

Incidence of Food Insecurity Risk Factors Within a Large, Obesogenic Regional Community: A Population-based Study

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Abstract

Aim: This descriptive study examined the incidence of food insecurity indicators in a large regional community, in Queensland, Australia, where high rates of obesity and corresponding obesity-driven non-communicable diseases are present. The implications of food insecurity in a large regional community are due to findings within the literature that demonstrate an association between mild-to-moderate food insecurity and a higher incidence of overweight or obesity. This concept was termed the 'food insecurity obesity paradox' within the literature.

Subject and Methods: Six key food insecurity risk factors were examined using chi-square analysis and odds ratio, including education level, unemployment, single-parent status, rental status, Indigenous heritage, and young people. Publicly available information from the Australian Bureau of Statistics was utilized for data analysis.

Results: Analysis indicated that social inequity, associated with food insecurity may result in higher obesity levels within regional Australia. These findings were even more pronounced among females, young people, and Indigenous community members, who had a higher incidence of corresponding social and cultural determinants that influenced experience of food system inequity.

Conclusion: The present study has indicated that high rates of obesity in 'at risk' communities, government policies designed to create social mobility to address social inequity, may be effective in decreasing obesity rates and the associated corresponding chronic disease burden.

1. Introduction

The worldwide high incidence of obesity is contributing to rising and unprecedented burden of chronic disease on healthcare systems and increases pressures on finite resources within healthcare systems across the world (Australian Institute of Health and Wellbeing [AIHW] 2018a). Reducing this rise in obesity levels has been identified by the World Health Organisation (WHO) as a global priority in 2018, stating that it is one of the biggest health challenges of the 21st century (2018a). This public health challenge is one of the key factors leading to significant increases in rates of non-communicable chronic diseases such as coronary artery disease, Type 2 diabetes, and stroke in many regional areas in Queensland, Australia, and throughout the world (AIHW 2018a). The prevalence of obesity and severe obesity are projected to increase to 35% by 2025 in Australia compared to 19% in 1995 (Hayes et al, 2017).

The scientific literature has demonstrated that obesity rates may be meaningfully influenced by food insecurity in specific instances. Mild-to-moderate food insecurity which is defined as a reduction in the quality, variety, or desirability of dietary intake (Franklin et al, 2012; Dhurandhar 2016) does not involve hunger; however, it can disrupt nutritional intake. However it is not clear why the food insecurity paradox is correlated with obesity, although it is proposed that high calories (with low nutritional value food) is consumed in lower socio-economic and food insecure regions and these patterns are influenced by social and cultural determinants (Hayes et al, 2017).

This study was conducted to better understand rates of food insecurity risk factors in the Ipswich community, a large regional community in South East Queensland, Australia (Ipswich City Council, 2017). Food insecurity risk factors were chosen due to the lack of research undertaken to assess rates of food insecurity in this region. Ipswich community was selected as a case study because people residing in Ipswich experience a

disproportionately high level of obesity, do not consume adequate amounts of fruit and vegetables, and have a higher incidence of non-communicable chronic diseases such as diabetes, heart disease, stroke and cancer (Darling Downs and West Moreton Public Health Network [DDWMPHN], 2017; Queensland Health, 2018). The 2018 Regional Year Book (Department of Infrastructure, Transport, Cities and Regional Development, 2018) stated that 78.3% of the Ipswich population are overweight or obese compared with 71.7% in 2007. Additionally, according to the SEIFA Index of Disadvantage that measures socio-economic disadvantage characteristics such as unemployment, income, and educational attainment, the Ipswich community has been identified as an area of significant social disadvantage within the top 25% of disadvantage within the state of Queensland (.idcommunity, 2016).

2. Literature Review

Australia has experienced a rapid and sustained increase in obesity levels, reaching 63% of the adult population (Australian Bureau of Statistics [ABS], 2015), with 71% of men and 56% of women being classified as overweight or obese (AIHW, 2018a). These increasing obesity rates are causing a significant resource drain and adversely impacting health care service optimization. The AIHW (2018a) states that being overweight or obese significantly increases the risk of mortality from all causes by 31% with each 5kg/m² increase in body mass index (BMI). Obesity is implicated as a salient risk factor for the majority of the significant disease burdens occurring in Australia and across the Western world (AIHW, 2018a). Adults in the lowest socioeconomic geographic areas were 34% more likely to be obese (AIHW, 2018a). In fact, adults living in disadvantaged areas in Queensland were 49% more likely to be overweight than those in advantaged areas. Children in disadvantaged areas in Queensland were 25% more likely to be obese (Queensland Health 2016).

Further, it is well established that some demographic subsets within Australia are faring worse in terms of obesity rates. The Aboriginal and Torres Strait Islander Health Performance Framework report showed that Aboriginal or Torres Strait Islanders were much more likely to be overweight (43%) and obese compared to 28% of the non-Indigenous population (AIHW, 2018a; AIHW, 2018b) and overweight accounts for 70% of the Indigenous population over the age of 18, compared to 63% of the non-Indigenous population (AIHW, 2018a; AIHW, 2018b). Fifty-eight percent of all deaths in the Aboriginal and Torres Strait Islander population in Australia, between 2011 and 2015 have been classified by the National Healthcare Agreement 2015 Standards as 'avoidable' and consist of non-communicable, obesity-driven mortality outcomes (AIHW, 2018b).

