

Title: A policy perspective on household food security measures: Extent, severity, and correlates: A population-based survey in Western Australia

Abstract

Objectives: To compare the extent, severity and correlates with household food insecurity among Western Australian adults using the U.S. and Canadian Household Food Security Survey Module (HFSSM) coding systems and assess their suitability for government policy considerations.

Study Design: Continuous cross-sectional population representative computer-assisted telephone interviews

Methods: Between 2017 and 2021, the United States Department of Agriculture's HFSSM was added to the Western Australian Health and Wellbeing Surveillance System in addition to the usual single item measure. Weighted population estimates of the extent and severity of food insecurity were calculated (n=8,684 households), and demographics, socio-economic and lifestyle-related health risk factors were analysed using bivariable regression models, with multivariable models fitted to assess associations for both the U.S. and Canadian coding systems.

Results: Food insecurity prevalence was 3.0, 3.6 and 5.1 percent using the single item, U.S. and Canadian schemes, respectively. There are significant differences between HFSSM classification schemes ($p=0.04$), the U.S. reported 1.8% for both of moderate and severe, compared to 3.4% moderate and 1.7% severe with the Canadian. A significantly higher proportion of food insecurity was reported among households with children. Both systems found significant positive associations with inability to save money, low educational attainment, low income, not owning a house, higher Body Mass Index, stressful life events, and psychological distress ($p<0.05$), with the strength of associations lower using the Canadian system.

Conclusions: Dimensionality and thresholds applied in HFSSM classification influence the extent and severity of food insecurity reported. Robust definition of the policy problem, the first step in policy deliberations, is critical. Findings highlight the importance of instrument and choice of classification scheme in defining the problem and the inadequacy of the single item measure routinely used in Australia.

Key words: food security; food insecurity; measurement; policy; Australia

Introduction

Food insecurity exists “*whenever the availability of nutritionally adequate and safe foods, or the ability to acquire acceptable food in socially acceptable ways is limited or uncertain*” (pg. 5).¹ A preventable public health risk, food insecurity is associated with wide-ranging health consequences: poor diet quality^{2,3}, diet-related disease^{2,3}, emotional and mental health problems^{4,5}, poor growth and development^{6,7}, social and behavioural problems^{6,8}, school absenteeism⁸, and poor academic outcomes^{6,8} in children. The likelihood of adverse consequences increases with the food insecurity severity and chronicity^{7,9}, with intergenerational impact⁹.

The prevalence of this global public health priority is increasing¹⁰, with catastrophic consequences in very low income or war affected countries¹¹ and within wealthy countries^{12,13}. Measuring and defining food insecurity is essential as a nuanced understanding helps identify policy leverage points¹⁴. The United States (U.S.) Department of Agriculture monitors food insecurity using the gold standard 18-item Household Food Security Survey Module (HFSSM)¹⁵ to assess the extent and severity of household food insecurity at a population level, taking children into consideration. Canada uses the HFSSM with different categorisations to calculate severity thresholds for policy responses¹⁶.

Food insecurity monitoring is integral to protecting and promoting public health and is inadequate in many developed countries including in Australia^{17,18}. Australian Governments frame the problem as a small population sub-group issue^{12,17} based on estimates of 3-5% prevalence using single measure, ‘*In the last 12 months was there any time you have run-out-of-food and not been able to purchase more?*’¹⁹. However, true estimates are likely higher¹⁹. The limitations of the single item measure of food insecurity used in Australian government’s monitoring surveys are well described^{20,21}. Population representativeness is essential for policy deliberations, and concerns have been raised that Australian Government policy recommendations are based on unreliable estimates of food insecurity²⁰.

Government policy deliberations in Australia are stifled by inconsistent, inadequate and infrequent food insecurity monitoring. Intelligence is sought from population representative Australian Bureau of Statistics (ABS) surveys that rely on single item instrument that report a 3-5% prevalence and lack granularity regarding the severity of food insecurity, the proportion who experience marginal food insecurity, or the prevalence among children²⁰.

