominantly Universitas Tidar); as such, the prevalence estimates generated in this study should be understood to describe these participating institutions and not Indonesian universities more broadly. In addition, participants were recruited by non-probability convenience and snowball sampling and self-selected into an online survey, which may introduce selection bias. Self-reported weight, height, and income could each introduce measurement error, while our use of categorical allowance bands precluded more precise estimation in the dose-response analysis. This study's strengths include its use of a validated food security module with wide coverage and good internal consistency (Cronbach's $\alpha = 0.80$), relatively large sample size, and inclusion of multiple universities.

Conclusion

Food insecurity was highly prevalent in this multi-institutional sample of Indonesian undergraduate students, affecting 43.3% of participants, with one in seven experiencing very low food security. Living arrangement and monthly allowance were the dominant determinants: students living independently in boarding houses and those with the lowest allowances faced substantially higher odds of food insecurity, whereas sex, parental education, scholarship status, and smoking were not independently associated after adjustment, and the higher crude risk among scholarship recipients most plausibly reflected the targeting of aid to economically vulnerable students. These findings suggest that higher-education institutions and policymakers should prioritise food-security screening and targeted support for students who live away from home and have limited financial resources. Future research should employ larger, more representative multi-institutional samples and longitudinal designs to confirm these associations, quantify the consequences of food insecurity for students' health and academic outcomes, and evaluate the effectiveness of campus-based interventions in the Indonesian context.

Acknowledgment

The authors thank all students who participated in this study, and the LPPM Universitas Tidar for institutional support.

References

- Abasilim, O. R., Nwosu, K. O., Akintimehin, O. O., Ezeigwe, O. J., Dimgba, O. O., Lama, M., ... & Obekpa, E. O. (2026). Food Insecurity and Adolescent Obesity in the United States: A Social Ecological Analysis of Multi-Level Risk Factors and Structural Inequities. *International Journal of Environmental Research and Public Health*, 23(4), 458. <https://doi.org/10.3390/ijerph23040458>
- Ahmad, N. S. S., Sulaiman, N., & Sabri, M. F. (2021). Food insecurity: Is it a threat to university students' well-being and success? *International Journal of Environmental Research and Public Health*, 18(11), 5627. <https://doi.org/10.3390/ijerph18115627>
- Asrullah, M., Maula, A. W., Dewi, S. L., Helmyati, S., & Melse-Boonstra, A. (2024). Food insecurity and BMI are associated with depressive symptoms among adolescents in Yogyakarta Province, Indonesia, during the COVID-19 pandemic: A 1-year longitudinal study. *British Journal of Nutrition*. Advance online publication. <https://doi.org/10.1017/S0007114524003027>
- Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2000). *Guide to measuring household food security* (Rev. ed.). U.S. Department of Agriculture, Food and Nutrition Service.
- Brownfield, N., Williams, J., Bates, G., & Thielking, M. (2026). A qualitative study examining the experiences of food insecurity and psychological distress among university students. *Cogent Education*, 13(1), 2636431. <https://doi.org/10.1080/2331186X.2026.2636431>
- Bruening, M., Argo, K., Payne-Sturges, D., & Laska, M. N. (2017). The struggle is real: A systematic review of food insecurity on postsecondary education campuses. *Journal of the Academy of Nutrition and Dietetics*, 117(11), 1767–1791. <https://doi.org/10.1016/j.jand.2017.05.022>
- Choi, J. H., Szymanski, K., Jung, D. H., & King, T. Z. (2025). Beyond the nest: the role of financial independence in young adult health. *International Journal of Behavioral Medicine*, 1-14. <https://doi.org/10.1007/s12529-024-10339-6>

