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Exploring Adelaide University student's food security, employment, dietary and lifestyle  
behaviours before and during the Covid-19 pandemic:  
A retrospective study

A thesis submitted in partial fulfilment of the  
HONOURS DEGREE of BACHELOR OF  
HEALTH AND MEDICAL SCIENCES IN  
The Discipline of Physiology  
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## Abstract

**Background:** Poor dietary and lifestyle behaviours play a vital role in the health of adolescents and young adults. The impact of food security is wide reaching and has been found to be associated with a poorer diet and general wellbeing. As a result of the Covid-19 pandemic, the Australian food chain has been disrupted, worsening levels of food insecurity and thus, worsening student's health and wellbeing. Understanding the extent of this issue is important, as it can help develop strategies to decrease food insecurity among vulnerable populations and improve general health in the future. Using an electronic survey, this study aims to assess the level of food insecurity among university students from the University of Adelaide, while also investigating student's dietary behaviours before the Covid-19 pandemic (i.e. prior to February 2020) and during the Covid-19 pandemic (i.e. March – November 2020).

**Methods:** An electronic survey was administered on REDCap, a secure, web-based software. All students from the University of Adelaide were eligible to participate. Using validated instruments, students reported their food security and dietary behaviours before and during the Covid-19 restrictions. IBM SPSS Statistics was used to export responses and compare differences in data.

### **Results:**

This present study found that 17% of students were food insecure prior to the Covid-19 pandemic, increasing to 26.8% during the Covid-19 pandemic. Marital status, children, socioeconomic status and government benefits are predictors of food security rates. Student's dietary behaviours have changed before and during the Covid-19 pandemic. Skipping breaking and snacking regularly are common behaviours among students, commonly

influenced by factors such as time constraints, cost of food items, and lack of motivation in food preparation and availability.

**Conclusion:**

Although the majority of students from the University of Adelaide are food secure, further research is needed among a larger sample to establish more critically the severity of food insecurity among students from the University of Adelaide. The level of food insecurity and changes in student's dietary behaviours will be of benefit to the public health and welfare bodies to implement strategies to improve student's employment, finances and food literacy skills.

## 1. Introduction

Poor dietary intake and related health behaviours play an important role in the development and maintenance of a healthy lifestyle.(1) The shift from adolescence to adulthood is a significant period for creating healthy life-long behavioural patterns.(1) However, past research has suggested, that during university, students typically engage in behaviours that decrease the likelihood of optimal health.(2) These behaviours i.e. frequent consumption of sugar-sweetened beverages and low activity levels, underpin the risk of heart disease, various cancers, depression and other non-communicable conditions in the future.(2) Previous research has also found that Australian tertiary students fail to consume the recommended daily serving of fruit and vegetables (6 serves of vegetables for males, 5 serves of vegetables for women and 2 serves of fruit for both) as a result of undertaking study and not considering the risks of developing chronic diseases when making food choices.(2) During this life stage, factors such as skipping meals, snacking and frequent consumption of fast foods can play a detrimental role in developing food literacy skills and life-long habits.(2) Undeniably, late adolescence and early adulthood are substantial stages of transition i.e. changes in employment and living situation, highlighting the importance of understanding factors such as, knowledge and attitude towards healthy dietary behaviours.(2) One significant factor that plays a role in the development of a healthy lifestyle pattern among university students is food security.(3)

Food security is defined by the World Health Organization as “all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.”(4) The absence of this, i.e., food insecurity, is a global issue among university students and access to adequate food is a core

social determinant of health.(4) Food insecurity rates in other countries have been reported as a total of the whole population, for example, in 2017 12% of US households reported as food insecure, 70% of the Nigerian population are currently food insecure, 10% of adults from the UK were food insecure in 2017 and 5% of Australians were food insecure in 2014.(5)

However, reported rates of food insecurity among university students have been found to be higher than the general population .(5) A recent systematic review of 18 studies among university students conducted by Bruening et al., 2019 identified an average rate of food insecurity of 42%, with majority of these studies from western countries, including nine in the US and three in Australia.(6) A pilot study at Deakin university in Victoria reported that food insecurity among their student sample (n=124) was 72%.(7) Researchers suggested that the prevalence of food insecurity varies by substrata of the population with the strongest predictor being low income and low education levels.(7) In addition to this, previous research has revealed that demographic characteristics such as, country of birth and employment status, are the most common predictors of food insecurity among university students.(7)

Research focusing on food insecurity is relatively new in Australia, with much conducted within the past decade on the general population.(6) As food insecurity has been found to have poor outcomes on student health and academic performance, measurement of its prevalence during the Covid-19 pandemic, including the levels of severity, is important. The Covid-19 pandemic has been an unprecedented time that has caused social and economic changes across the world, possibly exacerbating levels of food insecurity.(8) As a result of the pandemic, the South Australian government responded with wide-spread public health measures, including social distancing restrictions, business closures, employment changes and travel bans.(9) To ameliorate this, the Australian government introduced financial relief measures such as, JobKeeper payments to maintain employment and JobSeeker for those who were suddenly left unemployed.(9) Furthermore, the pandemic also temporarily disrupted the