Robust measures are urgently needed to estimate the extent and severity of household food insecurity in Australia. Using the USDAs HFSSM, third sector reports 18-33% of Australian households experienced food insecurity between 2018 and 2021²²⁻²³ and other studies report 4-83%, depending on the studied population subgroups^{21,24,25}. The prevalence discrepancy misrepresents the problem and is a major challenge for policy makers²¹. The Health and Wellbeing Surveillance System (HWSS) is the only government routine monitoring and surveillance system to introduce the 18-item HFSSM on a continuous basis in the Western Australian metropolitan areas. This study aims to analyse HWSS data from 2017 to 2021 with the following research questions:

1. What proportion of households reported experiencing food insecurity using the 18-item HFSSM compared to the single item measure?
2. What demographic and lifestyle factors are associated with food insecurity?
3. How does applying the U.S. or Canada classifications to the 18-item-HFSSM change the results?

Methods

Study design

WA Health's HWSS continuous cross-sectional survey uses Computer-Assisted Telephone Interviews (CATI) and a stratified randomisation to select sample households. Data collected between 2017 and 2021 were used for this study, with the average response rate of 85.9% (91.8% in 2017 to 80.0% in 2021). One person aged 16 years and older per household whose birthday was next completed the survey²⁶. Ethics approval was granted by the [blinded for review] (RGS0000005317) and [blinded for review] Human Research Ethics Committees (HRE2022-0547).

Dependent variables

The food security dependent variables include during the past 12 months used a single 'run-out-of-food' item and the USDA's 18-item-HFSSM^{15,16}, introduced in 2017 to the metropolitan area sample (n=8,684 households pooled between 2017-2021). The 18-item-HFSSM has been used since 1995 in the U.S. and 2004 in Canada, with different coding categorisations to interpret findings^{15,16}. Food insecurity is categorised into four groups, and U.S. scheme

nomenclature is used in this paper: ‘no’ and ‘marginal’ (food secure) and ‘moderate’ and ‘severe’ (food insecure)^{15,16}.

Independent variables

A range of potential protective or risk factors were examined to identify correlates of food insecurity. Socio-demographic variables included were sex, age (in years), highest education attainment, marital status, employment status, country of birth, able to save money, household size, number of children in the household, annual household income (AUD\$), number of social group engagements, private health insurance, government pension support, private homeowners, moved house in the previous 12 months, and level of socioeconomic advantage by geographic area as per ABS’ Socioeconomic Index for Areas Index of Relative Socio-Economic Disadvantage (SEIFA)²⁷.

Lifestyle risk variables included smoking status, alcohol intake (short-term >4 standard drinks a day; long-term >2 standard drinks a day)²⁸. Health-related variables included BMI (kg/m²), self-rated general health (1=poor to 5=excellent), number of clinically diagnosed chronic diseases, and psychological distress using Kessler Psychological Distress Scale-10 of symptoms in the past four weeks (1=low to 4=very high)²⁹. Stressful life events experienced in the last twelve months (e.g., financial hardship, serious injury, marital split)³⁰.

Statistical analyses

Data were weighted using the raking method, adjusting for sex, age, country of birth, marital status, employment status, educational attainment, and household size to match the proportion in the WA adult population as per the ABS’ 2016 Australian Census of Population and Housing^{31,32}. Descriptive analyses were conducted to depict sample characteristics. The weighted prevalence of food insecurity for the run-out-of-food item, the U.S., and Canada HFSSM coding schemes were calculated for the total sample and for households with and without children. A series of bivariable logistic regression models for both the U.S. and Canada schemes were fitted to identify factors associated with food insecurity. Multivariable logistic regression for each classification scheme, using the backward stepwise regression methods, was then fitted including variables that emerged statistically significant at the bivariable level ($p < .10$). The analytical sample for the multivariable logistic regression model was 7,764 following the listwise deletion for the independent variables. Analyses were conducted using Stata v.17³³.

Results

Table 1 shows sample characteristics (n=8,684), 43% male, average age of 67 years old (SD=14.9, range=18-100 years), 65% married, 24% household income of <AUD\$40,000/annum, and 26% attained $\geq$ tertiary degree.

INSERT TABLE 1 HERE

Experiences of food insecurity

Being worried about running out of food (5.2%) had the highest proportion of affirmative responses, and higher proportions of households with children reported affirmative responses than those without (see Table 2).