- Creed, P. A., Hood, M., Kim, S., & Bialocerkowski, A. (2026). Working students and precarious employment: A latent profile analysis. *Journal of Career Assessment*, 10690727251411293. <https://doi.org/10.1177/10690727251411293>
- Dehove, H., Mofakhami, M., Baudry, J., Kesse-Guyot, E., Julia, C., Touvier, M., ... & Bellicha, A. (2025). Correlates of food insecurity among university students in a socioeconomically disadvantaged area of the Paris suburbs: A cross-sectional study. *Plos one*, 20(10), e0334523. <https://doi.org/10.1371/journal.pone.0334523>
- El Zein, A., Shelnutt, K. P., Colby, S., Vilaro, M. J., Zhou, W., Greene, G., Olfert, M. D., Riggsbee, K., Morrell, J. S., & Mathews, A. E. (2019). Prevalence and correlates of food insecurity among U.S. college students: A multi-institutional study. *BMC Public Health*, 19, Article 660. <https://doi.org/10.1186/s12889-019-6943-6>
- Essiam, F. A. A., Amoako, M., Owusu, E. K., Ogura, E., Hammond, E. A. S., Tijani, I. A., ... & Gowans, L. J. J. (2025). Intersecting burdens: oral health, dietary patterns, food security and their impact on cardiometabolic risk and mental health in Ghana. *BMC nutrition*, 11(1), 228. <https://doi.org/10.1186/s40795-025-01223-x>
- Food and Agriculture Organization. (1996). *Rome Declaration on World Food Security and World Food Summit Plan of Action*.
- Galseku, P. M., Keenan, G. S., Stevenson, L., Cousins, R., Lingwood, J., Dixon, H., & Bourke, L. (2026). The association between food insecurity and academic performance among higher education students: A systematic review. *Current Nutrition Reports*, 15(1), 17. <https://doi.org/10.1007/s13668-026-00744-6>
- Ghazali, A. N., Razali, S., Sham, F., Saw, J. A., & Shuib, N. (2025). Depression and Its Associated Factors Among Students of a Malaysian University. *Malaysian Journal of Medicine and Health Sciences*, 21(6), 1338-1. <https://doi.org/10.47836/mjmhs.v21i6.1338>
- Hmimou, M., Laamrani, A., Hajaj, S., Sehbaoui, F., & Chehbouni, A. (2026). Soil Property Monitoring in Africa via Spectroscopy: A Review. *Environments*, 13(4), 228
- Hu, M., Moskal, M., & Read, B. (2026). Between privileged dependence and precarious autonomy: class and gender in Chinese students' experiences in international education. *Globalisation, Societies and Education*, 1-15. <https://doi.org/10.1080/14767724.2026.2636564>
- Itani, R., Mattar, L., Kharroubi, S., Bosqui, T., Diab-El-Harake, M., & Jomaa, L. (2022). Food insecurity and mental health of college students in Lebanon: A cross-sectional study. *Journal of Nutritional Science*, 11, Article e68. <https://doi.org/10.1017/jns.2022.68>
- Khusun, H., Arumsari, I., Suraya, I., Badzlina, F., & Fitri, U. (2026). Food security status of Indonesian university students and its sociodemographic factors. *Malaysian Journal of Nutrition*, 32, 107-118.
- Maitra, C. (2025). How Food Insecure Are People Living in Australia?. *Australian Journal of Agricultural and Resource Economics*, 69(3), 717-731. <https://doi.org/10.1111/1467-8489.70020>
- Martinez, S. M., Frongillo, E. A., Leung, C., & Ritchie, L. (2020). No food for thought: Food insecurity is related to poor mental health and lower academic performance among students in California's public university system. *Journal of Health Psychology*, 25(12), 1930–1939. <https://doi.org/10.1177/1359105318783028>
- Martinez, S. M., Grandner, M. A., Nazmi, A., Canedo, E. R., & Ritchie, L. D. (2019). Pathways from food insecurity to health outcomes among California university students.

