

ORIGINAL RESEARCH

Food insecurity among university students in Victoria: A pilot study

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Food insecurity is defined as the inability to access and procure, through conventional avenues, nutritionally adequate foods capable of supporting an active and healthy lifestyle.¹ Food security status exists on a continuum ranging from: *food security*, when individuals show no evidence of food insecurity and dietary preferences are consistently satisfied; *food insecurity without hunger*, when regular consumption of food occurs, however anxiety or uncertainty over access to food of a sufficient quality or quantity may evenuate; and to a greater severity, *food insecurity with hunger*, when meals are neglected or inadequate, with hunger and possibly malnutrition being direct outcomes.^{2–4}

Food insecurity represents a significant public health dilemma and remains a contributor to many nutritional, health and developmental problems.^{5,6} In particular, moderate forms of food insecurity (without hunger) are known to be associated with chronic diseases including overweight and obesity, which can be the consequence of a reliance on cheap calorically dense foods.^{7,8} Further, food insecurity (with hunger) is associated with under nutrition.^{1,9} Experiencing food insecurity may also affect psychological, social and economic wellbeing.^{6,10}

In Australia, conservative estimates indicated 5.2% of the general population experienced food insecurity, with 40% of those at a severe level.^{10,11} The extent of food insecurity is likely to vary across the lifespan; however, the years attending a tertiary institution may be one period of life when food insecurity becomes pronounced.^{12–14} This may be due to university students having more independence if they are living out of home for the first time or from managing the demands of both employment and study.^{12,15,16} To date, a few studies have assessed the prevalence of food insecurity among university students as well as the potential determinants.¹² A greater level of understanding is warranted given these students represent a group that will

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contribute to the future progression and prosperity of Australia.^{17,18}

Research at *Griffith University* in Queensland, Australia, recently reported that the prevalence of food insecurity among tertiary students was 72% (47% without hunger; 25% with hunger) using a multi-item assessment measure.¹² Internationally, research conducted at the *University of Hawaii* (UHM) in the United States discovered 21% of the student body experienced food insecurity (15% without hunger; 6% with hunger) using the United States Department of Agriculture (USDA) multi-item assessment measure.¹⁹

Food insecurity is the outcome of immediate issues around *food availability, accessibility and utilisation*.⁹ Although diverse factors expose certain groups in society to varying degrees of food insecurity,¹¹ financial constraints are recognised as a key predictor.^{20–24} Relevant indicators of financial status include total income and income source (employment, welfare dependency and parental support).^{20–24} Further, for students who are living independently away from home for the first time (renting, share house, university residence, with extended family), the cost of living and utility expenses may amplify economic stress and lead to the displacement of money away from purchasing nutritious food.^{19,25,26}

The present pilot study aimed to quantify the prevalence and severity of food insecurity among tertiary students enrolled in a Victorian-based institution (Deakin University) and to investigate key factors potentially associated with this. To our knowledge, the prevalence of and factors contributing to food insecurity in Australian students have only been reported in one prior study.¹² The present study is the first to undertake this within a Victorian institute and the first to use multivariate regression models to examine explanatory factors. Results may help advocate for further research funding to assess this issue on a wider scale and eventually inform policies to protect the wellbeing of students as well as their academic performance by minimising food insecurity prevalence.^{9,11}

Methods

Deakin University has campuses located in three townships (Burwood, Geelong (two separate campuses: Waterfront and Waurin Ponds) and Warrnambool) within the state of Victoria, Australia, and has over 40 000 enrolled students. Students from each of these campuses were eligible to participate, with the only exclusion criteria being students below 18 years of age (for ethics purposes). Students were invited to complete a self-reported questionnaire on their eating behaviours and personal characteristics (no direct mention of food insecurity occurred during recruitment to avoid bias). All surveys completed by students were anonymous. Ethics approval for this cross-sectional study was granted by the Deakin University Faculty of Health Human Ethics Advisory Group.

The recruitment process spanned four weeks in duration. A range of techniques were used to recruit participants, including: on-campus recruitment; information flyers, bulletins and posters situated at prominent sites throughout all

campuses and all faculties; notices via Deakin Studies Online unit sites; and announcements made at 10 lectures from randomly selected courses across all faculties. Surveys were distributed within lectures where announcements were delivered, and also mailed to those who expressed interest in participating. Information was posted on a further 68 unit sites by unit chairs upon request. At the end of recruitment, 124 surveys were completed for this pilot study. In place of a compensation for each participant, a small donation was made for each survey completed (\$0.25 per survey) to the charitable food organisation Second Bite.²⁷

To estimate the prevalence and severity of food insecurity within the student body, the survey included several questions derived from the multi-item United States Department of Agriculture-Adult Food Security Survey Module (USDA-AFSSM).³ This survey is the most contemporary, validated and commonly employed measure of food insecurity internationally.^{10,28}

Our questionnaire to assess food insecurity and associated factors among tertiary students contained 45 items, in a format that included both open- and closed-ended questions. With permission, the survey was based on that used by Hughes and colleagues in Queensland,¹² with slight modifications to accommodate the Deakin University cohort.