Research undertaken by Egen and colleagues in the United States of America (USA), using median household incomes, demonstrated a link between socioeconomic disparities and significant differences in rates of obesity and life expectancy (Egen, Beatty, Blackely, Brown, & Wykoff, 2017). This comprehensive, longitudinal study found that social-economic stressors such as low income are associated with higher rates of obesity and lower life expectancy (Egen, et.al., 2017). This finding is supported by a large sample size, where Cook and colleagues (2017) established that Asian-American children and adolescents who were from a low socio-economic (SES) ethnic group were significantly more likely to be overweight than those in the high or middle SES group.

Whilst these correlations between social determinants and higher obesity rates are clear, the specific causation remains complex, which reinforces the critical need to undertake further research that explores obesity within a social model of health lens, rather than a biomedical model of health. One theory that potentially accounts for these associations is the 'Food Insecurity Obesity Paradox', which describes how low-to-moderate food insecurity

is linked with high obesity rates. There are four pillars to food security; availability of food, access to food, affordability of that food, and the use of food (Charlton, 2016). Charlton (2016, p. 73) defines food security as “the physical, social and economic ability to access sufficient, safe and nutritious food”. Auckland, King, Murray, and Saunders (2015 p. vii), however, attempts to define food security in a much broader sense as being when “all citizens obtain a safe, personally acceptable, nutritious diet through a sustainable food system that maximizes health choices, community self-reliance and equal access for everyone”. This latter definition of food security takes into account the broader social and cultural context of food choices, accessibility, use, and availability in an equitable food system.

There are varying degrees of food insecurity; Franklin and colleagues stated that food insecurity can range from hunger to mild food insecurity (Franklin et al., 2012). Dhurandar (2016) identified that food insecurity is mild-to-moderate when food can be accessed most of the time; however, this may not be the most nutritional food for the household which leads to a disrupted eating pattern. The ‘Food Insecurity Obesity Paradox’ states that those who are experiencing food insecurity, not driven by hunger, but rather social and cultural constructs that are determining their food choices, are more likely to experience obesity (Ramsey, et al., 2011). Research clearly indicates that mild-to-moderate food insecurity is directly associated with an increased risk of being overweight or obese (Dhuranda (2016); Franklin et al., 2012; Loo & Skipper, 2017). Martin and Ferris (2007) were one of the first research teams who demonstrated that mild-to-moderate food insecurity is directly related to obesity rates (Martin & Ferris, 2007). Franklin and colleagues reviewed 65 studies conducted between 2005 and 2011 specifically investigating the links between obesity and food insecurity. Thirty percent of these studies showed a positive correlation between obesity and food insecurity (Franklin, et al., 2012).

Multiple studies from within Australia and USA strongly demonstrate the link between challenging socio-economic drivers, mild-to-moderate food insecurity, and obesity (Ramsey, et al., 2012b; Rosier, 2012). There is further evidence suggesting that this is particularly prevalent among women, with one study demonstrating women from food-insecure households were up to two BMI units heavier than women from food-secure households (Martin & Ferris, 2007; Franklin, et al., 2012). The risk of women being in food-insecure households was directly related to single-parent status, renting, lower-income, and lower educational attainment, resulting in women within Australia experiencing a higher percentage of not just one, but multiple food insecurity risk factors (Martin et al., 2017; McDonald, 2011). Swinburne et al., (2020) demonstrated that the levels of obesity are greatly disproportionate in populations in low-income countries, particularly women. Additionally, after analyzing socio-economic characteristics for both adults and childhood obesity within food insecure households, Martin and Ferris (2007) found that girls are at two times the risk of being overweight or obese than boys, if their parents are obese.

Data for food insecurity in regional Australia is sparse and incomplete. It is apparent from this body of research, that the ‘Food Insecurity Obesity Paradox’ is prevalent in many lower, socio-demographic areas around the world. The ‘Food Insecurity Obesity Paradox’ was identified in the literature as early as 2004 by Burns as a “hidden crisis” occurring within Australian communities. The findings in this review of literature have determined the food insecurity risk factors that have been further analyzed in this study.

3. Data And Methodology

The detailed, longitudinal characterization of the Ipswich community to determine food insecurity risk factors was undertaken with publicly available data on the ABS website from 2006, 2011, and 2016 census (ABS, 2017a, 2017c, 2017d). The sample utilized in this study was from the census community profile data collected from 2006, 2011, and 2016, which represents the three most recent census periods (ABS, 2017a, 2017c, 2017d). The community profile for the local government area (LGA) of Ipswich was extracted from the ABS website (ABS, 2017a). The 2016 census data included 200,123 people and a geographical land area of 108,497.8 hectares (ABS, 2017a). This population rose from 140,182 people in 2006, with an increase of 42.76% over the ten years (ABS, 2017d). The boundaries of the LGA of Ipswich did not geographically change over this period.

The community population profiles containing data for LGA provides specific data about Aboriginal and Torres Strait Islander peoples, time series, place of paid work, social community data, and working population data (ABS, 2017b). These profiles allow researchers accessing the data to compare and contrast LGA's and overall comparative Australian statistics.