- Martino, E., Li, A., & Bentley, R. (2025). Becoming infrastructured: international graduate researchers and precarious housing. *International Journal of Housing Policy*, 1-25. <https://doi.org/10.1080/19491247.2025.2515543>
- McKay, F. H., Olajide, B. R., Melleuish, L. J., Pitt, P., Lau, E. H., & Dunn, M. (2025). Food insecurity among post-secondary students in high income countries: systematic review and meta-analysis. *Current nutrition reports*, 14(1), 58. <https://doi.org/10.1007/s13668-025-00651-2>
- Meza, A., Altman, E., Martinez, S., & Leung, C. W. (2019). “It’s a feeling that one is not worth food”: A qualitative study exploring the psychosocial experience and academic consequences of food insecurity among college students. *Journal of the Academy of Nutrition and Dietetics*, 119(10), 1713–1721. <https://doi.org/10.1016/j.jand.2018.09.006>
- Moosavian, S. P., Awlqadr, F. H., Mehrabani, S., Mazinani, K., Hosseini, M. S., Hodder, S., ... & Moradi, S. (2026). The association between food insecurity and adverse health outcomes in adults: an umbrella review of systematic reviews and meta-analyses. *Nutrition reviews*, 84(7), 1387-1400. <https://doi.org/10.1093/nutrit/nuaf136>
- Mposula, Z., Pacza, T., Szepesi, J., Wagaki, M. M., & Máthé, E. (2026). Adequate Dietary Diversity Versus Suboptimal Diet Quality: The Paradox of Food Insecurity Among International Students in Hungary. *Nutrients*, 18(6), 946. <https://doi.org/10.3390/nu18060946>
- Nazmi, A., Martinez, S., Byrd, A., Robinson, D., Bianco, S., Maguire, J., Crutchfield, R. M., Condrón, K., & Ritchie, L. (2019). A systematic review of food insecurity among US students in higher education. *Journal of Hunger & Environmental Nutrition*, 14(5), 725–740. <https://doi.org/10.1080/19320248.2018.1484316>
- Nikolaus, C. J., An, R., Ellison, B., & Nickols-Richardson, S. M. (2020). Food insecurity among college students in the United States: A scoping review. *Advances in Nutrition*, 11(2), 327–348. <https://doi.org/10.1093/advances/nmz111>
- Öztürk, M. E., Yıldız Kopuz, T. N., & Yıldırım, H. (2026). The effect of food insecurity on psychosocial aspects of academic achievement. *Frontiers in Public Health*, 14, 1866556.
- Pourmotabbed, A., Moradi, S., Babaei, A., Ghavami, A., Mohammadi, H., Jalili, C., Symonds, M. E., & Miraghajani, M. (2020). Food insecurity and mental health: A systematic review and meta-analysis. *Public Health Nutrition*, 23(10), 1778–1790. <https://doi.org/10.1017/S136898001900435X>
- Prasetya, B., Adinugroho, T. P., Mulyono, A. B., Tampubolon, B. D., & Wahono, D. R. (2025). Tobacco’s social and economic issues in Indonesia from 1992 to 2023—a review to address product development. *International Journal of Innovative Research and Scientific Studies*, 8(2), 80-102.
- Sarfika, R., Saifudin, I. M. M. Y., Wicaksana, A. L., Malini, H., Wenny, B. P., Rahayuningsih, A., ... & Abdullah, K. L. (2026). Predictors and protective factors of mental health outcomes among Indonesian adolescents: an SCT-based multi-center study. *International Journal of Social Psychiatry*, 72(3), 582-593. <https://doi.org/10.1177/00207640251372672>
- Trinh, T. A., & Nhieu, N. L. (2026). A r, s, t-spherical fuzzy decision-making model of university happiness: case study of University of Economics Ho Chi Minh

- Trumbo, K., Mayer, K., & Daily, M. (2025). Food Insecurity and First-Generation College Students: An Exploration of Mixed Methods and Institutional Transformation. *Journal of First-generation Student Success*, 1-17.
<https://doi.org/10.1080/26906015.2025.2547863>
- Weaver, R. R., Vaughn, N. A., Hendricks, S. P., McPherson-Myers, P. E., Jia, Q., Willis, S. L., & Rescigno, K. P. (2020). University student food insecurity and academic performance. *Journal of American College Health*, 68(7), 727–733.
<https://doi.org/10.1080/07448481.2019.1600522>
- Whatnall, M. C., Hutchesson, M. J., & Patterson, A. J. (2020). Predictors of food insecurity among Australian university students: A cross-sectional study. *International Journal of Environmental Research and Public Health*, 17(1), 60.
<https://doi.org/10.3390/ijerph17010060>
- WHO Expert Consultation. (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *The Lancet*, 363(9403), 157–163.
[https://doi.org/10.1016/S0140-6736\(03\)15268-3](https://doi.org/10.1016/S0140-6736(03)15268-3)
- Willson, R., Stewart-Robertson, O., Julien, H., & Given, L. M. (2026). Academic casualisation and precarity: a scoping review. *Higher Education Research & Development*, 45(4), 1165-1187.
- Wolfson, J. A., Insolera, N., Cohen, A., & Leung, C. W. (2022). The effect of food insecurity during college on graduation and type of degree attained: Evidence from a nationally representative longitudinal survey. *Public health nutrition*, 25(2), 389-397.
- Woo Baidal, J. A., Duong, N., Goldsmith, J., Hur, C., Lauren, B. N., Partida, I., ... & Meyer, D. (2023). Association of a primary care-based mobile food pantry with child body mass index: A propensity score matched cohort study. *Pediatric obesity*, 18(6), e13023. <https://doi.org/10.1111/ijpo.13023>
- Ximenes, S. M. (2025). School feeding program and Sustainable Development Goals (SDGs) in education: Linking food security to learning outcomes in Timor-Leste. *ASEAN Journal for Science Education*, 4(2), 155-168.