Single-item measure of food insecurity used in the National Health Survey may underestimate prevalence in Australia

Rebecca McKechnie,[1] Gavin Turrell,[2,3] Katrina Giskes,[1] Danielle Gallegos[1]

Food and nutrition security is defined by the Food and Agricultural Organization (2012) as: "when all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life".[1]

Food and nutrition security is underpinned by four dimensions, being: i) availability of sufficient amounts of nutritionally adequate food; ii) adequate financial and physical access to such foods; iii) the infrastructure, resources and ability to utilise foods; and, iv) stability of the previous three pillars over time. Any absence or disruption of one or more of these pillars results in food insecurity.

Food insecurity may be associated with a range of adverse health outcomes. Among adults, it may lead to dietary choices less consistent with recommendations for good health,[2,3] overweight or obesity,[4,5] poorer self-reported general health[6,7] and increased risk of chronic disease (such as heart disease, diabetes and depression).[8,9] Among children, food insecurity may result in poorer self- or parent-reported general health,[10,11] lower academic achievement,[12,13] behavioural and conduct problems[12] and poor health and social outcomes in adulthood.[14,15] These implications are of notable significance to public health, making food insecurity an issue worthy of continued monitoring and surveillance.

Abstract

Objectives: To compare prevalence estimates of food insecurity using a single-item measure, with three adaptations of the United States Department of Agriculture Food Security Survey Module (USDA-FSSM).

Methods: Data were collected by postal survey, from individuals aged ≥18 years from disadvantaged suburbs of Brisbane, Australia (n= 505, 53% response). Food security status was ascertained by the Australian single-item measure, and the 6-, 10- and 18-item versions of the USDA-FSSM. Prevalence estimates of food insecurity and different levels of severity of food insecurity estimated by each tool were determined. Data were analysed using McNemar's test, polychoric correlation and Rasch analyses.

Results: The prevalence of food insecurity was 19.5% using the single-item measure; significantly less than the 24.4%, 22.8% and 21.1% identified using the 18-item, 10-item and 6-item versions of the USDA-FSSM, respectively. Rasch analyses revealed that overall the USDA-FSSM may be a valid tool for the measurement of food insecurity within the current sample.

Conclusion: The measure of food insecurity employed in national surveys in Australia may underestimate its prevalence and public health significance.

Implications for public health: Future monitoring and surveillance efforts should seek to employ a more accurate measure as the first step in recognising the right to food for all Australians.

Key words: food security, measurement, monitoring and surveillance

The most commonly used measure to assess food insecurity at the household level is the 18-item United States Department of Agriculture Food Security Survey Module (USDA-FSSM);[16,17] this scale is used in national surveys across high-income countries, such as the United States and Canada, and is the predominant measurement tool mentioned in literature. The USDA-FSSM comprises 18 items that specifically assess financial access to food; responses to the FSSM items are summed to allow for identification of varying levels of severity (low food security, very low food security and low food security among children). The measure is also able to be shortened to a 10-item and 6-item sub-scale that can differentiate between low levels of food security and very low levels of food security. Adaptations of the USDA-FSSM, such as the 15-item Latin American and Caribbean household food security scale (ELCSA) tool and the 9-item Household Food Insecurity Access Scale (HFIAS) also exist for use in less industrialised countries.[18] In New

Zealand, food security status is assessed via a multi-item tool comprised of eight questions included in the yearly National Health Survey. This scale has been validated for use among the New Zealand population; however, its ability to be compared to international data collected via other measures of food security remains undetermined.[19] These tools primarily assess financial access to food.

In Australia, a single-item measure of food insecurity that asks: "In the last 12 months was there any time you have run out of food and not been able to purchase more?" is incorporated in the three-yearly National Health Survey (NHS) and, incorrectly, is used as an indicator for the spectrum of severity of food insecurity.[20] Unfortunately, food insecurity was not assessed during the recent National Health Survey in 2014–2015.[21]

The most recent data available from the 2011–2012 Australian Health Survey (AHS) (a larger survey that incorporates the National Health Survey as well as a more comprehensive diet and exercise survey, the National Nutrition and Physical Activity Survey), identified the prevalence of food insecurity among the general Australian population to be approximately 5%.[22] However, research has suggested that the single-item may underestimate the prevalence of food insecurity compared to the more comprehensive USDA-FSSM.[23] To ascertain the true burden of food insecurity, be able to make meaningful comparisons between countries and guide policy and interventions to address this issue, it is imperative that accurate measures of food insecurity be employed.