Australian food supply, causing a change in purchasing patterns among consumers.(8) The uncertainty during the Covid-19 pandemic triggered a rapid increase in purchasing among consumers resulting in temporary food shortages.(8) Collectively, these changes have potentially worsened food insecurity among university students in Australia, particularly as 9 out of 10 tertiary students undertake paid work while studying, with the majority of students being employed in these insecure positions impacted by current changes, thus, exposing them to food insecurity.(8)

Food security is a basic human right and precisely understanding the extent of the issue (i.e. food insecurity) and its determinants can inform the development of targeted and effective strategies to minimise food insecurity in the student population and improve general health outcomes in the future.(8)

The aims of this study are to:

1<sup>st</sup> Aim: To assess the level of food insecurity in the University of Adelaide student population before the Covid-19 pandemic (i.e. before February 2020) and during the Covid-19 pandemic (i.e. March – November 2020) while highlighting associations with socioeconomic status and student characteristics.

2<sup>nd</sup> Aim: Using an online survey, we will investigate student's dietary behaviours before the Covid-19 pandemic (i.e. before February 2020) and during the Covid-19 pandemic (i.e. March – November 2020).

## 2. Methods and Materials

### *2.1 Study design*

An electronic survey was administered using REDCap (Research Electronic Data Capture) a secure, web-based software.(10) The survey investigated student's food security and health associated food behaviours before and during the Covid-19 pandemic. All students currently enrolled at the University of Adelaide were eligible to participate. The survey went live on 15<sup>th</sup> September 2020 and data collection concluded on 10<sup>th</sup> November 2020. Consent was embedded into the survey as part of the participant information sheet before commencing. Completion of the online survey took approximately 10 minutes and participants were free to leave at any point. This survey also utilised the CHERRIES checklist to report the results.(11) All study procedures were approved by The University of Adelaide's Human Research Ethics Committee (H-2020-159).

### *2.2 Participants and recruitment*

This study included students from the University of Adelaide. It benefited from the opportunity to invite the entire student population to participate, allowing a sufficiently large and diverse result dataset. All students enrolled in face-to-face courses from the university (~20,771) were eligible to participate. Recruitment occurred in two stages. As students at the commencement of recruitment were working off campus due to the Covid-19 restrictions, initial ethical approval sought to recruit through social media. The survey was promoted through the use of the University of Adelaide social media pages including both Facebook and Twitter (Refer to table 1). Given the return to campus in semester two, an amendment to ethics was submitted and the second wave of recruitment occurred through posters and flyers dispersed around the campus and additional social media posts were made (Refer to table 2).



All recruitment posts made mention of an incentive. Participants were free to choose if they wanted to go into the draw to win a 1 in 3 \$50 Coles voucher (Refer to appendix 3).

Table 1: Participant recruitment stage 1

<b>Social Media Page</b>	<b>Date of Post</b>	<b>Post insights</b>
Student Representative Centre Facebook	17.09.2020	3 likes, 7 clicks, 312 reached
Adelaide Graduate Centre Twitter	25.09.2020	3 likes, 2 retweets

Table 2: Participant recruitment stage 2

<b>Location/Buildings</b>	<b>Date pinned</b>	<b>Amount</b>
Helen Mayo South level 1	28.30.2020	1
Helen Mayo South elevators	28.30.2020	2
Faculty of Health and Medical Sciences (HMN) level 4	28.30.2020	1
HMN PhD/honours student office level 2	28.30.2020	1
Scott Theatre	30.30.2020	2
Schulz Building (bathroom, elevator, pin board)	30.30.2020	4
Madley Studio	30.30.2020	3
Physics Building (elevator)	30.30.2020	2
Hughes (female bathroom, elevator)	30.30.2020	2
Napier (pin board)	30.30.2020	1
Engineering Building	30.30.2020	1
<b>Total QR code scans: 73</b>		

<b>Social Media Page</b>	<b>Date of Post</b>	<b>Post insights</b>
Uni of Adelaide Sciences Facebook	15.10.2020	3 likes, 9 clicks, 529 reached
Uni of Adelaide Sciences Instagram	15.10.2020	11 likes, 287 reached
Uni of Adelaide Sciences Twitter	15.10.2020	3 clicks, 1 retweet

### *2.3 Socio-demographic and student characteristics*

Socio-demographic variables collected include gender, age, education, country of birth, marital status, number of children, employment type, government benefits, hours of paid work and weekly income. The characteristic questions that were used, were those previously reported by the Australian Bureau of Statistics from their National Health Survey.(12)

Students were grouped into advantaged and disadvantaged socioeconomic areas by their postal code using The Socio-Economic Indexes for Areas by the Australian Bureau of Statistics.(13)