INSERT TABLE 2 HERE

Extent and severity of food insecurity

Overall, 3.6% of households experienced food insecurity using U.S. compared to 5.1% Canadian HFSSM coding, with statistically significant 1.5% discordance ($p=0.043$). Households with children increased the magnitude of the discordance, 2.3% and 1.3% in households with and without children, respectively. Whereas only 3.2% of households reported using the single item, significantly lower than the U.S. and Canada coding schemes ($p<0.05$). The lowest prevalence of food insecurity was reported in 2020 (2.2% U.S.; 3.4% Canadian) and the highest was in 2021 (5.1% U.S.; 7.5% Canadian). The Canadian classification yielded significantly higher prevalence of food insecurity than the U.S. and the run-out-of-food measure each year ($p<0.001$), see Table 3.

INSERT TABLE 3 HERE

Table 4 shows the severity of food insecurity for the U.S. scheme, 3.6% of households experienced food insecurity (low food security (LFS)=1.9%; very low food secure (VLFS)=1.7%) and 4.9% of households with children compared to 3.3% of those without

children ($p=.0389$). Of the food secure households according to the U.S. system, 4.0% were categorised as marginally FS, with a higher proportion among than those without children (households with children 6.5% versus 3.5%, without children, $p=0.0002$). The Canadian scheme found 5.1% had experienced food insecurity (3.4% were LFS (i.e., moderate) and 1.7% VLFS (i.e., severe)) and 7.2% among households with children compared to 4.7% for those without ($p=0.0063$).

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Factors associated with food insecurity

Weighted univariate logistic regression models revealed that assessed independent variables, except for sex, housing stability and family size, emerged significant ($p<0.1$) for both U.S. and Canada coding schemes.

Multivariable model ($n=7,764$) for the U.S. coding scheme revealed that respondents who were: unable to regularly save money (Adjusted Odds Ratio (AOR)=9.83; 95% CI=5.11, 18.89; $p<0.001$), current smokers (AOR=1.64; 95% CI=0.94, 2.85; $p<0.10$), not house owners (AOR=3.86; 95% CI=2.37, 6.27; $p<0.001$), had private health insurance (AOR=1.82; 95% CI=1.09, 3.04; $p<0.05$), separated, divorced, or widowed (relative to married couples: AOR=1.82; 95% CI= 1.07, 3.10; $p<0.05$), had experienced a psychosocially stressful life event (AOR =2.61; $p<0.01$), and in very high psychosocial distress (AOR=3.08; 95% CI=1.32, 5.18; $p<0.01$) were more likely to experience food insecurity compared to their counterparts. Significantly positive relationships were also found between food insecurity and BMI (AOR=1.04; 95% CI=1.01, 1.07; $p<0.05$), number of children in the household (AOR=1.45; 95% CI=1.04, 2.03; $p<0.05$) and number of chronic diseases (AOR=1.34; 95% CI=1.09, 1.64; $p<0.01$). Conversely, a negative association was found with age-squared (AOR=0.99; 95% CI=0.99, 1.00; $p<0.001$) indicating a nonlinear relationship and the age effect declined as respondents got older. Respondents who completed ≤ 12 year and under (AOR=3.66; 95% CI=1.63, 8.20; $p<0.01$) and trade certificates (AOR=2.21; 95% CI=1.02, 4.80; $p<0.05$) compared to $\geq$ tertiary degree attainers; and those who earned $\leq$ AUD\$40,000/annum compared to $\geq$ AUD\$80,000/annum (AOR=5.15; 95% CI=1.82, 14.52; $p<0.001$) and households in the medium than the least disadvantaged SEIFA (AOR=2.45; 95% CI=1.06, 5.68; $p<0.05$) were more likely to experience food insecurity.

Using the Canadian HFSSM coding scheme, the weighted multivariable model resulted in significant differences between FI and age-squared, ability to save money, education attainment, household annual income, owning a house, BMI, stressful life events and psychological distress ($p < 0.05$ for each comparison), in the same direction as the U.S. coding but the strength of the associations was slightly reduced (see Table 5). Contrary to the U.S. coding scheme, the Canadian coding found non-significant associations between food insecurity and marital status, SEIFA, and smoking status, while age was positively correlated (AOR=1.12; 95% CI=1.04, 1.20; $p < 0.01$).