The current study compared the prevalence of food insecurity in disadvantaged suburbs of Brisbane city in 2009, using different measures to ascertain food security status: the single-item used in the NHS and the 18-, 10- and 6-item iterations of the USDA-FSSM. Furthermore, the psychometric properties of the 18-, 10- and 6-item versions of the USDA-FSSM were assessed to identify the appropriateness of the scales for a low-socioeconomic Australian sample and potential improvements to improve the validity of these scales among an Australian population.

Methods

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Queensland University of Technology Human Research Ethics Committee (Project number 0800000735). Written informed consent was obtained from all subjects.

Study design

A cross-sectional design was employed to compare the single-item Australian measure to the 18-, 10- and 6-item versions of the USDA-FSSM.

Study scope and sampling

The current study was conducted in the Brisbane Statistical Sub-Division (SSD) and comprised 1,000 individuals randomly selected from households in the 80 most socioeconomically disadvantaged census collector districts (CCDs), being the most disadvantaged 5% of CCDs in the SSD. CCDs are the smallest units for which statistical data are available in Australia.[24]

Sample size was determined with consideration given to objectives of other aims of the study (published).[25,26] Acceptable values for meaningful and/or practically significant differences between variables of interest (based on the aforementioned previous objectives) for food secure compared to food insecure households were determined using results from existing literature. Starting figures determined using standard calculations were multiplied by factors of 1.60 to account for an anticipated 60% non-response, 2.00 (the number of groups for comparison) and 2.33 to account for an uneven sample fraction (approximately 30% of the target population were expected to be food insecure). The variable that yielded the largest required sample was selected for determination of the final sample size for the overall research project; 1,000 participants were required for 90% power, with a type one error of 5%.

The sampling of individuals was undertaken as follows. Firstly, the lowest 5% of CCDs were identified according to each CCD's Index of Relative Socioeconomic Disadvantage (IRSD) score, which was obtained from the Australian Bureau of Statistics (ABS).[27] Secondly, data providing name, gender, age and address were accessed via the electoral roll; individuals between the ages of 25 and 45 years were selected to capture the age group with the greatest likelihood of having a residential child (to address a related aim of the study); however, the final age range of respondents ranged between 20 and 59 years. Individuals residing in suburbs that contained the required CCDs were extracted and addresses were then geocoded to CCDs using MapInfo (version 11.5, MapInfo Corporation, Troy, New York). Finally, households within the required CCDs were identified and 1,000 households were randomly selected to participate in the study.

Participants and data collection

Data collection occurred via postal-survey between March and May 2009. The questionnaire was 12 pages in length, comprised primarily of previously validated items, and sought information on dietary and health factors, household food security status and a range of socio-demographic characteristics such as gender, age, country of birth, household income, family type and Indigenous status.

Food security status

Food security was assessed using four measures. Firstly, the single NHS question was included, which asked participants: "In the previous 12 months was there any time you have run out of food and not been able to purchase more?" The response option was 'yes/no', and households were coded as either food secure (negative response) or food insecure (affirmative response).