Data Management and Analysis:

Initially, the relevant food insecurity risk factor population data was extracted from the ABS community profiles for Australia and Ipswich. The data was 'cleaned' to ensure that a population would not be counted twice (Abbott, 2016). For example, when ascertaining the relevant data for the Indigenous population variable for Ipswich, the number of Indigenous people in Ipswich was subtracted from the overall population for Ipswich, so that the Indigenous population was not counted twice.

The Chi-Square test including the p -value was then calculated within a Microsoft Excel 2016 spreadsheet using the Chi-Squared formula (Abbott, 2016). This was done by the following steps:

- a. Finding the variables of interest (e.g., Indigenous Australians and the other population of Australia) within the ABS Community Profiles;
- b. Extracting the relevant data (i.e. the number of persons within the populations who do and do not have certain food insecurity risk factor);
- c. Chi-Squared test of independence was then calculated (see below for formula), with p values of $< .05$ used as statistically significance was calculated using an excel spreadsheet. The expected count was also calculated;\

$$\chi^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$$

- d. This was replicated for the 2006, 2011, and 2016 census data points to evaluate for trends over time.

An additional consideration with large sample sizes is that of Type I error, i.e. the inaccurate rejection of the null hypothesis or "false positive" (Nickerson, 2011). When examining relationships and differences when using large samples, statistically significant results are often found that do not reflect a practical significance (Khalilzadeh & Tasci, 2017). To provide a more accurate interpretation of significant results, effect sizes need to be utilized in result interpretation. However, due to the complex measurement that is often involved in social science, studies with large sample size often report smaller effect sizes, making an accurate assessment of practical significance

difficult (Levine, Asada, & Carpenter, 2009; Slavin & Smith, 2009). As such, to compensate for both shortcomings in significance and effect size, the odds ratio (i.e., the odds of an outcome across conditions) was used as a measure of effect size in this analysis (Levine et al., 2010).

4. Results

The results are presented according to the identified food insecurity risk factors including education level, level of unemployment, single-parent status, renting status, and the Indigenous population and young people. Additionally, when data was available to represent gender, the gender comparison for the Ipswich region has also been presented within the corresponding section.

Overall percentage analysis results

The initial analysis determined the percentage of the population within Australia and Ipswich with at least one food insecurity risk factor, over the three previous census point data collections. **Table 1.1** displays these percentages. Overall, it is clear from the percentage data represented that Ipswich had a higher percentage of the population who were experiencing these food insecurity risk factors. These percentages were higher than the national average in almost all categories over the three census dates. However, further analysis was required to understand the statistical significance and the relationship between these variables, hence, the ChiSquared test and p -value were calculated and are presented and discussed below.

Chi-Square test and percentage difference results

A Chi-Square test of independence was calculated on the following variables outlined below, to examine the statistical significance between these variables (Abbott, 2016). This analysis aims to ascertain if the Ipswich population had a higher proportion of people with food insecurity risk factors than the general population in Australia. This is presented in table form, to demonstrate relationships of expected and actual population counts and includes the Chi-Squared analysis value, the p -value, and the odds ratio value.

The following section analyses the young person (15-24 years of age) population in Ipswich in combination with education, single parent, and employment food insecurity risk factors. This analysis has been undertaken to determine if two food insecurity risk factors were prevalent in the Ipswich young person population and comparisons made to the overall Australian young person population when analyzing each risk factor.

The following section analyses the Indigenous population in Ipswich in combination with education, single parent, rental and employment status food insecurity risk factors. This analysis has been undertaken to determine if two food insecurity risk factors were prevalent in the Ipswich young person population and comparisons made to the overall Australian young person population when analyzing each risk factor.

5. Discussion

The detailed, longitudinal characterization of the Ipswich community (as a case study) resulted in a comprehensive understanding of the food insecurity risk factors occurring within the region. These results were then juxtaposed to the overall Australian population. This demonstrated that the Ipswich region was at risk of higher rates of multiple food insecurity risk factors than the rest of the country. The analysis of this data has demonstrated that Ipswich experiences five out of six food insecurity risk factors at a higher rate than the rest of

the Australian population with the exception of unemployment (specifically not in labour force demographics). Additionally, many of these risk factors were significantly more likely in the female population in Ipswich. Further analysis also indicated that young people and the Indigenous population groups were likely to experience more than one food insecurity risk factor. The results also demonstrated that for the Indigenous population in Ipswich, there was a further likelihood of a compounding risk factor for rental status, single-parent status, unemployment for females, and being a young person. This is significant for the Indigenous population in Ipswich, as this leads to not only a high risk of food insecurity but additionally, these have all been identified as significant social determinants that lead to poorer overall health outcomes including increased rates of non-communicable diseases and higher mortality rates (Talbot & Verrinder, 2010; Su et al, 2011).

Further, results indicated that Indigenous people from Ipswich were more likely to have completed year twelve than the Indigenous population in the rest of Australia. This may reflect the significant diverse policy initiatives and resources by the state government that has been implemented in the Ipswich region to increase year 12 completion rates for Indigenous people. This does demonstrate how social policy has been customized and prioritized for this group in a community that has been identified as at risk of social inequity. However, the Indigenous population in Ipswich were significantly less likely to have completed year 12 than the non-Indigenous population in Ipswich. Whilst the data is suggesting that this is improving, it is still a point of disadvantage and a food insecurity risk factor for the Indigenous population of Ipswich.