#### *2.4 Food insecurity tool and dietary choices*

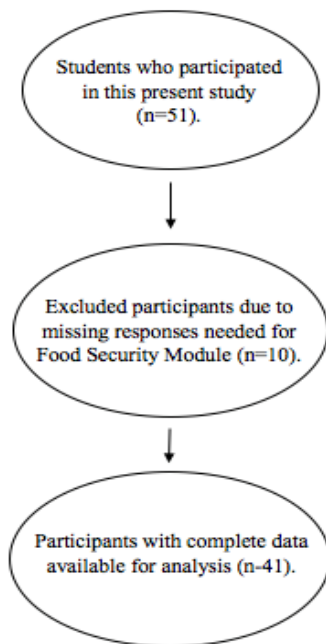
Food insecurity was examined using a multi-item measure obtained from 16 items used by the Food Security Survey Module from the United States Department of Agriculture Community Food Security Assessment Toolkit (Refer to appendix 1).(14) This survey is a uniform national measure that categorises households and individuals as food secure, or food insecure at different degrees of severity, and includes household, adult and child food insecurity measure items.(14) The survey tool produces raw scores of food security among adults and their household.(14) The Food Security Survey Module has been used extensively including in Australian populations to estimate levels of food insecurity as it is currently the most sensitive and accurate tool.(15) Responses of “yes,” “often,” and “sometimes” were attributed a score of one, with the total food security score calculated as the sum of individual responses, ranging from 0–10.(14) Food security status was categorised as; high food security (0), marginal food security (1-2), low food security (3-5) and very low food security (6-10).(14) Modules selected for the survey were previously validated in university student populations and were comprised solely of the adult reference questions (Refer to appendix 1).(3, 5, 7) This section of the survey was asked twice e.g. before the Covid-19 pandemic (before February 2020) and during the Covid-19 pandemic (March – November 2020). Those with high or marginal food security are classified as food secure and those with low or very low food security are classified as food insecure.

The second part of the survey was comprised of a student food attitude and behaviour survey (Refer to appendix 2). This section of the survey was asked twice e.g. before the Covid-19 pandemic (before February 2020) and during the Covid-19 pandemic (March – November 2020). This survey was adapted from a validated survey in the student population used in a study by Devine et al., 2006 focusing on students from Queen’s University and University of Ulster in Northern Ireland.(16)

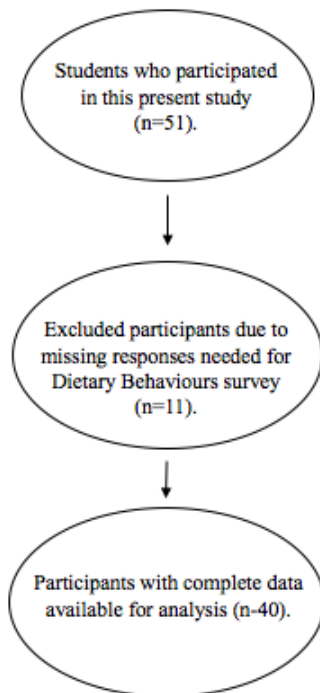
### *2.5 Data analysis*

Data sets were exported from the online survey platform to IBM SPSS Statistics for Windows, version 26.0.(17) To report food security accurately, where there were missing responses, participants were removed (Refer to flow chart 1). For missing responses among the dietary behaviours survey, participants were removed (Refer to flow chart 2). Descriptive analyses were performed to compare all available student data before the Covid-19 pandemic and during the Covid-19 pandemic. Food security rates and dietary behaviours were described as percentages of the total population.

Flow chart 1: Data cleaning for Food Insecurity Survey Module



Flow chart 2: Data cleaning for Dietary Behaviours Survey



### 3. Results

#### *3.1 Demographics and student characteristics*

Survey respondents were primarily female (70.7%), from Australia/New Zealand (56%). Majority of the students were single (75.6%) more than half were postgraduate students (51.2%) and almost all (95.1%) did not have children. Most students (87.8%) lived in the advantaged socioeconomic areas, were not employed (34.1%), did not receive any government benefits (82.9%) and out of those who were employed, 29.2% worked 11-20 hours per week. Sociodemographics and other characteristics of students are presented in Table 3.

Table 3: Sociodemographics and student characteristics of participants (n=41)

<b>Sociodemographic and Characteristics of Participants</b>	<b><i>n (%)</i></b>
<b>Gender</b>	
Female	29 (70.7)
Male	12 (29.2)
<b>Home Country/Place</b>	
Australia/New Zealand	23 (56)
South-East Europe	1 (2.4)
North Africa & Middle East	3 (7.3)
South East Asia	8 (19.5)
North East Asia	1 (2.4)
Southern & Central Asia	3 (7.31)
Central & South America	1 (2.4)
Prefer not to say	1 (2.4)
<b>Marital Status</b>	
Single	31 (75.6)
Married	10 (24.3)
<b>Study Status</b>	
Undergraduate	20 (48.7)
Postgraduate	21 (51.2)
<b>Children</b>	
None	39 (95.1)
2+	2 (4.8)
<b>Socio-economic status by postcode</b>	
Advantaged	36 (87.8)
Disadvantaged	5 (12.1)
<b>Employment Status</b>	
Full-time	2 (4.8)
Part-time Contract	6 (14.6)
Part-time Casual	6 (14.6)
Casual	13 (31.7)
Not employed	14 (34.1)
<b>Government Benefits</b>	
Student Youth Allowance	6 (14.6)
Other	1 (2.4)
None	34 (82.9)
<b>Hours worked per week</b>	
30+	3 (7.3)
21-25	3 (7.3)
11-20	12 (29.2)
<10	10 (24.3)
0	13 (31.7)
<b>Weekly Income</b>	
\$800-\$999	1 (2.4)
\$650-\$799	1 (2.4)
\$450-\$649	9 (21.9)
\$300-449	9 (21.9)
<\$299	13 (31.7)
Nil	8 (19.5)