The relative severity of food insecurity reflected the ranking outlined in the USDA-AFSSM.⁴ This scale's algorithm categorises individuals as either food secure, food insecure without hunger, or food insecure with hunger.^{3,25}

Individuals were classified as food insecure without hunger if their responses were 'often true' or 'sometimes true' to any of the following statements related to their current university year:^{3,28}

I worried that my food would run out before I had money to buy more.

I couldn't afford to eat balanced meals.

The food that you bought just didn't last and you didn't have money to get more.

Individuals were classified as food insecure (with hunger) if, in addition to answering affirmatively to any of the above questions, they also answered 'yes' to any of the following:^{3,28}

Did you ever decrease the size of your meals or skip meals because there wasn't enough money for food?

Were you ever hungry but didn't eat because you couldn't afford enough food?

Did you lose weight because you didn't have enough money for food?

Did you ever not eat for a whole day because there wasn't enough money for food?

Those students who responded 'no' to the above questions were classified as food secure. Factors associated with food insecurity were measured using a range of questions, with those examined in the present study relating to factors that might support or hinder a student's ability to procure food, including: living arrangements (not living with family or living with family), employment status (yes or no), personal annual income (\$0–\$16 000 or ≥\$16 000), main food con-

Table 1 The food security status of Deakin University students according to demographic and student characteristics, and socioeconomic and social support factors, measured using the USDA

	No.	Food security status			χ^2 (P-value)
		Food secure %	Food insecure without hunger %	Food insecure with hunger %	
Sample	124	52.4	17.7	29.8	
Age					
19–24 years	87	47.1	19.5	33.3	3.283
≥ 25 years	37	64.9	13.5	21.6	(0.194)
Gender					
Male	30	60.0	23.3	16.7	3.432
Female	94	50.0	16.0	34.0	(0.180)
Campus location ^(a)					
Burwood	54	57.4	12.9	29.6	
Geelong	31	45.2	19.4	35.5	2.056
Warrnambool	37	51.4	21.6	27	(0.725)
Living arrangements					
Not living with family	58	39.7	20.7	39.6	7.440
Living with family	66	63.6	15.2	21.2	(0.024)
Employed					
No	43	46.5	16.3	37.2	1.716
Yes	81	55.6	18.5	25.9	(0.424)
Personal annual income					
\$0–\$16 000	81	51.9	14.8	33.3	2.098
\geq \$16 001	43	53.5	23.3	23.3	(0.350)
Main food contributor					
Parental support	48	58.3	12.5	29.2	
Employment	49	53.1	20.4	26.5	2.928
Government	27	40.7	22.2	37.0	(0.570)
Receive government Benefits					
No	66	63.6	15.2	21.2	7.440
Yes	58	39.7	20.7	39.7	(0.024)
Deakin support services Knowledge					
Yes	39	43.6	28.2	28.2	4.408
No	85	56.5	12.9	30.6	(0.110)

^(a) Two students study off-campus.

tributors (parents, employment or government), receiving government support (yes or no) and knowledge of Deakin University support services (yes or no). Other factors reported included age (19–24 years or ≥ 25 years), gender (male or female) and campus location ((Burwood, Geelong (Waterfront (n = 9) and Waurm Ponds (n = 22) campuses combined for analysis), or Warrnambool)).

Data analysis on the associations between the above factors and food insecurity was undertaken using Stata 12.1 (StataCorp, College Station, TX, USA). Analysis consisted of cross-tabulations with χ^2 tests performed and multinomial regression analysis. The regression analysis independently assessed a number of potential risk factors for food insecurity among tertiary students and models were adjusted for students' age (categorical), gender and campus location, each of which were conceptualised as potential confounders based on existing literature. Being food secure was modelled as the reference group so that the reported results are the

likelihood of being either food insecure without hunger or with hunger compared with those who are food secure.