Overall, the Indigenous population in Ipswich is over two times more likely to be a single parent than the non-Indigenous population in Ipswich. Whilst there was no data available for gender differentiation for this risk factor, the overall single parent statistics in the Ipswich region did demonstrate a significantly higher risk for females. Furthermore, this may indicate that the Indigenous female population in Ipswich has multiple, potentially compounding, risk factors for food inequity and the corresponding, socially determined poorer health outcomes (Rumbold & Dickson-Swift, 2012). Additionally, the high rates of renting for the Indigenous population in Ipswich is of concern as the literature demonstrates that renting status may represent a cascade of disadvantage and social inequity which may be compounded by financial insecurity (McDonald, 2011).

Indigenous females in the Ipswich region were significantly more likely to be unemployed. This is also reflected in overall employment data in the region, where females in the overall population were significantly more likely to be unemployed than males. This may be due to historical and culturally constructed family care and domestic responsibilities disproportionate to males (McDonald, 2011). Hence, unemployment is a food insecurity risk factor for both Indigenous and non-Indigenous females in the Ipswich region, which leads to food system and health inequities for this segment of the population.

Additionally, the data analyzed also revealed that there were higher rates of young people (15-24 years of age) in the Ipswich Indigenous population than the overall Australian Indigenous population. The literature demonstrates that young people are less likely to be financially secure and hence, more likely to be renters which is an additional risk factor (McDonald, 2011). The significance of potentially multiple social risk factors that may lead to food insecurity and poorer health outcomes is therefore evident within this population group in Ipswich.

The analysis of gender in the available data revealed a significant difference in the unemployment levels between Indigenous males and Indigenous females in the Ipswich region. Indigenous females in the Ipswich region were significantly more likely to be unemployed. This is also reflected in the overall employment data in the region, where females in the overall population were significantly more likely to be unemployed than males. Additionally,

young people who are females are significantly more likely to be single parents than males in the Ipswich region. This demonstrates that young females in the Ipswich region are at higher risk of multiple and significant food insecurity risk factors that may lead to a higher risk of food insecurity, obesity, and associated non-communicable disease burden (Martin et al., 2007).

The impact of these social determinants in the Aboriginal and Torres Strait Islander community has resulted in and been perpetuated by transgenerational trauma, social and health inequity, and cultural degradation caused by gross class and racial divides and government policy aimed at segregation, over the history of white settlement in Australia (Walsh-Dilley, Woldford & McCarthy, 2016). The social, health and cultural systems that have been forced upon the Indigenous peoples of Australia have ostracised this group of people from their traditional food systems, food sources, and cultural and social structures resulting in gross health and nutritional inequities (Rosier, 2012).

Research (McDonald, 2011) demonstrated that young people are at risk of a cascade of disadvantage and social inequity driven by socio-economic factors perpetuated by financial insecurity. The findings from the analysis of food insecurity risk factors for the Ipswich region indicated that there was a higher rate of young people in the community than the overall population in Australia. The analysis revealed the relationships between young people and employment, single-parent status, and education which demonstrated that young people may be at risk of more than one food insecurity risk factor, which may result in social, health, and food inequity (Rumbold et al., 2012; Talbot et al., 2018).

However, the findings presented in this paper also reflected that young people in Australia are much less likely to be single-parents than those in the over 25 years of age group. This may potentially reflect the high divorce rates Australia is experiencing, which occurs predominately outside of this age group (McDonald, 2011). However, in Ipswich, young people are over two times more likely to be single-parents relative to the rest of Australia. This is a significant risk factor for the young people in the Ipswich community as this social determinant is correlated with food insecurity risk and further health disparities (Charlton, 2016; Ramsey et al., 2012) and coupled with age, is a compounding risk. Additionally, young people who are females are significantly more likely to be single-parents than males in the Ipswich region. This demonstrates that young females in the Ipswich region are at higher risk of multiple and significant food insecurity risk factors that may lead to a higher risk of food insecurity, obesity, and associated non-communicable disease burden such as Type 2 Diabetes (PHN HNA, 2018; Martin et al., 2007).

When analyzing the risk factor of education for young people, the data reflected that young people across Australia, including in Ipswich, are more likely to have completed year 12 as opposed to people over the age of 25. This is reflective of the general trend in society, of more people completing secondary education (McDonald, 2011). However, in Ipswich, young people are less likely to complete their secondary education compared to the rest of Australia. This is a significant additional risk factor for young people in the Ipswich region. This risk factor, however, was more significant for males in Ipswich than females, which may indicate the fact that more young males in lower SES areas leave school before year 12 to enter trades (McDonald, 2011).

The results from this study have established that for young people in the Ipswich region, the unemployment trend is increasing and the single-parent status is significantly higher than the rest of the Australian population in this age group, particularly for young women. The young people population group in Ipswich is also more likely to have not completed year 12 than compared to young people in Australia. This leads to young people in Ipswich at risk of multiple and at times significant risk factors which may be resulting in food system inequity. This has

significant social health policy implications for strategies that attempt to influence nutritional intake within the Ipswich region for this population.

