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Joanna Russell
jrussell@uow.edu.au

Victoria M. Flood
University of Wollongong, vflood@uow.edu.au

Heather Yeatman
University of Wollongong, hyeatman@uow.edu.au

Paul Mitchell
University of Sydney

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Abstract

Objective

With ongoing national concern about food security, the aim of the study was to estimate the prevalence of food insecurity and to identify associated characteristics in a cohort of older Australians.

Design, setting and participants

The Blue Mountains Eye Study is a cohort study of community living participants aged 49 + years. The 12-item food security survey was completed by 3068 participants in the cross sectional study which comprised 2335 survivors from baseline and the recruitment of an additional 1174 eligible residents.

Main outcome measures

Prevalence of self reported food insecurity was calculated and multivariate logistic regression provided odds ratios with 95% confidence intervals to determine risk factors.

Results

Overall prevalence of food insecurity was 13%. Women (15.7%) compared with men (9.4%) and younger participants, aged <70 years>(15.7%) than older participants, ≥ 70 years (8.4%), were significantly more likely to report being food insecure. Characteristics for reporting food insecurity included participants living in rented accommodation (OR 4.10, 95% CI: 2.83, 5.89) and those living on a pension only (OR 1.90, 95%CI: 1.30, 2.78).

Conclusions

A relatively high level of food insecurity among this representative population of older Australians should be an issue of concern for policy makers and health and welfare service providers. Addressing food insecurity should be a priority of integrated national food and nutrition policies and this should in turn inform health and welfare service provision to this vulnerable population.

Keywords

food, risk, prevalence, factors, insecurity, among, australians, older, cohort

Disciplines

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Prevalence and risk factors of food insecurity among a cohort of older Australians

Authors: Joanna Russell¹, Victoria Flood¹, Heather Yeatman¹, Paul Mitchell²

¹ School of Health Sciences, Faculty of Health & Behavioural Sciences, University of Wollongong, Wollongong, NSW, 2522, Australia

² Centre for Vision Research (Westmead Millennium Institute), University of Sydney, NSW, 2006, Australia

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Correspondence and off print requests to: Associate Professor Victoria Flood, School of Health Sciences, Faculty of Behavioural & Health Sciences, University of Wollongong, Wollongong, NSW 2522, Australia; Ph +61 2 4221 3947; Fax: +61 2 4221 3486;

Email: vflood@uow.edu.au

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ABSTRACT

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Conclusions: A relatively high level of food insecurity among this representative population of older Australians should be an issue of concern for policy makers and health and welfare service providers. Addressing food insecurity should be a priority of integrated national food and nutrition policies and this should in turn inform health and welfare service provision to this vulnerable population.

BACKGROUND

Food insecurity, the lack of access and ability to acquire safe and nutritious foods, has the potential to affect the health and well-being of individuals (1-4). The nature of food insecurity is complex and encompasses both the need for the availability of sufficient food but also foods that provide enough nutrients to maximise health and well being for the whole population (5). There has been increased awareness about food security at global and national levels particularly since the food crisis in 2007-2008 that resulted in a 51% increase in global food prices(6). A coordinated approach to the sustainability, availability, accessibility and utilisation of food is required nationally that also assesses food insecurity at the household and individual level. Those who are at greater risk of food insecurity and the risk factors affecting their ability to access safe and nutritious food require further investigation.

The older adult population is the fastest growing age group in Australia and, through the ageing process, this group has a higher risk of developing chronic disease and physical disabilities which may directly impact their ability to access food and be impacted by food insecurity. In 2006, approximately 13% of the Australian population was aged 65 and over and this proportion is expected to increase to 24% by 2036 (7). With increased life expectancy, there will be a greater increase in the number of adults aged 85 and over, resulting in a greater number of people requiring services and assistance from Government agencies (8).

Previously reported risk factors associated with food insecurity in older Australian adults included self-reported poorer health, living alone, not owning their own home, gender and age, however measurement of food insecurity was limited to economic access to food (9-10). Although the majority of older adults report excellent or good health, it has been found that more than half of Australian adults, aged 65 years and over, suffer from at least one chronic disability that limits every day activities(7). These chronic disabilities may affect the possibility of physically going shopping for food, carrying groceries home and the ability to prepare food. This, in turn, may affect the food security status of this population, more so than limited financial resources.