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Discussion

The current study measured food insecurity and associated factors between 2017 to 2021 using the population-representative WA HWSS survey, comparing a single run-out-of-food item with the 18-item-HFSSM. The single measure significantly under-reported the proportion of the population who were food insecure compared to the U.S. or Canadian HFSSM coding schemes (3.0%, 3.6%, and 5.1% respectively), consistent with previous studies^{21,34}. Governments identify and scope policy problems to inform solutions, programs and services³⁵. Framing the problem is a critical step in the policy cycle, as is the evidence to support this³⁵. The current study findings emphasize the differences in the policy problem based on the choice of measure.

The Canada HFSSM coding scheme classified a significantly higher proportion of households as experiencing food insecurity and the presence of children in the household increased the magnitude of this discordance. The risk of marginal food insecurity was significantly higher using the U.S. HFSSM system and some of these households experienced LFS according to the Canada scheme with the difference due to thresholds applied, e.g., two affirmative responses represent marginal food insecurity in the U.S. categorisation and the Canadian scheme categorises them as moderate^{15,16}. Understanding the marginally food secure population is important as there is an increased likelihood of adverse health consequences and higher health care costs among this group^{36,37}. Food security policy actors should consider the impact of the analysis on the way the problem is presented, for example, the Canadian coding scheme identified the marginally food insecure population which could be a priority for prevention policy.

Temple et al (2024) examined the robustness of the 8-item Food Insecurity Experience Scale (FIES) in the Australian government funded nationally representative Household Income and Labour Dynamics in Australia survey in 2020 and found 6.47% of Australians experienced moderate or severe food insecurity (2.93%) and 8.32% experienced mild food insecurity in the previous 12 months²⁰. Based on their findings, they also highlighted the need for policy deliberations to consider the severity of food insecurity²⁰. However, a limitation of the FIES is that it does not assess food insecurity in children. A national food relief charity introduced the HFSSM measure in their annual Australian survey in 2021²³ reporting a population prevalence of 38% of households experiencing food insecurity (11% marginal, 11% moderately, and 17% severely). The higher prevalence of food insecurity reported in the Foodbank survey is likely due to differences in population representativeness and methodological processes²³), highlights the need for nationally representative government funded surveys.

The discrepancy between the U.S. and Canada HFSSM coding schemes can also be explained by dimensionality differences. Households with children may be categorised differently dependent on the coding scheme applied. The U.S. scheme scores all affirmative responses uni-dimensionality, without distinguishing between adult- and child-focused items and the Canadian scheme considers them separately, bi-dimensionality^{15, 16}. The current study findings highlight these differences by comparing two instruments and the two coding schemes with the same dataset, and suggests caution be taken when selecting the coding scheme to interpret the extent and severity of food insecurity.

The proportion of households experiencing food insecurity was lowest in 2020, consistent with reports of lower income inequality and food security during this period. This may be partially due to the additional financial assistance from the Australian Government during the early stages of the COVID-19 pandemic (e.g., Job Keeper, Job Seeker, the Coronavirus Supplement, and the COVID-19 disaster payment)^{38,39}. The highest proportion of households experiencing food insecurity was in 2021. The potential explanation for the observed increase in food insecurity in 2021 is the withdrawal of government support and an increased housing and living cost following COVID-19 pandemic, with, an estimated 1.7 million Australians had incomes below the poverty line at this time, 25% more than prior to the pandemic³⁸. Food relief agencies also reported sharp increases in demand for services in 2021^{39,40} alongside increasing cost of living and low wage growth⁴⁰. Similarly, a USD\$500/year increase in U.S. rental costs was associated with a three-percentage increase in household food insecurity⁴¹, highlighting the importance of policy to increase wages and

financial supports. This current study was not designed to examine cause and effect; it is recommended that future studies are undertaken to test the relationship between government policy and food insecurity in the Australian context.

In line with previous research, households with children were significantly more likely to experience food insecurity, and with a greater severity^{24,42}. Given the impact of food insecurity during childhood, and its recognition as an adverse childhood experience⁴², this is an important policy focus area. Social vulnerability factors associated with food insecurity identified in this study and a recent systematic review⁴³ suggest policy responses focus on social protection measures, in addition to ensuring the provision of food.