### *3.2 Food security among students using the United States Department of Agriculture Household Food Security tool*

Food security status responses were assessed and are presented in Table 4. Among the University of Adelaide students, 53.6% had high food security rates before Covid-19, slightly decreasing to 51.2% during Covid-19. Meaning that over half of the sample did not have any affirmative responses in their survey and thus, do not have any risk of experiencing food insecurity. Very low food security was present in 2.4% of the sample before the Covid-19 pandemic, increasing to 4.8% during the Covid-19 pandemic.

Table 4: Food security among the University of Adelaide students using the United States Department of Agriculture Household Food Security Survey

<b>Variable</b>	<b>Before Covid-19 n (%)</b>	<b>During Covid-19 n (%)</b>
<b>High food security</b>	22 (53.6)	21(51.2)
<b>Marginal food security</b>	12 (29.2)	9 (21.9)
<b>Low food security</b>	6 (14.6)	9 (21.9)
<b>Very low food security</b>	1 (2.4)	2 (4.8)

### *3.3 Food security before and during Covid-19*

Table 5 outlines the proportion of the sample in categories of food secure and food insecure before and during the Covid-19 pandemic. Students with high or marginal food security were classified as food secure and those with low or very low food security were classified as food insecure.

Table 5: Food security among the University of Adelaide students before and during the Covid-19 Pandemic (n=41).

<b>Variable</b>	<b>Before Covid-19 n (%)</b>	<b>During Covid-19 n (%)</b>
<b>Food Secure</b>	34 (82.9)	30 (73.1)
<b>Food Insecure</b>	7 (17)	11 (26.8)

### *3.4 Sociodemographics and student characteristics associated with food insecurity*

Table 6 outlines student's sociodemographics and student characteristics by food security status. Before the Covid-19 pandemic, 12.1% of females and 2.4% of males had low food security, with 2.4% of females having very low food security. During the Covid-19 pandemic, 17% of females and 4.8% of males had low food security, and 2.4% of females and 2.4% of males had very low food security. Those with low food security before and during the Covid-19 pandemic were mainly from Australia/New Zealand (9.7%). Typically, those with low food security before the Covid-19 pandemic were single (9.7%), postgraduate students (9.7%) and did not have children (14.6%). During the Covid-19 pandemic, those with low food security were mainly single (19.5%), postgraduate students (12.1%) and did not have children (21.9%). Out of those living in an advantaged area, 7.3% had low food security and 2.4% had very low food security before the Covid-19 pandemic, increasing to 17% and 4.8% during the Covid-19 pandemic. Before the Covid-19 pandemic, 9.7% of students with low food security worked in a casual job and did not receive government benefits, 14.6% worked less than 10 hours a week and 9.7% made less than \$299 a week. During the Covid-19 pandemic, out of those with low food security, 9.7% were not employed, 9.7% did not receive government benefits, 12.1% worked less than 10 hours a week and 7.3% made less than 299 or nil per week.



Table 6: Sociodemographics and student characteristics by food security status before Covid-19 and during Covid-19 (n=41) (n %)

Variable	High food security before Covid-19	Marginal food security before Covid-19	Low food security before Covid-19	Very low food security before Covid-19	High food security during Covid-19	Marginal food security during Covid-19	Low food security during Covid-19	Very low food security during Covid-19
<b>Gender</b>								
Female	16 (39)	7 (17)	5 (12.1)	1 (2.4)	15 (36.5)	7 (17)	7 (17)	1 (2.4)
Male	6 (14.6)	5 (12.1)	1 (2.4)		6 (14.6)	2 (4.8)	2 (4.8)	1 (2.4)
<b>Home Country/Place</b>								
Australia/New Zealand	13 (31.7)	5 (12.1)	4 (9.7)	1 (2.4)	14 (34.1)	5 (12.1)	4 (9.7)	
South-East Europe	1 (2.4)				1 (2.4)			
North Africa & Middle East	2 (4.8)	1 (2.4)			1 (2.4)	1 (2.4)	1 (2.4)	
South East Asia	4 (9.7)	3 (7.3)	1 (2.4)		4 (9.7)	2 (4.8)	1 (2.4)	1 (2.4)
North East Asia	1 (2.4)					1 (2.4)		
Southern & Central Asia	1 (2.4)	1 (2.4)	1 (2.4)				3 (7.3)	
Africa								
Central & South America		1 (2.4)			1 (2.4)			
Prefer not to say		1 (2.4)						1 (2.4)
<b>Marital Status</b>								
Single	16 (39)	10 (24.3)	4 (9.7)	1 (2.4)	15 (36.5)	6 (14.6)	8 (19.5)	2 (4.8)
Married	6 (14.6)	2 (4.8)	2 (4.8)		5 (12.1)	3 (7.3)	1 (2.4)	
Widowed					1 (2.4)			
<b>Study Status</b>								
Undergraduate	13 (31.7)	5 (12.1)	2 (4.8)		11 (26.8)	5 (12.1)	4 (9.7)	
Postgraduate	9 (21.9)	7 (17)	4 (9.7)	1 (2.4)	10 (24.3)	4 (9.7)	5 (12.1)	2 (4.8)
<b>Children</b>								
None	20 (48.7)	12 (29.2)	6 (14.6)	1 (2.4)	19 (46.3)	9 (21.9)	9 (21.9)	2 (4.8)
2+	2 (4.8)				2 (4.8)			
<b>Socioeconomic Status by Postcode</b>								