Food security in Australia is not currently monitored on a regular basis and, if included in national surveys, is limited to a single item: "In the past 12 months were there any times when you ran out of food and couldn't afford to buy any more?" Results from the 2004 National Health Survey single item reported a 5.1% prevalence of food insecurity compared to 14.7% in the USA based on an 18

item tool (last 8 questions asked if children are part of the household) (11-12). Food security status is monitored annually in the USA and is able to determine the severity as well as food insecurity status (12).

The single item measures the financial ability to buy food but does not address the physical issues of accessing nutritionally adequate food or anxiety about acquiring food which may be more important factors for older adults (13-14). Including these characteristics provides greater knowledge of the detrimental outcomes of being food insecure. It has been suggested that poor diet may contribute negatively to the health status of older adults by increasing the risk of developing chronic diseases and/or exacerbating existing conditions (15). The aim of this study was to determine the prevalence of food insecurity among an older Australian population using a comprehensive measure as well as examine the characteristics associated with food insecurity from demographic, lifestyle and health factors.

METHODS

Study

The Blue Mountains Eye Study (BMES) is a population based cohort study of vision and common eye diseases in residents west of Sydney aged 49 years and over. Full details of the study design have previously been reported (16). Of the identified 4433 eligible community living residents, 3,654 (82.4%) (BMES1) participated in baseline clinic visits (1992-1994). After five years, all participants from BMES1 were invited to attend repeat visits during 1997-1999 and 2335 (75.1%) survivors were examined (BMES2A). In 1999 a repeat door-to-door census in the same area was conducted and a further 1174 (85.2%) participants were recruited from 1378 eligible residents who had moved into the study area (BMES2B). Cross Section 2 is made up of a combination of BMES2A and BMES2B with a total of 3509 participants examined. The study followed the recommendations of the Declaration of Helsinki and was approved by the Sydney West Area Health Service Human Research Ethics Committee. All participants provided written informed consent.

Food Security Survey

The food security survey was included in the data collection for Cross Section 2. It comprised 12 statements relating to individual and household food situations and participants responded either "never true", "sometimes true" or "often true". Participants were coded as food secure if they

answered “never true” to all 12 statements and food insecure if they answered any one of the statements “sometimes true” or “often true”. The first 10 statements were adapted for an elderly population by Wolfe et al (14) from the Radimer/Cornell hunger and food insecurity measures (Table 1) (17). Wolfe et al (14) reported good sensitivity when the results from the tool were compared to food security status assessed during in-depth interviews of 24 participants aged between 60 and 89 years. The last two statements (K. and L. in Table 1), also based on Radimer’s research, were designed to measure household and individual food insufficiency in the Queensland Regional Survey in 1993 (18). The last two items were validated by comparing results to income and fruit and vegetable intake and both were strongly associated (18).

Analysis variables

During the clinic visits, participants completed interviewer-administered questionnaires that asked about lifestyle, demographic factors and full medical history in addition to the food security survey. Housing tenure was collapsed into three types; participants who owned their house or apartment; participants who rented their house or apartment; and other. Similarly, living arrangement was reduced to living with a spouse; living alone; or living with others. Income was not measured directly but participants were asked about their source of income and whether they received a government pension. Other sociodemographic variables included age, gender, marital status and degree of education attained. Body Mass Index (BMI) was calculated from height and weight measurements (kg/m^2) taken during clinic visits. Participants self reported any history of acute myocardial infarction (AMI), stroke, arthritis, asthma and cancer if previously diagnosed by their doctor, with self rated health reported as excellent, good, fair or poor. Hypertension was defined if participants recorded a systolic blood pressure $\geq 160\text{mmHg}$ or diastolic blood pressure $\geq 100\text{mmHg}$ at the clinic visit or were using antihypertensive medication. Walking disability was assessed by examiners during clinic visits as any subject who had walking difficulties or used a cane/crutches/walker or a wheel chair.

