Food Insecurity: Is it an Issue Among Tertiary Students?

Introduction

Ready access to a safe and nutritious food supply is a basic human right, identified at the 1996 and 2009 World Food Summits(Food and Agriculture Organization of the United Nations 1996, Food and Agriculture Organisation 2009). The multi-dimensional nature of food security is captured by the definition:

> *"Food security exists when all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".* (Food and Agriculture Organisation 2009)

Consequently, food insecurity may occur when access to or availability of sufficient amounts of healthy, culturally-appropriate and nutritious foods are compromised, or when individuals cannot access these foods in socially-acceptable ways. Food insecurity in developing countries is a salient issue for the entire population (Food and Agricultural Organisation 2010). However, in developed countries like Australia, the majority of the population lives with an abundant national food supply and within a well-established social security safety net, yet food insecurity remains an issue for a number of population subgroups (NSW Centre for Public Health Nutrition 2003).

Internationally, research suggests that the major determinant of food insecurity is poverty, placing particular population sub-groups at higher risk, including those with lower incomes, single parent households, minorities, and the unemployed (Chavez, Telleen et al. 2007, Tarasuk and Vogt 2009, Ramsey, Giskes et al. 2011). From the last nutrition survey undertaken in Australia in 1995, the single question (*"In the last twelve months were there any times that you ran out of food and couldn't afford to buy more"*) elicited higher rates of food insecurity among young people (15%), those who are renting (20%), those on low incomes (20%), the unemployed (23%), and single parent households (23%) (Burns 2004). University students often fall into several of these groups (James, Bexley et al. 2007). As would be expected, therefore, available evidence indicates that this population is also at higher risk of food insecurity, although this evidence is presently sparse, and largely unpublished in academic literature (Booth and Smith 2001, Grant, Maccarone et al. 2004, Monash Student Association 2008, Hughes, Serebryanikova et al. 2011). A 2006 study of Australian university student finances reported that food insecurity affected approximately 14% of students (James, Bexley et al. 2007). A study of Hawaiian college students, however, reported a food insecurity prevalence of 21% with a further 24% of students being at risk of food insecurity

(Chaparro, Zaghloul et al. 2009). The reported Australian figure of 14% is therefore at odds with both other Australian evidence and that from elsewhere.

Numerous studies, most notably in the United States and Canada, have concluded that food insecurity is associated with poor health and nutrition outcomes, poor psychological and cognitive functioning, substandard academic achievement, and an increased risk of chronic disease with higher occurrences of overweight or malnutrition (Hamelin, Habicht et al. 1999, Townsend, Peerson et al. 2001, Winicki and Jemison 2003, Parker 2007, Seligman, Bindman et al. 2007, Kirkpatrick and Tarasuk 2008, Huddleston-Casas, Charnigo et al. 2009). These impacts not only result in compromised life choices for individuals and families, but also contribute to the potential cost burden to the health care system due to long term health repercussions. Only one Australian study has examined factors associated with food insecurity among university students (Hughes, Serebryanikova et al. 2011), and none internationally have investigated association between income and food insecurity among tertiary education students. The objectives of this study are, therefore, to investigate (1) the extent and severity of food insecurity among students attending a metropolitan university in Brisbane, Australia, and (2) the socio-demographic, dietary, and health factors associated with food insecurity among this sub-group. Given the potential associations between academic achievement, chronic disease, and food insecurity, the presence of food insecurity among university students is likely to have a range of serious consequences in both the short and long term. In addition, for universities, addressing food insecurity could have a potential role in improving student retention rates. This study will therefore provide important insights into the severity of food insecurity and provide evidence to underpin action by the tertiary sector to improve the education experience and contribute to long term health.

Methods

This study was approved by a University Human Research Ethics Committee (0900000750). Data were collected between September and October 2009, using a web-based survey. The survey was disseminated by email to a cohort of 14 439 students, corresponding to all enrolments in the Business and Health Faculties. Attempts were made to recruit students with varying ranges of health knowledge by inviting disparate faculties to participate. The Health and Business faculties responded within the required time-frames. Web-based advertising was placed on the university home page and posters were used to increase response rates. The survey remained active for a period of six-weeks with an email reminder sent at three weeks. Students were not offered any incentives to participate.