Advantaged	22 (53.6)	10 (24.3)	3 (7.3)	1 (2.4)	20 (48.7)	7 (17)	7 (17)	2 (4.8)
Disadvantaged		2 (4.8)	3 (7.3)		1 (2.4)	2 (4.8)	2 (4.8)	
<b>Employment Status</b>								
Full-time	1 (2.4)	1 (2.4)			1 (2.4)	2 (4.8)	1 (2.4)	
Part-time Contract	3 (7.3)	2 (4.8)	1 (2.4)		5 (12.1)	3 (7.3)		
Part-time Casual	3 (7.3)	3 (7.3)			3 (7.3)		1 (2.4)	
Casual	6 (14.6)	3 (7.3)	4 (9.7)		5 (12.1)	2 (4.8)	2 (4.8)	
Not employed	9 (21.9)	3 (7.3)	1 (2.4)	1 (2.4)	7 (17)	2 (4.8)	4 (9.7)	2 (4.8)
Self employed							1 (2.4)	
<b>Government Benefits</b>								
Student Youth Allowance	3 (7.3)		2 (4.8)	1 (2.4)	4 (9.7)		3 (7.3)	1 (2.4)
Job Seeker						1 (2.4)	1 (2.4)	
Job Keeper					1 (2.4)	1 (2.4)		
Other	1 (2.4)				3 (7.3)	1 (2.4)	1 (2.4)	
None	18 (43.9)	12 (29.2)	4 (9.7)		13 (31.7)	6 (14.6)	4 (9.7)	1 (2.4)
<b>Hours worked per week</b>								
30+	2 (4.8)	1 (2.4)						
21-25	1 (2.4)	2 (4.8)			3 (7.3)	2 (4.8)	1 (2.4)	
11-20	8 (19.5)	4 (9.7)			7 (17)	2 (4.8)		
<10	2 (4.8)	2 (4.8)	6 (14.6)		6 (14.6)	3 (7.3)	5 (12.1)	
0	9 (21.9)	3 (7.3)		1 (2.4)	5 (12.1)	2 (4.8)	3 (7.3)	2 (2.4)
<b>Weekly Income</b>								
\$800-\$999	1 (2.4)				1 (2.4)			
\$650-\$799		1 (2.4)				1 (2.4)		
\$450-\$649	6 (14.6)	2 (4.8)	1 (2.4)		6 (14.6)	2 (4.8)	2 (4.8)	
\$300-449	5 (12.1)	4 (9.7)			5 (12.1)	3 (7.3)	1 (2.4)	
<\$299	5 (12.1)	3 (7.3)	4 (9.7)	1 (2.4)	3 (7.3)	2 (4.8)	3 (7.3)	
Nil	5 (12.1)	2 (4.8)	1 (2.4)		6 (14.6)	1 (2.4)	3 (7.3)	2 (4.8)

### *3.5 Student's dietary behaviours before and during the Covid-19 pandemic*

Forty responses were received from students regarding their dietary behaviours before and during the Covid-19 pandemic (Refer to Table 7). More than half (62.5%) were consuming their meals individually before the Covid-19 pandemic, increasing to 70% during the Covid-19 pandemic. The fridge (100%), microwave (100%), freezer (95%) and cooking equipment (95%) are the four main necessities that students had in their accommodation before and during the Covid-19 pandemic, while storage facilities (97.5%) were utilised more during the Covid-19 pandemic rather than before. Grocery shopping was done typically once a week by more than half of the students before and during the Covid-19 pandemic (62.5%, 52.5%). Majority of students (72.5%) considered the price of food when grocery shopping before the Covid-19 pandemic and 70% during the Covid-19 pandemic. When grocery shopping, nutrition labels were only read sometimes by 30% of students before the Covid-19 pandemic, which increased to 50% during the Covid-19 pandemic. The main nutrition label categories that were read before the Covid-19 pandemic were sugar (75%) and kilojoules (55%) and sugar (70%) and kilojoules (57.5%) during the Covid-19 pandemic. Cooking was enjoyed by 45% of students before the Covid-19 pandemic which increased to 55% during the Covid-19 pandemic. Notably, fresh vegetables/salads (85%, 67.5%), fruit (70%, 75%) and meals prepared from raw fresh chicken (70%, 70%) were commonly consumed on a weekly basis before and after the Covid-19 pandemic, whereas, ready-made meals (20%, 27.5%) and meals prepared from raw fresh fish (20%, 25%) were consumed the lowest during both periods. Dinner was consumed by almost all students (90%) on a daily basis before the Covid-19 pandemic and by 87.5% during the Covid-19 pandemic. Snack consumption decreased from 77.5% to 62.5% and typically those who snacked (47.5%) daily, did so 2-3 per day before the Covid-19 pandemic and 45% of students did during the Covid-19 pandemic. Takeaway food was usually purchased once (57.5%) per week before the Covid-

19 pandemic whereas only 27.5% of respondents purchased takeaway food weekly during the Covid-19 pandemic.