Results

Table 1 summarises the characteristics of students by food security status. Half of the sample (52%) reported being food secure. Almost 18% reported experiencing food insecurity without hunger and a further 30% experienced the more severe food insecure with hunger. A greater percentage of students (60%) not living with their family reported food insecurity (without (21%) and with hunger (40%)), compared with those living with family (36%; 15% without hunger and 21% with hunger). A greater percentage of students (60%) who received government benefits also reported higher levels of food insecurity compared with those who were not government income support recipients (36%). Food security status did not differ by age, gender, campus

Table 2 Multinomial regression of associations between food security status and student characteristics

	<i>Food security status</i>			
	<i>Food insecure without hunger</i>		<i>Food insecure with hunger</i>	
	OR	(95% CI)	OR	(95% CI)
Living arrangements				
Not living with family	1.00	—	1.00	—
Living with family	0.35	(0.12–0.99)*	0.29	(0.12–0.70)**
Employed				
No	1.00	—	1.00	—
Yes	1.07	(0.35–3.33)	0.49	(0.20–1.20)
Income				
\$0–\$16 000	1.00	—	1.00	—
>\$16 001	1.93	(0.63–5.88)	0.69	(0.26–1.81)
Main food contributor				
Parental support	1.00	—	1.00	—
Employment	2.23	(0.58–8.69)	1.30	(0.43–3.91)
Government	2.63	(0.61–11.40)	1.60	(0.50–5.11)
Receive government benefits				
No	1.00	—	1.00	—
Yes	2.26	(0.77–6.64)	2.52	(1.05–6.04)*
Deakin support services Knowledge				
No	1.00	—	1.00	—
Yes	2.48	(0.86–7.16)	1.26	(0.50–3.19)

Reference group: those who consume frequently.

All models adjusted for age, gender and campus location.

* $P \leq 0.05$, ** $P \leq 0.001$.

location, employment, income, the main food purchaser or their knowledge of Deakin University support services.

Regression analysis controlling for age, gender and campus location was undertaken to assess independent associations (Table 2). Food insecurity without hunger (OR 0.35; 95% CI 0.12–0.99) and food insecurity with hunger (OR 0.29; 95% CI 0.12–0.70) were less likely among students living with their family compared with those who were not. Students receiving government benefits were more than twice as likely than those not receiving benefits to report being food insecure with hunger (OR 2.52; 95% CI 1.05–3.19). No association was found between those receiving government benefits and reporting food insecurity without hunger. All other variables that were not statistically significant according to χ^2 statistics were still assessed in the regression models adjusting for age, gender and campus location to account for confounding; however, each remained statistically non-significant factors. In further analysis, both factors found to be significant in the regression models (living arrangements and receiving government benefits) were modelled together (in addition to the confounders) to determine whether independent effects remained (results not shown in table). In this model, living with family remained associated with a lower likelihood of being food insecure with hunger (OR 0.35; 95% CI 0.14–0.88); however, receiving government benefits was no longer a significant factor.

Discussion

The prevalence of food insecurity among the Deakin University student sample was 48% (18% without hunger; 30% with hunger). While not used in analysis, a single-item measure comparable to the Australian National Nutrition Survey was also asked of the students with 17% reporting food insecurity when this method was employed. Although larger studies are required to confirm these figures, both measures indicate that the prevalence of food insecurity is higher among students than within the broader Australian population (5.2%).²⁹

The prevalence of Deakin University students reporting food insecurity was lower (48%) than previously reported in Australia at Griffith University (72%).¹² However, a slightly higher prevalence of students experiencing the more severe form of food insecurity (with hunger) was reported at Deakin University (30%) compared with students at Griffith University (25%).¹² Internationally, the prevalence was also greater than previous estimates among tertiary cohorts at UHM, where 15% of students were food insecure without hunger and 6% with hunger.¹⁹

The findings of the present study demonstrated that those living away from their family may be most vulnerable to experiencing food insecurity. This association remained evident after being modelled with government support, indicating extra support for those living out of home may be

required. We also found that those receiving government benefits were more at risk of food insecurity; however, when modelled with living arrangements such a relationship was no longer significant. This may be indicative that many of those living out of home would also be the same people receiving government support and that living out of home is the more dominant factor.

It has previously been acknowledged that many students may experience poverty and increased financial strain, and this may be accentuated for students living away from home or who are reliant on government support (Youth Allowance, Austudy or ABSTUDY).^{12,30,31} Further, the increasing costs of living coupled with higher education expenses^{32–34} may be particularly challenging for these students to manage,^{19,35} thereby increasing their risk of experiencing food insecurity.^{12,36} The present study reported that food insecurity was less likely to arise among students who were residing with their family compared with those who were not. This is consistent with findings at Griffith University, where 40% of the student body sampled were living with their parents and were significantly less likely to be food insecure.¹² Similarly, at UHM, 11% of students living with their parents reported being food insecure versus 31% living with roommates.¹⁹

Deakin University students alone were twice as likely to be food insecure with hunger when receiving government benefits, irrespective of age, gender and campus location. The Australian Government has emphasised that quality tertiary education is required to develop a productive and innovative workforce and meet emerging skill shortages,³³ elements of which are critical within a competitive global economy, and essential to improving Australia's social and human capital.¹⁵ However, tertiary education participation and the ability of students to excel in their studies may become compromised if periods of food insecurity persist.^{6,17}