The 18-item USDA-FSSM was also incorporated in the questionnaire, and included questions relating to the food situation of the household in the previous 12 months, such as running out of food and being unable to purchase more due to financial constraints, being unable to afford balanced meals, reducing the size of meals or skipping meals because of being unable to afford food, and going hungry due to not being able to afford food. Similar questions were asked in relation to children's dietary behaviours (if children were present in the household). Responses to these items were summed (score of 1 for an affirmative response and 0 for a negative response) and scores were used to categorise households as either: food secure (0 to 2); low food security (3 to 5 among households without children, 3 to 7 among households with children); very low food security (6 to 10 among households without children, 8 to 12 among households with children); and very low food security among children (13 to 18 among households with children).[16] For the purpose of data analyses, categories were dichotomised to 'food secure' or 'food insecure'; these

classifications were derived by initially classifying 'adult food insecurity' (score of three or higher based on the 10 adult-related items) and 'child food insecurity' (score of two or higher based on the eight child-related items). Households were then classified as food insecure if they were identified as experiencing 'adult food insecurity', 'child food insecurity' or both. This scoring protocol is in line with recommendations by Nord,[28] and the current scoring protocol implemented in national surveys across Canada, as it accounts for distortion in measurement when comparing households with and without children.[28]

The USDA-FSSM can be shortened to a 10-item and 6-item version.[16] The appropriate questions were isolated and scored; households were categorised as either: food secure, low food security or very low food security, and data dichotomised to 'food secure' and 'food insecure' for the purpose of analyses (with food insecurity status assigned to households with a score of three or higher when using the 10-item iteration, and two or higher when using the 6-item iteration, respectively).[16]

Analyses

Data were analysed using jMetrik freeware, SPSS version 16 (SPSS Inc., Chicago, IL, USA) and R software.

First, jMetrik freeware was used to undertake Rasch analyses to investigate the psychometric characteristics of the items in each of the USDA-FSSM adaptations. INFIT values were used to identify the discriminative capacity of each item by assessing the expected responses compared to actual responses. INFIT values investigate whether items in a scale measure the same construct independently of each other. When the responses to an item fit the model perfectly, an INFIT value of one is generated. INFIT values below one indicate fewer affirmative responses than expected, suggesting an item is redundant. INFIT values above one suggest that that more people answered affirmatively than predicted by the model, and that the information contributed to by the item may be 'overvalued'. Based on widely accepted ranges, cut-off values were set at a recommended range of 0.8 to 1.2, with a wider acceptable range of 0.7–1.3.[29]

Second, using SPSS and R, correlations between each of the USDA-FSSM adaptations and the single-item NHS measure were investigated via polychoric correlation.

McNemar's test (cross tabulation) was implemented to investigate the difference in prevalence estimated by each food security screening tool as well as the 18-, 10- and 6-item USDA tools with the raw score threshold adjusted to allow for the identification of the same prevalence as the single-item NHS measure. Finally, reliability analysis was used to investigate internal reliability of the 18-item, 10-item and 6-item measures.

Results

Of 1,000 individuals sampled, three were unable to speak English, 49 no longer resided at the address listed on the electoral roll and one was overseas, leaving 947 potential participants. A total of 505 completed questionnaires were returned, resulting in a final response rate of 53%, 487 for which complete data regarding food security status was available.

Table 1 summarises the demographic characteristics of participants in the study compared to the characteristics of the general population in the CCDs sampled. The sample was comparable to the general population residing in the selected CCDs in terms of gender, country of birth and Indigenous status; however, the sample included a slightly greater proportion of higher income households than the population within the selected CCDs.

Psychometric properties of 18-, 10- and 6-item USDA-FSSM

Results from the Rasch analysis are summarised in Table 2. Of the full 18 items in the USDA-FSSM, 10 fell within the widely accepted range for fit and four fell within the wider acceptable limits, leaving only four that fell outside both the standard and wider acceptable ranges. Of these, two were redundant and two appeared to have been provided more affirmative responses than predicted by the model. In the 10-item short form US adaptation, two fell outside the wider limits of agreement (one redundant and one overvalued). Finally of the 6-item version, three fell outside the standard acceptable range; however, only one of these fell outside the wider limits of agreement.