Table 7: Student's behaviours before Covid-19 and during Covid-19 (*n* %)

<b>Behaviour</b>	<b>Before Covid-19 <i>n</i> (%)</b>	<b>During Covid-19 <i>n</i> (%)</b>
<b>Preparing &amp; Eating Food</b>		
With a group	15 (37.5)	12 (30)
Individually	25 (62.5)	28 (70)
<b>Access to in Accommodation</b>		
Stove top	36 (90)	36 (90)
Over	35 (87.5)	36 (90)
Grill/BBQ	15 (37.5)	14 (35)
Fridge	40 (100)	38 (95)
Freezer	38 (95)	39 (97.5)
Microwave	40 (100)	38 (95)
Storage facilities (e.g. food cupboards)	37 (92.5)	39 (97.5)
Cooking equipment (e.g. saucepans, knives)	38 (95)	39 (97.5)
<b>Purchasing Considerations</b>		
Quality/Freshness	17 (42)	18 (45)
Habit/Routine	18 (45)	17 (42.5)
Price of food	29 (72.5)	28 (70)
Money	8 (20)	10 (25)
Availability in shops	7 (17.5)	14 (35)
Taste	16 (40)	11 (27.5)
Convenience in preparation	10 (25)	14 (35)
Foods known to cook	22 (55)	20 (50)
Someone else decides	5 (12.5)	4 (10)
<b>Grocery shopping</b>		
Every day	1 (2.5)	0
Every 2-3 days	12 (30)	9 (22.5)
About once a week	25 (62.5)	21 (52.5)
Once a month	2 (5)	9 (22.5)
Less than once a month	0	1 (2.5)
<b>Feelings towards cooking</b>		
I really liked cooking	8 (20)	8 (20)
I liked cooking	18 (45)	22 (55)
I neither liked nor disliked cooking	10 (25)	7 (17.5)
I disliked cooking	4 (10)	1 (2.5)
I really disliked cooking	0	0
<b>Foods consumed on a weekly basis</b>		
Fresh vegetables/salads	34 (85)	27 (67.5)
Fruit	28 (70)	30 (75)
Eggs	22 (55)	22 (55)
Ready-made meals (oven/microwave)	8 (20)	11 (27.5)
Other convenience foods (e.g. fish, burgers)	17 (42.5)	18 (45)

Dairy products (cheese, yoghurt)	23 (57.5)	22 (55)
Meals prepared from raw fresh fish	8 (20)	10 (25)
Meals prepared from raw fresh chicken	28 (70)	28 (70)
Meals prepared from other raw fresh meat	18 (45)	21 (52.5)
<b>Meals consumed (average day)</b>		
Breakfast	26 (65)	24 (60)
Lunch	33 (82.5)	33 (82.5)
Dinner	36 (90)	35 (87.5)
Snacks	31 (77.5)	25 (62.5)
<b>Snacking per day between meals</b>		
4-5	2 (5)	1 (2.5)
2-3	19 (47.5)	18 (45)
Once	18 (45)	15 (37.5)
Never	1 (2.5)	6 (15)
<b>How often did you read nutrition labels on food</b>		
Always	8 (20)	5 (12.5)
Fairly often	10 (25)	9 (22)
Sometimes	15 (37.5)	20 (50)
Never	7 (17.5)	6 (15)
<b>What nutrition information did you look at</b>		
Serving size	17 (42.5)	19 (47.5)
Energy (kilojoules)	22 (55)	23 (57.5)
Protein	11 (27.5)	15 (37.5)
Fat	16 (40)	14 (35)
Carbohydrates	18 (45)	17 (42.5)
Sugar	30 (75)	28 (70)
Dietary fibre	9 (22.5)	8 (20)
Sodium	11 (27.5)	11 (27.5)
<b>Takeaway food purchased per week (i.e. McDonalds)</b>		
Everyday	1 (2.5)	0
4-6 times	2 (5)	2 (5)
2-3 times	6 (15)	12 (30)
Once	23 (57.5)	11 (27.5)
Never	8 (20)	15 (37.5)

#### 4 Discussion

This retrospective study aimed to assess the level of food insecurity in the University of Adelaide student population, while also investigating students dietary behaviours before the Covid-19 pandemic (before February 2020) and during the Covid-19 pandemic (March - November 2020). This study utilised the Food Security Survey Module from the United States Department of Agriculture Community Food Security Assessment Toolkit to assess food security among students and has identified that the majority of students from the University of Adelaide were food secure prior to the Covid-19 pandemic and during the Covid-19 pandemic. This study also identified several changes in student's dietary behaviours before and during the Covid-19 pandemic.