One positive trend that is occurring in the Ipswich region for young people demonstrates that the gap has closed between males and females in relation to employment, with no difference in the employment levels for either male or female young people by 2016. A factor that may influence the rates of young people entering the workforce may be single-parent status or if they are staying at home parents. Those people, who are more likely to be women (Franklin et al., 2012), would not be reflected in unemployment data which may potentially influence this trend. Hence, these figures may not be reflective of what is occurring in the Ipswich region. Further cross-sectional analysis would be required to ascertain if this is a more significant problem than what is reflected in the data analyzed in this study.

The social inequities driving food insecurity include education, single-parent status, rental status, and the Indigenous and young people demographics within the Ipswich community are significant. Additionally, there are several significant food insecurity risk factors for women, Indigenous people and young people in the Ipswich region and the data does indicate that potentially concurrent risk factors may be occurring within these population groups. The literature indicates that these social inequities lead to a higher risk of food insecurity, higher risk of being overweight or obese, higher mortality rates, and higher non-communicable disease rates (AIHW, 2018; Talbot et al., 2010; WHO, 2018a).

Strengths, Limitations And Opportunities

A strength of this research is that it accessed a very large, robust, publically available data set from the ABS, which gave a clear data in relation to the prevalence of food insecurity risk factors for the Ipswich community. Further opportunities exist to extend this research to include the next census data release to further understand trends occurring within the Ipswich community. This data set provided information on inequities occurring within Ipswich which is not only applicable to the food system and has wider health implications for the community. Social inequities have been linked to overall lower life expectancy, higher morbidity rates and poorer disease survival rates. This has broad implications for future practice, research and social health policy.

Whilst this data identified the prevalence of food insecurity risk factors, there has however been no studies conducted within the Ipswich community of self reported food insecurity rates. Further research is required to understand this phenomena that is occurring in the community and the relationship to obesity rates.

Conclusion

Whilst this data highlights 5 out of 6 risk factors are more pronounced in the Ipswich community than the rest of Australia, this does not directly demonstrate the degree to which food insecurity is present or direct causation between these risk factors and high obesity rates. However, many risk factors for food insecurity have been identified within the Ipswich community that are occurring at a higher rate than elsewhere in Australia. This has several implications for the development of social health policy. The research suggests that government policies based on increasing social mobility in lower socio-economic regions may be required to address the obesity epidemic. Food system inequities require a long-term, sustained, and strategic leadership approach to prioritize the most vulnerable within society, which will need bi-partisan government support, multi-sectoral collaboration, and strong leadership to slowly enhance food system equity within the community. Friel and colleagues (2015)

argue that an effective and sustainable response to increasing levels of obesity must include both broader structural approaches that address social inequity. This includes understanding the socio-economic demographics of the community in which interventions are embedded and influencing food insecurity risk factors.

Declarations

Ethics approval and consent to participate

This study utilised publically available information found on the Australian Bureau of Statistics website from census data, hence no ethics approval was required.

Consent for publication

All authors give consent for publication in the Journal of Health, Population and Nutrition.

Availability of data and material

The authors retain the original data and material in line with research data management policies at The University of Southern Queensland.

Competing interests

The authors declare that there are no competing interests affecting the quality or integrity of this research.

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Authors' contributions

All authors contributed in a meaningful way to this body of research and manuscript.

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Availability of data and material (data transparency): All data utilized is publicly available on the Australian Bureau of Statistics website from the 2006, 2011, and 2016 census.

Code availability: Not applicable

Authorship contribution statement: All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by Aletha Ward, John Gilmour, Amy Mullens, and Cath Rogers. The first draft of the manuscript was written by Aletha Ward and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Tables

Table 1. Percentage of population with food insecurity risk factors in Ipswich and Australia

Food insecurity risk factors	2006		2011		2016	
	Ipswich	Australia	Ipswich	Australia	Ipswich	Australia
	N=241,707	N=19,855,287	N=281,788	N=21,507,719	N=323069	N=23,401,892
Single Parent Households	19.84%	15.61%	20.52%	15.64%	20.92%	15.56%
Male	3.49%	2.72%	3.66%	2.86%	3.72%	2.95%
Female	16.34%	13.35%	16.86%	13.38%	17.20%	13.29%
Indigenous	3.37%	2.29%	3.84%	2.55%	4.35%	2.77%
Male	1.66%	1.13%	1.90%	1.26%	2.18%	1.38%
Female	1.72%	1.16%	1.94%	1.29%	2.17%	1.40%
Young people (0-24)	38.57%	33.45%	38.67%	32.60%	37.85%	31.42%
Male	19.70%	17.12%	19.69%	16.70%	19.31%	16.08%
Female	18.86%	16.33%	18.98%	15.90%	18.54%	15.34%
Rental Households	30.62%	19.38%	36.84%	20.87%	39.67%	20.97%
High School (Less than Y12)	55.26%	47.88%	48.87%	42.25%	42.75%	37.41%
Male	27.60%	23.52%	24.45%	20.95%	21.47%	18.72%
Female	27.67%	24.36%	24.42%	21.30%	21.28%	18.69%
Unemployed	3.17%	3.16%	4.57%	3.46%	5.63%	4.14%
Male	1.51%	1.69%	2.40%	1.84%	2.90%	2.22%
Female	1.67%	1.47%	2.16%	1.61%	2.73%	1.92%
Not in labour force	31.97%	33.11%	31.41%	33.00%	30.65%	33.08%
Male	12.28%	12.96%	12.39%	13.27%	12.52%	13.86%
Female	19.69%	20.16%	19.02%	19.72%	18.13%	19.22%
Total not working	35.14%	36.28%	35.98%	36.45%	36.27%	37.22%
Male	13.78%	14.65%	14.79%	15.12%	15.41%	16.08%
Female	21.36%	21.63%	21.19%	21.33%	20.86%	21.14%

NB. The percentages do not add up to 100% overall because individuals could belong to more than one category.