In the current environment, it is plausible that existing government support arrangements may be insufficient to accommodate both students' educational and personal needs, including their dietary requirements.^{16,21,36} For students receiving Youth Allowance alone, the maximum annual income from the commonwealth is \$9023 (including start-up scholarships).³⁷ This figure is well below the average Australian income of \$56 175 (pre-tax).³⁸ Using the Henderson poverty line, a standard measure that assesses the adequacy of income relative to income units, this figure is 55%–64% below the June Quarter (2012) poverty line of \$19 994 (for single/unemployed individuals) and \$24 658 (for single/employed individuals), respectively.^{39,40}

Reconfigured government policies relating to student income support were recently introduced to enhance accessibility and equity primarily to low socioeconomic status, indigenous, rural and remote students.^{17,30} These included the *student start-up scholarship*, the *relocation scholarship* and the *new supplementary allowance* (announced in the 2012–2013 budget).^{15,41,42} Future studies are required to monitor the effectiveness of these policies on improving student wellbeing.

It was not within the scope of the present study to explore and determine the impact of food insecurity upon health

status; however, prior research has demonstrated food insecurity being attributable to a myriad of short- and long-term health complications, immediate effects being hunger, anxiety, fatigue, lethargy and illness.^{6,7,24,43,44} Food insecurity has shown to affect academic performance through the reduced attendance, aptitude, motivation, and concentration of children and adolescents of various ages.^{45,46} At a tertiary level, no studies have investigated the relationship between food insecurity and academic performance. However, inferior income support (a risk factor for food insecurity) has led to adverse impacts on university participation, completion rates and the quality of a higher education experience.¹⁷ Additionally, a greater reliance on employment has also been reported, which may displace time allocated towards study.¹⁶ To date, the effect of government support on the health conditions and academic performance of food insecure students at a tertiary level has not been extensively investigated.¹⁹

The key outcomes of the present study were based on a validated food insecurity measurement tool (USDA).³ The application of this tool to a tertiary student population previously allowed for a consistent methodological approach to be maintained. However, future research may aim to develop food insecurity measures that are more sensitive to detecting the extent of food insecurity among students. This may involve the inclusion of modified measures of explanatory factors, such as more precise indicators of income, and income sources capable of detecting greater variance among a student population, as well as the impact of students' living arrangements. Although the present study includes a relatively small sample size, it does however provide evidence of some potentially important determinants and can be used to advocate for a larger scale study exploring this topic. Students from all faculties participated in the study; however, it is noted that the present sample was overrepresented by health faculty students (70%). As food insecurity was not directly mentioned during recruitment, it is unlikely that those who chose to participate did so specifically because they were suffering from food insecurity and it is more likely that their participation was due to a personal and professional interest in nutrition-related issues. The survey data were collected early in the study year, and although the students may have been at the institute for several years, this still potentially represents a period of adjustment. Future research tracking students over a year or the period of their degree may help elucidate critical time points for interventions. Importantly, surveillance of this nature could also help determine the long-term consequences of food insecurity. Finally, the cross-sectional nature of the present study negates any opportunity to determine temporal influences and can instead only assist in detecting cross-sectional associations between food insecurity and the tested independent variables.^{47,48}

The present study contributes to the current understanding of food insecurity among tertiary students. Importantly, it highlights that the extent of food insecurity among other universities, nationally and internationally, requires further monitoring, which could be instigated by the higher

educational institutes.²⁹ This knowledge will be beneficial for public health and welfare bodies.^{1,9} Future researchers should orientate the focus around identifying the prevalence, determinants, health and academic outcomes aligned with students' food insecurity experiences.^{19,49} Researchers should continue to implement a validated measure of food insecurity such as the USDA tool in order to maintain a consistent and accurate assessment of food insecurity among students.⁴⁹

Food insecurity without hunger is a significant problem for one in every six students surveyed at Deakin University, and food insecurity with hunger a pressing concern for one in every three students. Therefore, a need exists to increase food availability and accessibility at Deakin University with one possibility being the establishment of on-campus food banks, a strategy that is consistent with recommendations from UHM and Canadian universities.^{13,19,50} However, this should not be treated as a solution and further work determining and intervening on causes of food insecurity in tertiary population is required.

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Authorship

S. Brockington and L. Thornton designed the study and developed the research survey; D. A. Micevski collected the data; D. A. Micevski and L. Thornton undertook data analysis. D. A. Micevski wrote the first draft of this paper. L. Thornton and S. Brockington assisted with redrafting and editing this paper. All authors contributed to, read and approved the final manuscript.

Conflict of interest

There are no conflicts of interest to declare for all authors on the paper.

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