Statistical Analysis

All statistical analyses were performed using SAS (version 9.1; SAS Institute, Cary, NC, USA). Descriptive statistics for group differences between food insecurity and a range of sociodemographic and health variables were analysed using Chi-square tests. Variables were included in the analyses if they were associated with, or known potential risk factors for food insecurity as described in the literature.

Multiple logistic regression was used to develop models to predict food insecurity status with odds ratios (OR) and 95% confidence intervals reported here. Independent variables with a univariate p value of less than 0.25 were included in the initial model. Backward stepwise regression was used to exclude variables that were not statistically significant predictors of food insecurity in this population after adjusting for other factors. Goodness-of-fit was assessed using the Hosmer and Lemeshow test (19).

RESULTS

The food security questionnaire was completed by 3,068 (87.4%) Cross Section 2 participants. A description and summary of responses to the individual statements are shown in Table 1. A higher number of participants reported anxiety about running out of food or being unable to afford enough food for the household compared to other statements. In addition, 7.3% of participants reported a lack of variety in their diet.

Prevalence of food insecurity

Overall, the prevalence of reporting any level of food insecurity was 13.0% from the 12-item tool. Statement K, 'In the last 12 months, were there times that your household ran out of food and there wasn't money to buy any more food?', is similar to the single item used in previous Australian surveys and we found that 3% of participants responded 'sometimes' or 'often' true to this statement.

Table 2 gives the prevalence of food insecurity by sociodemographic and health characteristics. A higher proportion of adults aged between 49 and 70 years (15.7%) compared to those aged 70 plus years (8.4%) and more females (15.7%) than males (9.4%) reported being food insecure (Table 2). People in rental accommodation were four times more likely to report some level of food insecurity than home owners (43.6% vs 10.8%). Participants were significantly more likely to report being food insecure if they were obese (BMI ≥ 30) ($p=0.0002$), rated their health as poor or fair ($p<.0001$), had two or more health conditions ($p=0.05$) or had a walking disability ($p=0.03$). There was no difference in prevalence of food security between those who had a history of hypertension, diabetes, myocardial infarction, stroke or cancer compared to those with no history of these conditions (data not shown).

Factors for food insecurity

All the variables included in Table 2 were significantly related to food insecurity, as the dependent variable, and included in the multivariate logistic regression initial model. These variables included gender, age, smoking status, marital status, living arrangement, home tenure, education, pension, BMI, walking disability, self reported health, the presence of two or more chronic conditions, self reported arthritis and asthma. Only risk factors that remained significant in the final model are shown in Table 3, with the strongest predictors for reporting food insecurity as follows: living in rented accommodation (OR 4.10 95% CI: 2.83-5.89), age between 49 and 70 years (OR 2.43, 95% CI: 1.80-3.28), receipt of a pension only (OR 1.90 95% CI: 1.30-2.78) and being a current smoker (OR 2.22 95% CI: 1.59, 3.12). The final model satisfied the Hosmer-Lemeshow goodness-of-fit test. When the data were stratified by gender and age group (aged less than 70 years versus 70 plus years) three common risk factors were found amongst the four groups: living in rented accommodation, receipt of a pension and being a current smoker (Data not shown).

DISCUSSION

The prevalence of any level of food insecurity (13%) in a cohort of older adults was considerably higher than previous findings in older Australian populations which ranged from 2.0% to 4.5% in similar age groups (9-10, 18). The higher prevalence can be explained by the more comprehensive measurement tool compared to the single item used by others. When the single statement K from the study tool was compared to the single item commonly used in previous studies, our results are similar. The prevalence of food insecurity described here is lower than the 5% reported in the general Australian population using a single item(10) but that is to be expected as the single item only addresses the ability to afford food, affecting a higher proportion of younger adults, whereas older adults may have different risk factors for food insecurity such as physical limitations (20-22). Our results provide insight into the more complex nature of food insecurity in terms of anxiety about acquiring food, and achieving a nutritious diet that is sufficient to meet the needs of an older person as opposed to just the ability to afford food.