This present study found that 17% of students from the University of Adelaide were food insecure before the Covid-19 pandemic and 26.8% during the Covid-19 pandemic. This rate of food insecurity before and during the Covid-19 pandemic is much lower than the rate of food insecurity previously reported in another study conducted on Australian university students in Newcastle (48.1%).<sup>(5)</sup> The current rates in this present study are at the lower range of prevalence as compared to a review conducted on Australian universities students (26-48%).<sup>(7, 18, 19)</sup> A noteworthy point here is that this review was conducted between 2011-14, which suggests that food insecurity rates have been high for several years among the student population.

It can be assumed that the strongest factor influencing the rate of food insecurity in this present study may be a result of students being single and not having children. A study conducted in 2015 by Lindberg and colleagues found that family households with low income typically reported higher rates of food insecurity.<sup>(20)</sup> Data by the Australian Institute

of Family Studies found that the weekly cost of raising a child ranges from \$140 - \$170 per week.(21) The study also found that raising two children is \$340 per week when all categories such as personal care, clothing and household goods are taken into consideration.(21) Being single and not having children means that students do not have family/children- related expenses and therefore, are not significantly spending their income elsewhere.

Additionally, rates of food insecurity are typically shown in students who live in disadvantaged areas. This may be explained by lower socioeconomic status, typically known as a predictor of food security.(22) A study by Ward et al., 2013 looking at food affordability in Adelaide found that food insecurity is associated with low socioeconomic status.(23) This association is due to employment, financial obligations and lower educational attainment in these disadvantaged areas.(23) The results in this present study also suggests that those with a higher socioeconomic status (i.e. living in advantaged areas), have higher food security. It has also been previously acknowledged that students who live away from their family i.e. on their own, or are reliant on government support, experience food insecurity as a result of living costs and being unable to manage their finances.(24) Micevski et al., 2013 found that 30% of Deakin university students (n=124) were twice as likely to experience food insecurity when receiving government benefits, suggesting that government benefits may be insufficient to accommodate student's educational costs, living expenses, personal needs and dietary requirements.(7) Comparisons to this present study can be made, however, it is important to note that the study conducted by Micevski et al., 2013 contained a sample size three times of this present study.(7)



This present study also sought to compare changes in students dietary behaviours before and during the Covid-19 pandemic. Using a student food attitude and behaviour survey, some slight variations in student's food choices and cooking behaviours have been found. Past researchers have discovered common behaviours among students including lower consumption of fruit and vegetables, increased intake of snacking and skipping breakfast.(5, 25) These past findings are somewhat comparable to this present study as not all students consumed breakfast on a daily basis however, the majority did consume snacks. A cross-sectional study of 865 college students in India found that students reported skipping meals regularly, increasing their snacking behaviour.(25) Another cross-sectional-study on 891 adolescent students in Egypt reported that 60% of students skipped at least one meal per day.(26)

These behavioural changes have also been commonly influenced by factors such as time constraints, cost of food items, lack of motivation in food preparation and availability.(25, 26) A study conducted by Devine et al., 2006 in Ireland utilising the same tool as this present study found that 52% of their student sample did grocery shopping per week and 72% stated that their purchase is influenced by the quality and/or freshness of the food.(16) However, it is important to note that this current study has a much lower sample size as compared to the study conducted by Devine et al., 2006 (n=3,412). Although changes in purchasing considerations and grocery shopping are evident in this present study, this change may be a result of the Covid-19 pandemic sparking a fear in food shortages, causing panic buying around supermarkets.(27) Despite Australia having an abundance of produce in the country, supermarkets shelves were often empty during the early stages of the pandemic causing limits to individual's grocery shopping.(27) Results in this present study also suggest that the shift

in food availability caused students to purchase more ready-made meals and/or purchase takeaway meals.

The strengths of this present study include the use of the Food Security Survey Module from the United States Department of Agriculture Community Food Security Assessment Toolkit to measure food security. This tool is currently the most sensitive and comprehensive measure of food security used in several studies.(15) This study also considered a broad set of potential predictors of food security e.g. students socio-demographic factors and characteristics (age, race, income, study status) allowing comparisons to be made between time periods. Further, as this study explored lifestyle and dietary changes before and during the Covid-19 pandemic, understanding the impact of these associations is vital as this allows health and nutrition support, and interventions to be tailored for vulnerable students in the future.

Limitations of this study to consider is the small number of respondents and the implications of recruitment. Despite the use of social media pages where combined have a total of more than 7000 followers, social networks typically prioritise content by the likelihood that the user actually wants to see it, therefore possibly decreasing the probability of the post being seen.(28) Also, as the survey was live during the last couple of weeks of the semester, it can be assumed that students spent more time studying rather than scrolling through their social networks. Secondly, during stage 2 of recruitment, there was a lack of students on campus due to it being the end of the semester. It can be said that there was not enough foot traffic at the university and some locations/buildings did not have any students present. It is also important to take into account that participants volunteered to take part in the study. Their

choice may have been influenced by having interest in the topic (health science student) or they were motivated by the incentive.