Table 2.1. Food Insecurity Risk Factors for the overall Ipswich population and the overall Australian population

	2006		2011		2016	
	Ipswich	Australia	Ipswich	Australia	Ipswich	Australia
Education						
Year 12 not completed	58886	7562666	59377	6968259	60343	6766733
Year 12 completion	37423	6685801	52257	8136358	68567	9740481
Test Statistics χ^2	2499.17*		2219.59*		1789.11*	
Odds Ratio (95% CI)	1.39 (1.37-1.41)		1.33 (1.31-1.34)		1.27 (1.25-1.28)	
Employment						
Not working	37443	5737479	45718	6283724	53617	7031435
Working	69111	10074043	81353	10952901	94197	11858028
Test Statistics χ^2	60.21*		12.41*		56.75*	
Odds Ratio (95% CI)	0.95 (0.94-0.96)		0.98 (0.97-0.99)		0.96 (0.95-0.97)	
Single Parent						
Other families	7220	799748	8795	859174	10473 (7789)	908655
Test Statistics χ^2	496.49*		779.32*		1105.13*	
Odds Ratio (95% CI)	1.34 (1.31 – 1.38)		1.40 (1.36 – 1.43)		1.44 (1.41 -1.47)	
Renters						
Non Renters	14566	1087529	20751	1246414	25256	1304694
Test Statistics χ^2	32999		4550294		35577	
Odds Ratio (95% CI)	3876.94*		8784.08*		13580.85*	
Odds Ratio (95% CI)	1.85(1.81 – 1.88)		2.23(2.19 – 2.27)		2.51(2.47 -2.55)	
Young people						
15-24 year old	20434	2683832	24710	2841762	27391	2960997
Over 25 year old	86120	13127690	102361	14394863	120423	15928466
Test Statistics χ^2	364.31*		801.33*		903.59*	

Note: * $p < .001$.

Table 2.2. Food insecurity risk factors for the Female and Male population in Ipswich

	2006		2011		2016	
	Female	Male	Female	Male	Female	Male
Education						
Year 12 not completed	29482	29404	29671	29706	30046	30302
Year 12 completion	19568	17855	27418	24839	36234	32331
Test Statistics χ^2	45.22*		69.36*		120.18*	
Odds Ratio (95% CI)	0.91 (0.89-0.94)		0.90 (0.89 – 0.94)		0.88 (0.87 -0.90)	
Not working						
Working	22756	14687	26921	18797	30833	2278
Test Statistics χ^2	2397.36*		1939.01*		1368.81*	
Single Parent						
Other families	5949	1271	7227	1568	8612	1860
Test Statistics χ^2	3135.05*		3756.94*		4364.90*	
Odds Ratio (95% CI)	5.01 (4.71 - 5.33)		4.93 (4.67 – 5.12)		4.87 (4.62 -5.12)	

Note: * $p < .001$.

Table 3.1 Percentage of Food Insecurity Risk Factors for young people in Ipswich compared to percentage of young people in Australia

Young people 15 - 24 year old with food insecurity risk factors	2006		2011		2016	
	Ipswich N=20,434	Australia N=2,469,966	Ipswich N=24,710	Australia N=2,633,902	Ipswich N=27,391	Australia N=2,725,979
Single Parent Households	3.32%	1.52%	3.12%	1.40%	2.41%	1.10%
Not completed year 12	29.28%	24.36%	29.19%	24.96%	2.41%	18.92%
Male	16.36%	14.17%	16.13%	14.80%	12.59%	11.20%
Female	12.92%	10.19%	13.06%	10.17%	10.79%	7.73%
Unemployed	6.71%	6.38%	9.68%	7.46%	12.32%	9.00%
Male	3.30%	3.44%	5.23%	4.04%	6.72%	4.92%
Female	3.42%	2.94%	4.45%	3.42%	5.60%	4.08%
Not in workforce	27.28%	31.41%	29.98%	33.60%	29.85%	34.02%
Male	12.75%	15.61%	14.19%	16.90%	14.63%	17.50%
Female	14.53%	15.79%	15.80%	16.70%	15.22%	16.52%
Total not working	34.00%	37.79%	39.66%	41.06%	42.17%	43.02%
Male	16.05%	19.05%	19.42%	20.94%	21.36%	22.42%
Female	17.95%	18.74%	20.24%	20.12%	20.82%	20.60%
Not working relative to total population	6.52%	6.42%	7.71%	6.78%	7.82%	6.75%
Male	3.08%	3.24%	3.78%	3.46%	3.96%	3.52%
Female	3.44%	3.18%	3.94%	3.32%	3.86%	3.23%

The definition of a young person was determined by using the 15 – 24 age group in the ABS census data.