This current study found food insecurity was associated with social vulnerability including educational attainment^{43,44}, household income^{43,44}, BMI^{45,46}, psychological stress problems^{4,5}, home ownership⁴⁷, recent stressful life events⁴⁸, saving ability⁴⁹, households with children under 18 years^{50,51}, private health insurance⁵², and chronic health conditions⁵². However, associations were of slightly reduced strength using the Canada coding scheme.

An unexpected finding was that food insecurity was significantly higher in medium compared to least socio-economically disadvantaged neighbourhoods, with no difference between the least and most disadvantaged. This finding was in line with the Australian research that found families residing in medium socioeconomically disadvantaged areas were not eligible for financial support, despite difficulties balancing several financial, physical, social, or personal issues^{12,53,54}. Policy needs to consider the impact of food insecurity on middle income families and ways to support working families who are financially overcommitted.

Food security monitoring systems using robust tools (e.g., HFSSM) are crucial to understand the depth of the problem, changes over time, and to target efficient, effective and equitable policy. Effective action is unlikely to occur without these routine measures, as without this information, the definition of the policy problem, its prioritisation, identification of determinants, and ability to target action is limited^{12,17}. Incorporating the extent and severity of food insecurity and children is recommended. The HFSSM tool provides a comprehensive information about perceptions of diet quality of food consumed, cutting meal sizes, and skipping meals that are associated with micronutrient deficiency⁵⁵, diet quality and overweight and obesity^{45,46}, and subsequent diet-related chronic disease^{2,3}.

Despite the detrimental consequences of childhood food insecurity⁶⁻⁹, it remains relatively hidden in Australia as it is not measured. Many of the causes of food insecurity are

modifiable through social policies and public health interventions^{12,56}, yet counter to addressing the root cause, ineffective food relief remains the main response in most economically developed countries^{12,17,40}. Food relief is of some benefit but is a policy failure as it does not address the root causes of food insecurity^{11,57,58}. Effective policy precedent exists, the 2006 Canadian financial benefit of CA\$100/month/child under 6 years old reduced food insecurity by 25%⁵⁹ and the 2020 Australian social assistant payments in this study.

Strengths and limitations of the study

A strength of this study is the first Australian government funded, population-based food security surveillance that compares food security measures over five years incorporating the early stages of the COVID-19 pandemic and experiences of households with children. Since 2017, the Western Australian HWSS is the only government routine monitoring and surveillance system to introduce the 18-item HFSSM on a continuous basis. However, the study was only conducted in the metropolitan area as government policymakers responsible for regional areas did not agree to fund the extension of the HFSSM beyond the state capital city. A significantly higher prevalence and severity of food insecurity would be anticipated if regional areas were included as the likelihood of experiencing food insecurity is higher in regional compared to metropolitan areas⁶⁰. Recent research and the current findings suggest that further expansion to include regional to capture geographic differences is warranted. For example, the 2022/23 national Aboriginal and Torres Strait islander Health survey reported that households in remote areas were more likely to experience food insecurity than non-remote areas, 51% compared to 40%⁶¹.

Limitations include that the self-reported CATI survey may be subject to social desirability bias where people report what they think the interviewer wants to hear. The continuous survey over a number of years will likely account for this. The respondents were older and there were fewer households had children under 18 years relative to the Perth population. The methodology and raking weighting to resemble the population, partially accounted for this, nonetheless, bias would remain, so future research with an increased sample size to incorporate families with children is recommended. Some individual respondent characteristics for example, smoking status, may not represent the household. Future studies should be expanded statewide to measure geographic differences in food insecurity and in households with children. Some individual respondent characteristics (e.g., smoking status) may not represent the household. The single item measure reported the lowest proportion of

food insecurity and is likely underestimating the experience of food insecurity. Further, it does not evidence the severity of food insecurity or involvement of children, excluding policy actions based on these.

Author Statements

Ethical approval

HWSS datasets are not publicly available and ethics approval to access data for the current study was obtained from the *[removed for blinding]* Human Research Ethics Committee (RGS0000005317), and a reciprocal ethics approval was received from *[removed for blinding]* Human Research Ethics Committee (HRE2022-0547).

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Competing interests

There are no competing interests to declare. *[removed for blinding]* works in the Epidemiology Directorate at the Department of Health in Western Australia, who implement the survey.