Correlation between single-item NHS measure and USDA-FSSM adaptations

Findings from the polychoric correlation analysis revealed a high level of correlation

Table 1: Demographic and food security characteristics of sample compared with the population of residents aged 20 – 59 years in the selected CCDs.		
	Study sample (%) N = 487	Total resident population of selected CCDs[a] (%)
Gender		
Male	44.5	48.5
Female	55.5	51.5
Age group		
20 – 29 years	16.8	27.3
30 – 39 years	30.0	26.4
40 – 49 years	35.1	25.1
50 – 59 years	18.1	21.2
Country of birth		
Oceanic/ Antarctica	74.4	75.3
Europe	7.4	8.6
Africa & Middle East	2.9	1.4
Asia	13.8	13.3
Americas	1.5	1.4
Household Income		
≤ $499	22.9	23.6
$500–$799	17.7	25
$800–$999	11.5	8.7
$1000–$1399	16.2	22.5
$1400–$2499	27.1	16.4
≥ $2500	5.6	3.7
Family type		
Couple, no children	25.1	29.8
Couple, with children	49.2	37.4
Single-parent family	25.7	32.8
Indigenous status		
Non-indigenous	95.7	94.1
Aboriginal	3.5	5.1
Torres Strait Island	0.5	0.4
Aboriginal & Torres Strait Island	0.3	0.4

Note:

a: Data from the 2006 Australian census for CCDs with the 5% lowest IRSD scores in the Brisbane Statistical Subdivision.

between the 18-, 10- and 6-item USDA-FSSM and the single item from the NHS (r = 0.948, 0.972 and 0.948, respectively).

Differences in prevalence between single-item NHS measure and USDA-FSSM adaptations

The prevalence of food insecurity estimated by each measure is summarised in Table 3. The 18-item USDA-FSSM identified a greater proportion of food insecure households compared to the 10- and 6-item USDA-FSSM and the single question used in the Australian NHS (24.4% versus 22.8%, 22.1% and 19.5%, respectively). McNemar's test showed that the 4.9%, 3.3% and 2.6% differences (absolute difference) between the single-item NHS

question and the 18-item ($p<0.001$), 10-item and 6-item ($p=0.01$) tools, respectively, were significant. Reliability analyses showed the 6-item, 10-item and 18-item measures to have comparable reliabilities (Cronbach's alpha 0.89 for each).

Table 4 provides a summary of the cumulative per cent for the raw score of each of the USDA-FSSM adaptations. Based on these, the threshold score at which the USDA-FSSM most closely replicates the proportion of food insecurity as identified by the single-item

from the NHS is four for the full 18 items (one point below the current threshold for food insecurity), and three and two for the 10- and 6-item USDA-FSSM respectively, (equal to the current thresholds used to identify food insecurity using these tools).

Food insecurity severity as estimated by each measure

The 18-item, 10-item and 6-item tools estimated that 12.7%, 11.8% and 13.6% of the sample reported low food security and

10.9%, 11% and 8.6% reported very low food security, respectively. The 18-item tool identified that 0.8% of households reported low food security among children; however, the 10- and 6-item versions were not able to differentiate this level of severity of food insecurity.

Discussion

The study showed a high prevalence of food insecurity among disadvantaged urban areas of Brisbane. The food security screening question used in the NHS was highly correlated with each of the USDA-FSSM adaptations; however, it provided the lowest estimate of food insecurity (19.5%) compared to the three versions of the USDA-FSSM (24.4%, 23% and 21% for the 18-, 10- and 6-item USDA-FSSM, respectively). The NHS question was also unable to differentiate between the levels of severity of food insecurity. These findings suggest that the current national estimates of food insecurity may potentially underestimate the prevalence and public health significance of food insecurity and its experience among various socio-demographic groups.

Our findings are consistent with previous studies, which found that the single question used in the Australian NHS underestimated the prevalence of food insecurity by approximately five percentage points[23] and that the 6-item measure underestimated food insecurity by up to eight percentage points when compared to the 18-item USDA-FSSM.[30] Food insecurity is a complex issue, with varying levels of severity; as such, it is unlikely to be adequately captured by a single-item question. The current estimate of food insecurity in the general Australian population is approximately 5% and is based on the single item used in the NHS.[22] At the population level, a difference of 5% between the full 18-item USDA-FSSM scale and the single NHS item may equate to an extra 300,000 households that are not identified by the single question. Underestimation by this tool may suggest that the true prevalence of food insecurity among the Australian population may be closer to 10%, and the findings of the current study show that the prevalence of food insecurity is markedly higher in disadvantaged urban areas and may range from one-in-four to one-in-five households.