Survey Tool

The survey tool was comprised of 34 items, most of which had been previously validated in an Australian population. The use of these items is described below. Information was sought on food security status, dietary and health factors, and socio-demographic characteristics.

Food security status

Food security was assessed using the 18-item United States Department of Agriculture Food Security Survey Module (USDA FSSM). This tool takes into account the complex multi-dimensional nature of food insecurity issues within a 12-month reference period (Bickel, Nord et al. 2000) and exhibited good reliability (based on Cronbach's α greater than 0.70) within the current sample ($\alpha = 0.84$) (Nunnally 1978). Given the limitations of the Australian single-item food security measurement tool, the higher sensitivity USDA tool serves to provide better estimates of food insecurity prevalence and severity levels (Bickel, Nord et al. 2000, Nolan, Rikard-Bell et al. 2006). Questions relate to experience of, and anxiety due to, limited household food budget, perceptions of compromised food quality, adjustments to normal food usage, and instances and consequences of reduced food intake for adults and children in the household. A total food security score at the household level was obtained by summing positive responses. Scores were then categorised according to four severity levels as outlined in Table 1 (Bickel, Nord et al. 2000). Finally, data was collapsed into dichotomous categories of *food secure* and *food insecure*, with *low food security, very low food security* and *very low food security among children* forming the latter category.

[Table 1 about here]

Sociodemographic characteristics

Data on age, gender, indigenous status, housing tenure, household type, household income, enrolment status, and course details were collected. As per the National Health Survey (NHS), participants were asked to indicate their age group (<17, 17-24, 25-29, 30-34, ≥35), gender, and indigenous status (Aboriginal, Torres Strait Islander, both Aboriginal and Torres Strait Islander, none). Adjusted household income was calculated using the method implemented in the NHS, which weights multi-person household income such that the standard of living represented is equivalent to that of a single-person household. For this method, individuals within the household are allocated weightings (1 for the first adult, 0.5 for consecutive adults, 0.5 for the first child, 0.3 for each consecutive child), with each weighting being multiplied by the total number of corresponding adults or children and then summed (Australian Bureau of Statistics 2006). Household income was divided by this number to yield the equivalent income score. The

equivalent income variable was categorised into tertiles, with the lowest tertile representing the lowest income per household.

Fruit and vegetable intakes

Intakes of fruits and vegetables were assessed using the short-answer questions from the NHS (Australian Bureau of Statistics 2006). Participants were asked to indicate how many servings of fruit and how many servings of vegetables they consumed per day (0, <1, 1, 2, 3, ≥4). These data were re-coded to (<2 , ≥2) and (≤ 3, ≥4) for fruit and vegetables respectively.

Take-away consumption

Consumption of take-away food was assessed using items modified from the 1995 National Nutrition Survey (NNS), the most recent nutrition survey undertaken in Australia. Participants were asked to indicate the number of times per week they ate packaged potato chips (UK: crisps), fries or wedges, hamburgers, Chinese food, pizza, cakes, savoury pies, fried fish, and fried chicken. These items were identified in the NNS as the ten most popular take-away items consumed by the Australian population (Australian Bureau of Statistics 1995). The popularity of these foods do not appear to have changed markedly in the past twenty years (Australian Bureau of Statistics 2013). Responses to this question were *never/rarely*, *less than once per week*, *1-2 times per week*, and *3 or more times per week*.

Self-assessed health

Self-assessed health was investigated using a question from the Short Form 12 (SF12) (Ware, Kosinski et al. 1996) which asked participants to report whether they felt their health was *excellent*, *very good*, *good*, *fair* or *poor*.