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Table 1

Socio-demographic characteristics of the sampled households in Western Australia 2017-2021 (n=8,684).

Socio-demographics	Total households (unweighted) n (%)	Total households (weighted) %
Sex - male	42.8	45.7
Education		
≤Year 12	32.6	31.3
Tafe/Trade qualification	41.1	44.7
≥Tertiary degree	26.3	24.0
Household annual income		
Under 40,000	34.0	22.2
40,000-80,000	20.9	18.7
Above 80,000	24.3	37.0
Refused/unsure	20.8	22.1
SEIFA		
Most disadvantage	27.3	28.7
Medium	44.7	46.3
Least disadvantage	28.0	25.0
Marital status		
Married/De facto	64.5	63.9
Separate/widowed/divorce	27.1	17.5
Never married	8.4	18.6
Country of birth – Australia	60.1	49.7
Employment– Yes	31.0	50.1
Own house	88.1	86.5
House stability - moved	4.6	6.4
Receive government financial support	48.3	29.0
Age - mean (SD)	67.0 (14.9)	54.39 (17.9)
Number of children – mean (SD)	0.2 (0.5)	0.4 (0.8)
Number of family members – mean (SD)	2.0 (1.0)	2.5 (1.2)

Note: SD= standard deviation

Table 2

Affirmative responses (weighted) for each of the FSSM 18 items (n=8,684)

No.	<i>The 18 items</i>	Affirmative responses	Total sample n=9,684 %	HH without children n=8,090 %	HH with children n=594 %
hh2	Worried food would run out	Often true; Sometimes true	5.2	4.7	7.9
hh3	Food bought just didn't last	Often true; Sometimes true	3.7	3.6	4.2
hh4	Couldn't afford to eat balanced meals	Often true; Sometimes true	4.8	4.6	5.8
ad1	Adult(s) cut or skipped meals	Yes	2.7	2.6	3.3
ad1a	Adult(s) cut or skipped meals, 3+ months	Almost every month; Some months but not every month	1.8	1.8	1.8
ad2	You ate less than felt you should	Yes	2.5	2.5	2.9
ad3	You were hungry but didn't eat	Yes	1.8	1.9	1.3
ad4	You lost weight because not enough food	Yes	1.2	1.2	1.3
ad5	Adult(s) not eat for whole day	Yes	0.7	0.6	1.4
ad5a	Adult(s) not eat for whole day, 3+ months	Almost every month; Some months but not every month	0.6	0.5	0.9
ch1	Few kinds of low-cost food for children	Often true; Sometimes true			5.3
ch2	Couldn't feed children a balanced meal	Often true; Sometimes true			3.9
ch3	Children were not eating enough	Often true; Sometimes true			1.4
ch4	Cut size of children's meals	Yes			0.7
ch5	Children ever	Yes			0.6

	skip meals		
ch5a	Children skip meals, 3+ months	Almost every month; Some months but not every month	0.4
ch6	Children ever hungry	Yes	0.6
ch7	Children do not eat for whole day	Yes	0.0

Note: HH = household

Table 3

Weighted prevalence of food insecurity in WA population, using the U.S. and Canadian coding schemes by year (n=8,684).

Year	U.S. HFSSM classification	Canada HFSSM classification	Ran out of food
2017	3.2 ^{1,a}	5.3 ^{1,b}	2.1 ^{1,c}
2018	4.1 ^{2,a}	5.3 ^{1,b}	4.6 ^{3,c}
2019	3.5 ^{1,a}	4.5 ^{2,b}	2.7 ^{2,c}
2020	2.2 ^{3,a}	3.4 ^{3,b}	2.4 ^{1,a}
2021	5.1 ^{4,a}	7.5 ^{4,b}	4.3 ^{3,c}
All sample combined	3.6 ^a	5.1 ^b	3.2 ^c

Note:

- The prevalence of FI between U.S. and Canadian classifications were compared for each year and across the years between 2017 and 2021 for each scheme.
- Superscript letters in each row shows comparison in the prevalence of FI between different coding schemes on a given year, with a different letter in the same row indicates a significant difference between the two compared schemes in that particular year. For example, for the year 2017, ‘a’ is for U.S. scheme whereas ‘b’ for Canada scheme, indicating there is a significant difference in prevalence of FI between the U.S. and Canada schemes in 2017, with the cut-off point of $p\text{-value} < 0.05$.
- Superscript numbers in each column shows comparison in the prevalence of FI across the years. A different number in the same column for each classification scheme indicates a significant difference between the year, with the cut-off point of $p\text{-value} < 0.05$.