Table 3.2 Ipswich 15-24 year old age group compared to Ipswich over 25 years of age employment, single parent and education status

	2006		2011		2016	
	5-24 year old	25 years+	15-24 year old	25 years+	15-24 year old	25 years+
Employment						
Not Working	6947	30496	9800	35918	11552	42065
Working	13487	55624	14910	66443	15839	78358
Test Statistics χ^2	14.48*		180.51*		506.49*	
Odds Ratio (95% CI)	0.94 (0.91 – 0.97)		1.22 (1.18 – 1.25)		1.36 (1.32 – 1.40)	
Single parent status						
Single Parent Household	679	6541	770	8025	661	9812
Other	18319	105168	22318	124987	24533	143413
Test Statistics χ^2	161.92*		269.39*		559.52*	
Odds Ratio (95% CI)	0.60 (0.55 – 0.65)		0.54 (0.50 – 0.58)		0.40 (0.36 – 0.43)	
Education						
Grade 12 not completed	2924	55962	3551	55826	3225	57088
Grade 12 completed	6347	31076	7793	44464	9546	59021
Test Statistics χ^2	3784.04*		2429.25*		2609.83*	
Odds Ratio (95% CI)	0.26 (0.24 – 0.27)		0.36 (0.35 – 0.38)		0.35(0.34 – 0.37)	

Note: * $p < .001$.

Table 3.3 Ipswich 15-24 year old compared to Australian 15-24 year old employment, single parent and education status

	2006		2011		2016	
	Ipswich 15-24 year old	Australia 15-24 year old	Ipswich 15-24 year old	Australia 15-24 year old	Ipswich 15-24 year old	Australia 15-24 year old
Employment						
Not Working	6947	1021816	9800	1176934	11552	1285511
Working	13487	1682450	14910	1689538	15839	1702877
Test Statistics χ^2	125.68*		20.15*		8.00*	
Odds Ratio (95% CI)	0.85 (0.82 - 0.87)		0.94 (0.92 - 0.97)		0.97 (0.94 - 0.99)	
Single Parent						
Single Parent Household	679	40971	770	40084	661	33004
Other	18319	2428995	22318	2593818	24533	2692975
Test Statistics χ^2	430.53*		510.97*		424.43*	
Odds Ratio (95% CI)	2.21 (2.05 - 2.40)		2.25 (2.10 - 2.43)		2.22 (2.06 - 2.40)	
Education						
Grade 12 not completed	2924	326526	3551	359809	3225	292257
Grade 12 completed	6347	905447	7793	1009880	9546	1141643
Test Statistics χ^2	119.64*		147.02*		198.73*	
Odds Ratio (95% CI)	1.28 (1.22 - 1.33)		1.28 (1.23 - 1.33)		1.33 (1.28 - 1.39)	

Note: * $p < .001$.

3.4. Female 15-24 year old employment status compared to Male 15-24 year old employment status in Ipswich.

	2006		2011		2016	
Work Status	Female	Male	Female	Male	Female	Male
Not Working	3668	3279	5002	4798	5702	5850
Working	6331	7156	7231	7679	7849	7990
Test Statistics χ^2	62.97*		15.30*		0.10*	
Odds Ratio (95% CI)	1.26 (1.19– 1.34)		1.11 (1.05 – 1.17)		1.00 (0.95 – 1.04)	
Parental Status						
Single Parent	638	41	714	56	621	43
Non – Single Parent	9361	10394	11519	12421	12930	13797
Test Statistics χ^2	569.88*		593.92*		528.27*	
Odds Ratio (95% CI)	17.28 (12.58– 23.72)		13.75 (10.46 - 18.07)		15.41 (11.30 – 21.01)	
Education						
Grade 12 not completed	1290	3383	1589	1962	1499	1750
Grade 12 completed	1634	2979	4134	3659	4957	4590
Test Statistics χ^2	64.10*		67.22*		32.45*	
Odds Ratio (95% CI)	0.70 (0.64– 0.76)		0.72 (0.66 - 0.78)		0.79 (0.73– 0.86)	

Note: * $p < .001$.

Table 4.1 Percentage of Food Insecurity Risk Factors for Indigenous people in Ipswich compared to the percentage of Indigenous people in Australia

Indigenous population with Food insecurity risk factors	2006		2011		2016	
	Ipswich N=4,729	Australia N=450,301	Ipswich N=6,417	Australia N=541,953	Ipswich N=8,429	Australia N=640,742
Single Parent Households	37.76%	33.87%	37.78%	33.36%	36.38%	32.18%
Rental	61.64%	60.25%	63.63%	59.36%	64.33%	57.34%
Young people (0-24)	62.89%	56.50%	61.62%	55.21%	60.81%	53.01%
Male	32.16%	28.78%	31.31%	28.14%	31.76%	27.17%
Female	30.73%	27.73%	30.31%	27.07%	29.08%	25.84%
Not completed year 12	64.64%	68.15%	58.59%	64.23%	54.30%	59.15%
Male	29.74%	32.69%	27.46%	30.92%	36.93%	28.93%
Female	34.90%	35.46%	31.14%	33.31%	27.78%	30.22%
Unemployed	8.23%	7.89%	10.22%	8.67%	11.46%	9.44%
Male	4.12%	4.23%	5.71%	4.85%	6.03%	5.22%
Female	4.12%	3.66%	4.51%	3.82%	5.47%	4.22%
Not in labour force	41.96%	42.74%	42.05%	44.38%	39.93%	44.34%
Male	17.00%	17.68%	18.17%	19.06%	17.07%	19.95%
Female	24.96%	25.06%	23.88%	25.31%	22.93%	24.39%
Total not working	50.19%	50.72%	52.27%	53.05%	51.40%	53.79%
Male	21.12%	22.00%	23.88%	23.91%	23.10%	25.18%
Female	29.08%	28.72%	28.39%	29.14%	28.39%	28.61%
Unemployed 15-24	13.00%	10.71%	14.81%	12.16%	16.76%	13.33%
Male	6.26%	5.88%	8.65%	6.92%	8.93%	7.49%
Female	6.74%	4.83%	6.16%	5.24%	7.83%	5.83%
Total not working 15-24	55.91%	57.16%	61.11%	61.62%	60.42%	60.93%
Male	27.54%	27.17%	31.25%	30.30%	30.76%	31.04%
Female	28.37%	29.99%	29.85%	31.32%	29.71%	29.89%