Identification of the threshold at which the prevalence of food insecurity estimated by

Table 2: Item fit statistics for 18-item, 10-item and 6-item United States Department of Agriculture (USDA) Food Security Survey Module (FSSM) among an urbanised disadvantaged sample in Brisbane, Australia.

Item	18-item USDA-FSSM	10-item USDA-FSSM	6-item USDA-FSSM
Adult items			
Worried whether food would run out	1.33[b]	1.42[b]	NA
Ran out of food	0.97	0.98	1.24[a]
Couldn't afford healthy meals	1.06	1.11	1.26[a]
Adults cut size or skip meals	0.65[b]	0.63[b]	0.61[b]
Frequency adults cut/ skipped meals	0.73	0.87	0.98
Ate less than thought should	0.65[b]	0.73[a]	0.72
Hungry but didn't eat	0.81	0.89	0.98
Lose weight	0.87	1.21[a]	NA
Adults not eat for whole day	0.78[a]	0.84	NA
Frequency not eat whole day	0.84	1.00	NA
Child items			
Relied on few kinds foods to feed children	1.61[b]	NA	NA
Couldn't feed children health meal	1.24[a]	NA	NA
Children not eating enough	0.98	NA	NA
Cut size children's meals	0.88	NA	NA
Children hungry	0.78[a]	NA	NA
Children skipped meals	1.90[b]	NA	NA
Frequency children skipped meals	1.17	NA	NA
Children not eat for whole day	1.17	NA	NA

Notes:
a: INFIT value falls outside standard acceptable limit of 0.8–1.2
b: INFIT value falls outside wider acceptable limit of 0.7–1.3

Table 3: Prevalence and level of severity of food insecurity in the sample as measured by four different measurement tools (N = 487).

	Single-item Australian question[a,b,c]	6-item USDA-FSSM[a]	10-item USDA-FSSM[a]	18-item USDA-FSSM
Prevalence of food insecurity				
Food secure (%)	78.4	75.4	74.7	72.7
Food insecure (%)	19.5	22.1	22.8	24.4
Missing (%)	2.1	2.5	2.5	2.9
Level of severity of food insecurity				
Food secure (%)	78.4	75.4	74.7	72.7
Low food security (%)	NA	13.6	11.8	12.7
Very low food security (%)	NA	8.6	11.0	10.9
Very low food security among children (%)	NA	NA	NA	0.8

Notes:
USDA-FSSM, United States Department of Agriculture Food Security Survey Module.
a: Significantly different to 18-item USDA-FSSM
b: Significantly different to 10-item USDA-FSSM
c: Significantly different to 6-item USDA-FSSM

each of the USDA-FSSM adaptations most closely matched the prevalence identified by the single NHS question revealed that the single-item accurately captures those from households experiencing very low food security and very low food security among children. The item, however, does not effectively capture all households experiencing low food security, resulting in the underestimation identified above. If the single-item measure continues to be used for monitoring and surveillance, this should be acknowledged as a limitation of its use, and efforts made to adjust for the underestimation of food insecurity.

The more comprehensive USDA-FSSM is available in three adaptations, which may provide a more accurate picture of the burden of food insecurity. Rasch analyses revealed that overall the USDA-FSSM may be a valid tool for the measurement of food insecurity within the current sample, with only a small number of items falling outside both the standard and wider range for acceptable fit. Across all three adaptations of the USDA-FSSM, the item assessing whether individuals cut down the size of meals or skipped meals consistently yielded an INFIT value below 0.7, suggesting redundancy. The inclusion of this item is unlikely to be problematic; instead, the information from this measure is likely to be slightly undervalued in assessing food security status. The item investigating whether individuals worried about running out of food before they could afford to purchase more (included in the 18- and 10-item adaptations) yielded INFIT values above 1.3 (but below 1.4), indicating more affirmative responses to this question than predicted by the model; thus the information provided by this item is potentially 'overvalued' slightly. In the six child-related items contained within the 18-item USDA-FSSM, the questions assessing the ability to feed children healthy meals and the frequency with which children skipped meals also appeared to have been overvalued. Removal of items at this stage is unlikely to be warranted, given that all items fall within the range of 0.5–1.5, which indicates they are productive to the measurement of food insecurity,[29] with the exception of the two child-related items, which yielded INFIT values of 1.61 and 1.90. However, the INFIT values of these two items suggest that although these values are not productive for the construction of a scale, they do not degrade the current measurement system. Further validation studies within a population-based sample,