Weight status

Body mass index (BMI, kg/m^2) was calculated from self-reported height and weight, and categorised using the World Health Organisation (WHO) international classification for adults. Classifications are *underweight/normal weight* (<25), *overweight* (25-30), and *obese* (≥ 30) (World Health Organisation 2010). Additional questions pertained to: the use of food relief strategies (such as obtaining food through charity organisations), enrolment status (*full-time*, *part-time*), and compromised/suspended studies due to current financial situation (*yes*, *no*).

Statistical Analyses

Sample characteristics and the prevalence of food insecurity were summarised with descriptive statistics. Bivariate associations between food security status and other factors were determined with Chi-square tests. For factors significantly associated with food insecurity at the bivariate level, multivariate logistic regression was used to further investigate relationships and control for potential confounds.

Covariates

Potential confounding factors identified by bivariate analysis were: household structure, housing tenure, household income, income source, suspension of studies, BMI, perceived health, and number of servings of fruits and vegetables. Covariates that were associated with both food insecurity and its associated variables at the bivariate level were adjusted for during multivariate analyses. Consequently, each analysis investigating the association between food insecurity and a specific variable is uniquely adjusted for all relevant potential confounding variables. The covariates adjusted for in each analysis are summarised in the footnotes of Table 3.

Results

Of the students who received the direct email invitation, 810 responded resulting in a response rate of 6.7%. Table 2 shows the demographic characteristics and food security status of the sample. Relative to the overall student body in the two faculties, the sample over-represented the youngest age-group, females, domestic (Australian) students, and full-time students. The prevalence of food insecurity at a household level was approximately one in four (25.5%). Of these, 5.6% experienced very low food security, with another 2.3% experiencing very low food security among children.

[Table 2 about here]

Table 3 summarises the bivariate and multivariate associations between food insecurity, sociodemographic characteristics, and health and dietary factors. At the bivariate level, food insecurity was associated with household structure, housing tenure, household income, income source, previously suspended study due to financial difficulties, BMI, perceived general health, and fruit and vegetable intakes.

After adjustments for potential confounding variables, housing tenure, household income, income source, previous suspension of studies, perceived general health, and fruit and vegetable intakes

remained significantly associated with food insecurity. Compared to students who were living at home, those who boarded or rented were two or three times more likely to experience food insecurity respectively. Students in the lowest tertile for income were eighty percent more likely to experience food insecurity than their higher income counterparts. In regards to the source of income, students who participated in part-time work, obtained income support and received an equity based scholarship from the university were nearly four times more likely to report being food insecure compared to those who participate in full-time work.

Students who were food insecure were thirty-five percent less likely to consume adequate (more than two) serves of fruit per day, and fifty-five percent less likely to consume adequate (four or more) serves per day of vegetables, when compared to their food secure counterparts. Furthermore, students from food insecure households were twice as likely to report fair or poor general health and three times as likely to have deferred their studies due to financial difficulties.

[Table 3 about here]

Overall 5.6% of students had sought food relief from the university-sponsored food bank or other welfare agencies. The most popular form of food relief was the university sponsored food bank. The proportions of students who sought food relief were 14%, 24% and 15% for the categories of low food security, very low food security and very low food security among children respectively.

Discussion

This study investigated the prevalence of food insecurity among a convenience sample of students at an Australian University. While the sample over-represented females, younger age groups, domestic and full-time students, the prevalence was considerable, being 25%. Associated sociodemographic, dietary and health factors were also investigated. Findings indicated that low household income, reliance on income support or equity based scholarships, and renting or boarding as opposed to living at home were substantially associated with food insecurity. Furthermore, food insecurity had a strong inverse association with both fruit and vegetable intakes, and self-perceived general health. Among the present sample, the percentage and severity of food insecurity was similar across gender, age and study disciplines.

There is growing recognition that university students face increasing poverty and consequent difficulties in acquiring food. In 2010, the Australian National Union of Students held *Noodle Day* in recognition of the reliance on instant noodles as a mainstay of student diets (National Union of Students 2010). The growing anecdotal evidence is supported among this sample of students, with 25% experiencing food insecurity within the last 12 months. Of those who were food insecure, over

seven percent experienced more severe levels of food insecurity (5.5% very low food security; 2% very low food security among children).