Table 4.2. Ipswich Indigenous population compared to Ipswich non-Indigenous population education, rental, single parent and education status

	2006		2011		2016	
	Indigenous	Non-Indigenous	Indigenous	Non-Indigenous	Indigenous	Non-Indigenous
Employment						
Not Working	1305	36138	1959	43759	2632	50985
Working	1295	67816	1789	79564	2489	91708
Test Statistics χ^2	14.48*		180.51*		506.49*	
Odds Ratio (95% CI)	0.94 (0.91– 0.97)		1.22 (1.18 – 1.25)		1.36 (1.32 – 1.40)	
Single parent status						
Single Parent Household	606	6614	844	7951	1116	9357
Other	999	28180	1390	32685	1952	37635
Test Statistics χ^2	339.13*		430.78*		471.84*	
Odds Ratio (95% CI)	2.58 (2.32 - 2.87)		2.50 (2.28 - 2.73)		2.30 (2.13 – 2.48)	
Education						
Grade 12 not completed	1680	57206	1991	57386	2502	57841
Grade 12 completed	625	36798	1064	51193	1875	122002
Test Statistics χ^2	137.05*		181.14*		195.02*	
Odds Ratio (95% CI)	1.73 (1.58– 1.90)		1.67 (1.55- 1.80)		1.54 (1.45 – 1.64)	
Rental Status						
Renting	1144	13422	1653	19098	2319	22937
Non-renting household	712	32287	945	34632	1286	37119
Test Statistics χ^2	874.43*		839.86*		970.54*	
Odds Ratio (95% CI)	3.87 (3.51– 4.25)		3.17 (2.92 – 3.44)		2.92 (2.72 – 3.13)	

Note: * $p < .001$.

Table 4.3. Ipswich Indigenous population compared to Australian Indigenous population education, rental, single parent and education status

	2006		2011		2016	
	Ipswich Indigenous	Australia Indigenous	Ipswich Indigenous	Australia Indigenous	Ipswich Indigenous	Australia Indigenous
Employment						
Not Working	1305	144000	1959	186349	2632	230618
Working	1295	139918	1789	164932	2489	198159
Test Statistics χ^2	0.3		0.92		11.89*	
Odds Ratio (95% CI)	0.98 (0.91 - 1.06)		0.97 (0.91 - 1.03)		0.91 (0.86 - 0.96)	
Single parent status						
Single Parent Household	606	45874	844	56247	1116	67528
Other	999	89579	1390	112377	1952	177193
Test Statistics χ^2	10.97*		19.92*		25.1*	
Odds Ratio (95% CI)	1.19 (1.07 - 1.31)		1.22 (1.11 - 1.33)		1.21 (1.21 - 1.30)	
Education						
Grade 12 not completed	1680	193480	1991	207600	2502	231983
Grade 12 completed	625	54469	1064	80492	1875	122002
Test Statistics χ^2	33.06*		71.13*		133.99*	
Odds Ratio (95% CI)	0.76 (0.70 - 0.84)		0.73 (0.67 - 0.78)		0.70 (0.66 - 0.75)	
Rental Status						
Renting	1144	100408	1653	124099	2319	150832
Non-renting household	712	66251	945	84950	1286	112205
Test Statistics χ^2	1.51		19.81*		72.90*	
Odds Ratio (95% CI)	1.60 (0.97 - 1.17)		1.20 (1.11 - 1.30)		1.37 (1.26 - 1.44)	

Note: * $p < .001$.

Table 4.4. Female Indigenous employment and education status compared to Male Indigenous employment and education status in Ipswich.

	2006		2011		2016	
Work Status	Female	Male	Female	Male	Female	Male
Not Working	756	549	1064	895	1454	1183
Working	590	705	857	932	1186	1290
Test Statistics χ^2	39.84*		15.28*		26.79*	
Odds Ratio (95% CI)	1.65 (1.41 - 1.92)		1.29 (1.14 - 1.47)		1.33 (1.20 - 1.49)	
Education						
Grade 12 not completed	907	773	1058	933	1257	1241
Grade 12 completed	343	282	584	480	1047	833
Test Statistics χ^2	0.15		0.85		12.41*	
Odds Ratio (95% CI)	0.96 (0.80 - 1.16)		0.93 (0.80 - 1.08)		0.81 (0.71 - 0.91)	

Note: * $p < .001$.