Although some literature exists, the current Covid-19 pandemic is a complex situation that is still unfolding; to understand what is happening can only be done so by allowing patterns to unfold, thereby analysing them in retrospect in order to ascertain a coherent cause and effect.(29) As a result, literature within this realm is limited, and may continue to be so until such patterns stabilise to which only then experts can analyse the problem situation (Covid-19) in full.(29)

## 5 Conclusion

In summary, the majority of students from the University of Adelaide are food secure. The outcomes of the current study were based on a validated food insecurity measurement tool. However, further research among this population is important, as the extent of food insecurity among other universities nationally and internationally is present and investigating this further will be beneficial for public health and welfare bodies to improve the wellbeing of university students in the future. Considering that are some changes in students dietary behaviours, it is evident that strategies are needed which can provide benefits to students to improve their employment, help manage their finances and education on healthy dietary behaviours. Additionally, the next step of this research would be to explore changes in students dietary behaviours and its association with food security.

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## Appendix 1: U.S Household Food Security Survey Module.

### Stage 1: Single Adult Household Questions

**1. “I worried whether my food would run out before I got money to buy more.”**

- Often true
- Sometimes true
- Never true

**2. “The food that I bought just didn’t last, and I didn’t have money to get more.”**

- Often true
- Sometimes true
- Never true

**3. “I couldn’t afford to eat balanced meals”**

- Often true
- Sometimes true
- Never true

**4. “I relied on only a few kinds of low-cost food to feed myself because I was running out of money to buy food.”**

- Often true
- Sometimes true
- Never true

### Stage 2: Adult referenced Questions

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

- Yes
- No
- Prefer not to say

1a. [IF YES ABOVE] How many days did this happen within a month (approximately)?

\_\_\_ days

- Don't know

**2. Did you ever eat less than you felt you should because there wasn't enough money for food?**

- Yes
- No
- Prefer not to say

**3. Were you ever hungry but didn't eat because there wasn't enough money for food?**

- Yes
- No
- Prefer not to say

**4. Did you lose weight because there wasn't enough money for food?**

- Yes
- No
- Prefer not to say



## Appendix 2: Student Behaviour Survey

**1. Did you usually prepare and eat food with a group of people, or did you prepare and eat food individually?**

- Prepare and eat food as part of a group
- Prepare and eat food individually

**2. Which of the following did you have access to in your accommodation? Please tick all that apply.**

- Stove top
- Oven
- Grill/BBQ
- Fridge
- Freezer
- Microwave
- Storage facilities (eg food cupboards)
- Cooking equipment (eg saucepans, knives)

**3. When you were purchasing food, which 3 of the following factors did you consider most? Please tick 3 factors only.**

- Quality or freshness of the food
- Habit or routine
- Price of the food
- How much money I have
- The availability of the food in the shops I go to
- Taste
- Convenience in preparation
- Foods I know how to cook/prepare
- Someone else decides on most of the food I eat
- Other (please specify)

**FB4. How often did you buy groceries (approximately)?**

- Every day
- Every 2-3 days
- About once a week
- Once a month
- Less than once a month

**FB5. How much did you like or dislike cooking?**

- I really liked cooking
- I liked cooking
- I neither liked nor disliked cooking
- I disliked cooking
- I really disliked cooking

**FB6. Which of the following types of food did you eat regularly (at least 2 or 3 days per week)? Please tick all that apply.**

- Fresh vegetables/salads
- Fruit
- Eggs
- Ready-made meals (heated in the oven/microwave)
- Other convenience foods (eg fish fingers, burgers, chips)
- Dairy products (milk, cheese, yoghurt)
- Meals prepared from raw fresh fish
- Meals prepared from raw fresh chicken
- Meals prepared from other raw fresh meat

**FB7. Thinking of an average day, which meals did you usually partake in?**

- Breakfast
- Lunch
- Dinner
- Snacks

**8. Thinking of an average day, how many times did you typically eat BETWEEN meals (snack)?**

- 4-5
- 2-3
- 1
- Never

**9. How often did you look at the labels with nutritional information on food?**

- Always
- Fairly often
- Sometimes
- Never

**10. If you did read labels, please tick what nutritional information you looked at (tick all that apply).**

- Serving size
- Energy (kilojoules)
- Protein
- Fat
- Carbohydrates
- Sugars
- Dietary Fibre
- Sodium
- Other \_\_\_\_\_

**11. How often (during a typical week) would you purchase takeaway food (McDonalds, Chinese takeaway, Fish and Chips shops etc)?**

- Every day
- 4-6 times a week
- 2-3 times a week
- Once a week
- Never

**12. How often did you consume any kind of drink containing alcohol?**

- Every day
- 5 - 6 times a week
- 3 - 4 times a week
- Twice a week
- Once a week
- Never
- Prefer not to say

**13. How would you rate your sleep quality?**

- Very good
- Good
- Average
- Poor
- Very poor

**14. How long did it typically take for you to fall asleep?**

- 0-15 min
- 16-30 min
- 31-45 min
- 46-60min
- >60 min

**15. Did you feel like you lead a ...**

- Very healthy lifestyle
- Fairly healthy lifestyle
- Not very healthy lifestyle
- Unhealthy lifestyle