The prevalence reported in this study is double the prevalence of one in eight reported by Universities Australia(James, Bexley et al. 2007). It is also higher than that reported for the general population via the National Health Survey (5%) and comparable to the rates found among disadvantaged locales in Sydney (21%) (Australian Bureau of Statistics 2006) and Brisbane (24%) (Ramsey, Giskes et al. 2011), Australia. An increasing rate of food insecurity among university students is further supported by multiple studies which suggest that students are experiencing increasing levels of relative poverty. A contributing factor identified in these studies is the financial commitments related to tertiary education (Lloyd and Turale 2001, James, Bexley et al. 2007, Lewis, Dickson-Swift et al. 2007).

Consistent with this existing evidence, students with lower equivalent household incomes were more likely to report being food insecure (McIntyre, Connor et al. 2000, Bartfeld and Dunifon 2006, Foley, Ward et al. 2009). Lower household incomes leave fewer financial resources for the acquisition of food, and thus increase the risk of food insecurity. Food insecurity was also higher among students who were not living with their parents. In Australia, university-sponsored accommodation is not as common as in the United States and the majority of students living outside of home need to find accommodation within the open rental market. It is likely that students living away from home receive less financial support from their parents, and require part-time work and/or government financial support to meet rent and other living expenses. It is also likely that these incomes are low in relation to the wage of full-time workers. Thus students living away from home, independent of parental income, are likely to be at higher risk of food insecurity. Among the present sample, students who were working part-time, receiving government benefits, and receiving support from the university were more likely to be food insecure.

Student income support, sourced from the government or the university's scholarship scheme, is used to cover tuition and other university related fees rather than daily necessities (James, Bexley et al. 2007). In the event that students rely on these allowances as their principle source of income, poverty status, and vulnerability to being food insecure increases. Reliance on these allowances may increase the need for paid employment, reducing the time available to study and prepare meals, resulting in a cycle of food insecurity. It has been acknowledged previously that the first step is increasing students' awareness of the financial resources available to them (Mangan, Hughes et al. 2010). However, the relationship between income streams, expenditure, and food security warrants further investigation.

Regarding nutrition, findings among this sample indicated that food insecurity was associated with lower consumptions of fruits and vegetables. This is also consistent with the findings of previous studies (Hamelin, Habicht et al. 1999, James, Bexley et al. 2007, Chaparro, Zaghloul et al. 2009, National Union of Students 2010). Nutrient-dense fruits and vegetables are perceived as less satisfying, and less value for money compared to their energy-dense counterparts. Consequently, in an attempt to maximise perceived value for money, those from food insecure households are less likely to adhere to dietary recommendations (Drewnowski 2004, Drewnowski and Specter 2004, Scheier 2005). Students from food insecure households were twice as likely to rate their general health as only fair or poor. The association between food insecurity and poor health is likely to be a consequence of poor nutrition, stress associated with the inability to procure sufficient food, or both. Alternatively, poor general health may limit opportunities for participation in the workforce, resulting in lower household incomes and increased risk of experiencing food insecurity (Vozoris and Tarasuk 2003, Siefert, Heflin et al. 2004, Heflin, Siefert et al. 2005, Laraia, Siega-Riz et al. 2006).

Financial difficulties have been identified as a key factor in student drop-out or stop-out (Peel, Powell et al. 2004). Of note in this research, is the increased risk of food insecure students to report their studies as being compromised as a result of financial difficulties. To our knowledge, no studies have investigated the potential of food insecurity to compromise university study and attendance, thus it is unknown exactly how this phenomenon may occur. Hypothetically, the stress, physiological changes, psychological changes and/or poor health that may arise from financial difficulty and the inability to access sufficient amounts of food may result in compromised study and the decision to defer university attendance until a later date. These findings warrant further investigation in order to aid in the development of effective strategies to improve student retention as well as university experiences and academic performance.