and specific sub-groups of interest may be warranted, to further adapt the USDA-FSSM to suit the Australian population.

Overall, the findings of the current study suggest that using the 18-item measure potentially provides a more accurate and descriptive account of food insecurity; that this scale is a reasonably valid tool for measurement in the current sample (disadvantaged households in Brisbane); and that it may be a valid option for other population sub-groups, as well as the broader Australian population. However, in the context of national surveillance, there may be financial and space constraints associated with using the full set of 18-items, and of note is the corresponding increase in missing data that accompanies the increase in items included in each version of the scale. The 6-item measure provided an estimate of food insecurity similar to that provided by the 10 items, and two percentage points lower than that provided by the 18 items. Although this difference was statistically significant, compared with the single-item from the NHS (which yielded a prevalence rate nearly five percentage points lower than that of the 18-item scale and was unable to identify different levels of food insecurity), the six items provided a better representation of the prevalence and varying levels of food insecurity. The 6-item scale was also identified to be a valid measure of food insecurity in the current sample, with only one question falling outside the wider accepted range for fit; this item, however, still falls within the range accepted as being productive to measurement, and thus exclusion at this stage is not warranted. In addition, the six items included in this shorter iteration are similar to those included in the Food Insecurity Experience Scale (FIES). Recent work on the FIES has resulted in the development of a process for the calibration and subsequent comparison of other similar measures of food security on the basis of four or more items as anchoring points, thus providing opportunity for international comparisons of food security data.[31] Adoption of the 6-item version of the USDA-FSSM in place of a single question in national surveillance efforts, such as the NHS, could therefore provide a better estimate of the prevalence of food security, while minimising cost and participant burden that would accompany using the complete 18-item scale, as well as provide opportunity for international comparisons.

Raw score	18-Item USDA-FSSM (%)	10-item USDA-FSSM (%)	6-item USDA-FSSM (%)
0	49.3	51.7	64.5
1	63.9	65.7	75.4
2	71.9	74.7	81.8[a]
3	77.4	81.3[a]	85.1
4	80.7[a]	84.4	89.0
5	83.4	86.5	92.9
6	86.3	88.8	97.5
7	89.2	92.1	NA
8	90.6	93.5	NA
9	92.7	94.5	NA
10	94.3	97.5	NA
11	95.9	NA	NA
12	96.1	NA	NA
13	96.1	NA	NA
14	96.3	NA	NA
15	96.3	NA	NA
16	96.3	NA	NA
17	96.5	NA	NA
18	96.9	NA	NA
Missing	3.1	2.5	2.5

Table 4: Cumulative percentage of affirmative responses by raw score for 18-item, 10-item and 6-item United States Department of Agriculture (USDA) Food Security Survey Module (FSSM) and threshold at which % food insecure meets % identified by single-item National Health Survey (NHS) measure.