Table 4

The extent and severity of food insecurity among households in WA, with and without children (weighted).

	U.S. Classification			Canada Classification		
	Total HH (n=8,684) %	HH without children (n=8,090) %	HH with children (n=594) ¹ %	Total HH (n=8,684) %	HH without children (n=8,090) %	HH with children (n=594) %
Food secure	96.4	96.6	95.2	94.9	95.3	92.8
Food secure	92.4	93.1 ^a	88.6 ^b	92.4	93.1 ^a	88.7 ^b
Marginal FS	4.0	3.5 ^a	6.5 ^b	2.5	2.2 ^a	4.1 ^b
Food insecure	3.6	3.4	4.9	5.1	4.7	7.2
Low FS	1.8	1.8	2.4	3.4	3.1 ^a	4.7 ^b
Very low FS	1.8	1.6	2.5	1.7	1.6	2.5

Note: HH = Households. Significance test was done comparing between HH with and without children for each of the U.S. and Canada Coding schemes, and a different letter in a row within a given coding system (e.g., U.S. coding scheme) indicates significant difference, with the cut-off point of *p-value* < 0.05. For example, the proportion of marginal HH food secure is significantly higher among households with children (superscription ‘^b’) compared to those without children (superscription ‘^a’).

Table 5

Weighted multivariable logistic regression models identifying factors associated with household food insecurity in Western Australia (n=7,764).

Factors	U.S. classification		Canada classification	
	AOR	95% CI	AOR	95% CI
Age	-	-	1.12**	1.04, 1.20
Age square	0.99***	0.99, 1.00	0.99***	0.99, 1.00
Saving- unable to save	9.83***	5.11, 18.89	8.25***	5.06, 13.46
Education attainment				
≥Tertiary degree	ref	ref	ref	ref
TAFE/Trade	2.21*	1.02, 4.80	2.13*	1.09, 4.16
≤Year 12	3.66**	1.63, 8.20	3.15***	1.60, 6.22
Household income (AUD)				
Above 80,000	ref	ref	ref	ref
Under 40,000	5.15***	1.82, 14.52	5.36***	2.49, 11.51
40,000-80,000	2.34 ⁺	0.86, 6.00	1.95 ⁺	0.93, 4.10
Refused/not sure	3.48*	1.23, 9.84	3.37**	1.57, 7.26
Marital status				
Married/De facto	ref	ref	-	-
Separated/divorced/ widowed	1.82*	1.07, 3.10	-	-
Never married	0.69	0.32, 1.41	-	-
Number of children	1.45*	1.04, 2.03	1.32 ⁺	0.99, 1.75
SEIFA - Disadvantage				
Least	ref	ref	-	-
Medium	2.45*	1.06, 5.68	-	-
Most	1.83	0.77, 4.37	-	-
Own house - No	3.86***	2.37, 6.27	3.46***	2.17, 5.50
Private health insurance - No	1.82*	1.09, 3.04	1.56 ⁺	1.00, 2.43
BMI	1.04*	1.01, 1.07	1.03*	1.00, 1.06
Current smoker	1.64 ⁺	0.94, 2.85	-	-
Number of chronic diseases	1.34**	1.09, 1.64	1.18 ⁺	0.98, 1.42
Psychosocial distress scale				
Low	ref	ref	ref	ref
Moderate	0.71	0.35, 1.45	1.23	0.67, 2.25
High	1.50	0.75, 3.01	2.00*	1.09, 3.64
Very high	3.08**	1.50, 6.31	3.67***	1.82, 7.39
Stressor life event – Yes	2.61**	1.32, 5.18	3.46***	1.96, 6.10

Note: ‘-’ indicates non-significant results under the classification scheme report in the corresponding column (e.g., age is not significant under the U.S. coding scheme while significant in Canadian coding scheme, and marital status yielded significant under U.S. scheme whereas not significant under the Canadian). ⁺ $p<.10$; * $p<0.05$; ** $p<0.01$; *** $p<0.001$.