What is evident from this study is that even though students may be food insecure they are not all accessing food relief programs. In Australia there is no universal food safety net for individuals or families experiencing food insecurity, instead there is a growing reliance on charitable organisations to provide emergency food relief. Within the university sector, student bodies provide this service through the provision of a food pantry with food donated by staff and students. There are high levels of stigma attached with using food relief. The use of food banks can provide short term relief for clients providing little impetus for governing bodies to seek out longer term solutions (Tarasuk and Eakin 2003). University students in Australia tend to live within the general community which may be geographically distant to the institution they attend. As such there is a potential role for Universities to actively engage with government, and welfare agencies to: advocate for the

inclusion of food and nutrition needs within anti-poverty strategies; develop a systematic policy response for food price monitoring and modelling in relation to minimum wages and remoteness and to improve physical access to food outlets with reasonable prices. Universities have the potential to address these at a local institutional level.

Fundamentally food insecurity is about poverty, and as a result the higher education sector needs to re-evaluate income support. This means: advocating at a national level for an increase in the basic living stipend for tertiary students; reviewing and providing more affordable student housing (on campus housing is not necessarily available in all Australian universities); improved access to scholarships and funding at the local level for students in need; and ongoing monitoring and surveillance.

Food provisioning for students is another aspect to be addressed, with a focus on strategies that maintain human dignity, maximise access and affordability of healthy foods, and provide an environment which assists students in achieving the best possible physical and academic outcomes. Food banks, pantries and the distribution of rescued food are strategies commonly employed on many Australian University campuses. These provide a vital food safety net for students and could be strengthened with ongoing community-university partnerships. However, other strategies also need to be considered in order to meet the remit of maintaining human dignity. Such strategies could include: affordable, healthy campus food options; partnerships with food retailers off campus to provide subsidised healthy foods; development of food cooperatives that link in with community supported agriculture schemes; community gardens; adequate spaces for preparation of food; and enhancing food literacy. The development of meal plans supported by "food-cards" allowing access to options that could be absorbed by the Higher Education Contribution loan payable through taxation when students are employed.

By effectively addressing the food issue, these approaches may facilitate student retention, enhance academic achievement and contribute to short and long term social, physical and mental health.

Limitations

The low response rate is a limitation of this study. Low response rates for web-based surveys are an acknowledged limitation in the literature (van Gelder, Bretveld et al. 2010). Firstly, the low response rates resulted in a study sample that over-represented the youngest age-group, females, domestic (Australian) students, and full-time students relative to the overall student body in the Business and Health Faculties. It is well documented that females are more likely to respond to

health surveys (Korkeila, Suominen et al. 2001, Volken 2013). In over-representing the proportion of domestic students and females, it is possible that the prevalence of food insecurity in the sample was underestimated. An alternative view is that non-responders to a web-survey may be more likely to practice unhealthy behaviours potentially resulting in an underestimation of food insecurity among this sample (Kypri, Samaranayaka et al. 2011). It is also possible that the over-representation of younger age groups and full-time students may have resulted in an overestimation of the prevalence of food insecurity. Furthermore, the study sample was limited to two discipline groups although no association was found between study area and food security. Further studies among a more representative sample of university students, through a larger number of faculties are required to confirm these findings.

Secondly, this study relied on a cross-sectional design and was therefore unable to assess the temporal relationship of associations. All data collected were self-reported and there are known limitations with using this approach to data collection, specifically the potential for response bias. Income data were collected but expenditure data were not hence the proportion of income expended on food could not be ascertained. While there are limitations to the scope of this study the data from over eight hundred students provides lines of enquiry worthy of further investigation.

Conclusion

Food insecurity, which has potentially long term consequences on health and educational outcomes, is a significant issue among university students. Improving access, availability and affordability of food on campus needs to be given priority, with the development of innovative strategies that maintain human dignity. By identifying strategies that work to alleviate food insecurity, universities could be in a win-win situation; simultaneously improving retention rates, while at the same time empowering students to complete their degrees in a timely manner.

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