Notes:

a: Meets prevalence of food insecurity as estimated by single-item NHS measure

In considering the USDA-FSSM as a tool for the monitoring and surveillance of food security, one notable limitation is the sole focus on food insecurity arising from a lack of financial resources, meaning that this scale is only able to assess a subcomponent of the overarching 'access' pillar (of a total of four pillars underpinning food security: access, availability, utilisation and stability.[1] As such, it is possible that the USDA-FSSM may also underestimate the true prevalence of food insecurity. This may be particularly exacerbated among specific sub-groups of the population, for example older and young adults, people living in isolation and/or rural and regional areas, and people with physical disabilities or specific health or dietary requirements. Future research efforts should seek to identify ways to assess the remaining pillars of food insecurity and accurately capture its true burden on the population, as indicated in recent Australian research.[32,33]

For further consideration is the potential for the full 18-item USDA-FSSM to underestimate the prevalence of food insecurity among

households without children when compared specifically to households with children, when the simple summative method of scoring the scale and classifying households according to standard cut-off points is used. This issue has been investigated previously by Nord,[28] who concluded that to avoid this potential underestimation: a) the use and scoring of the adult-related items and child-related items should be performed separately, as described by Nord, and adopted in the current research; b) food security status be classified using probabilistic assignment; or c) researchers adopt clear and consistent acknowledgement throughout study findings of the bias and the reason it has occurred (this, however, is a less-desirable approach as this information often fails to be translated in practice).[28]

The findings of the current study should be interpreted within the context of the following limitations. First, sampling occurred specifically within socioeconomically disadvantaged urban areas of Brisbane, Australia. As such these findings may only be generalisable to lower socioeconomic sub-groups of the population. To date, the only two known studies comparing the USDA scales with the single Australian item have been undertaken in populations residing in disadvantaged urban areas. Further studies are required to determine whether the differences identified between these tools remain among a sample of the general population. In addition, our reliance on a 12-page mail-based survey may have biased the sample against those who live highly transient lifestyles, or who are from non-English speaking backgrounds and/or with poor literacy, resulting in under-representation of some of the most disadvantaged segments of society, and those at highest risk of experiencing food insecurity. Finally, the recruitment of individuals aged between 20 and 59 years of age may to an extent limit the generalisability of findings. This age range was selected for the purpose of sampling, and it is likely that people outside of this range were still considered when answering questions that related to the household as a whole. Nonetheless, it is possible that in specifying an age range for the purpose of recruitment, those who fell outside of this age group were under-represented. However, given that age groups above and beyond this specific age range are more likely to experience food insecurity for reasons beyond financial access (for example limited mobility and/

or physical disability and social isolation for older adults, and poor food literacy for young adults), the survey tools used in the current research would have been even less likely to adequately assess the prevalence of food insecurity outside of the specific age range targeted in the current research. This is both a limitation of the current research, as well as a limitation of existing tools to assess food security status, and future research should seek to develop comprehensive scales of assessing multiple pillars of food insecurity across a broader age range.

In summary, the current method of assessing food security status adopted in the three-yearly National Health Survey in Australia is likely underestimating the true prevalence of food insecurity. Compounding these inaccuracies in measurement is the failure to consistently measure food security status in each subsequent National Health Survey (with the single-question not included in 2004–2005 or 2014–2015 data collection efforts). The regular collection of accurate data pertaining to the prevalence of food insecurity in any population is imperative to assist researchers, practitioners and policy makers in ensuring equitable access to healthy, nutritious and culturally appropriate foods for all people. The findings of the current paper provide insight into the potential to include the 6-item iteration of the USDA-FSSM in upcoming National Health Surveys, and potentially in national surveillance efforts in other countries; the use of this shorter version would serve to limit the financial and space constraints associated with the inclusion of larger measurements scales, while providing opportunity for more accurate assessment of the prevalence of food insecurity (compared to the current single-item), as well as international comparisons. However, the limitations of the tool only being able to assess one component of the access pillar of food security should continue to be acknowledged, and if possible addressed by future research.

Conclusion

Food insecurity is prevalent and a significant public health issue in disadvantaged urban areas of Australia. The current single-item Australian measure potentially underestimates the prevalence of food insecurity. Screening and surveillance should seek to identify the prevalence of food insecurity using a more comprehensive

measure, such as the 18-item USDA-FSSM, which appears to be a valid measure for use among an Australian population and has been shown to provide higher estimates of food insecurity and information on the degree of severity of food security. In the context of financial and space constraints, however, the 6-item USDA-FSSM may be a more feasible option and has been shown to provide an estimate of food insecurity closer to that of the 18-item tool.

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