Results from the 18 item US Household Food Security Survey Module (HFSSM) in 2009 reported a 14.7% prevalence of household food insecurity in the US population(12), consistent with our results from the 12 item tool. In Australia, using a similar tool to the HFSSM, Nolan et al (23) found that over the previous year, 21% of households reported some level of food insecurity in three disadvantaged areas of Sydney. Again, in disadvantaged urban areas of Brisbane, the reported prevalence of food insecurity was 25% (24). These results were significantly higher than the level

reported when answering the single item question, suggesting that to date measurement of food insecurity in Australia has been limited, and that particular subgroups are at greater risk. Higher levels of food insecurity have been reported in disadvantaged areas as low income is a major risk factor. The Blue Mountains region, in contrast, has a relatively higher socioeconomic status compared to both New South Wales and Australia as a whole (25). Indeed, our population was found to be representative of the region's population at the time (26), yet 1 in 8 older adults in our study reported some level of food insecurity.

Burns et al (20) found 3.8% of households in the least disadvantaged areas of Melbourne reported food insecurity due to lack of financial resources. This prevalence is similar to the 3% found in our study from the single item 'K'. There was a significantly higher prevalence of food insecurity in the mid-disadvantaged and most-disadvantaged areas in Melbourne, suggesting that a higher prevalence may also exist in older adults in other areas of Australia (20). However, the results cannot be directly compared as our study population was aged 49 years and over, whereas the Melbourne population was aged 18 years and older. Temple reported the prevalence of food insecurity decreased as amount of income increased in Australian adults aged 55 years and over(10), providing some evidence that our results may be an underestimation of the degree of food insecurity in the general older Australian population

The strongest predictors for reporting food insecurity in this population were age, living in rental accommodation, receipt of a pension only and being a current smoker. These were also found when examining risk factors in men and women separately and also by younger older (49 years to <70 years) and older older (70 years plus) populations. Our findings are consistent with previous research from the US, Canada and Australia (4).

Similar to other studies of food insecurity in older adults we found that participants aged 70 plus years were less likely to report being food insecure than younger participants aged 49 years to 70 years (9-10). Possible explanations for these differences include a higher number owning their home outright, the availability of concessions on reaching official retirement age or possibly those at greater risk are no longer living independently in the community (10). Even if older adults receive government concessions on energy consumption, the food budget is discretionary and other household living expenses are often paid for first, with remaining income allocated to food. Such living expenses include medical expenses in particular out of pocket expenses, heating and/or

cooling costs or cost of transport (4, 27). In addition, rising food prices need to be accommodated within the limited budget.

Ongoing good health is a priority for older adults not only in terms of preventing disease but being able to live independently within the community. In our cohort, self-reported poor or fair health was an independent risk factor for being food insecure after multivariate adjustment. Previous studies have found that self rated poor or fair health is related to food insecurity as well as poor mental and physical quality of life (1, 28). Wolfe et al (29) reported health problems and physical disabilities affected experiences of food insecurity in an elderly population. Physical limitations or chronic health conditions may limit physical access to food in terms of lifting or being able to carry groceries home or no longer being able to drive (20) However, as these data are cross sectional, it is not possible to determine whether poor health is a risk factor or an outcome of food insecurity. Further longitudinal analysis would enable clearer directional pathways to be determined.

The benefits of using a more comprehensive measurement tool are the ability to assess anxiety about acquiring food, quantity and quality of food available in addition to food insecurity related to lack of financial resources. The use of a single item assessing only the economic aspects has been described as more of an indicator of food security (30), and does not adequately describe the increasingly complex nature of food security within the population. Results from our study and others (23-24) suggest considerable underestimation of food insecurity in Australia and further research into individual and household food security is essential. With the ongoing debate about the issues of global food availability and high food prices, the Government is proposing an integrated national food policy calling for both adequate quality and quantity of the food supply. To complement the supply side, monitoring the Australian population to ensure all sub groups are able to achieve a safe and nutritious diet is required to aid the development of appropriate interventions for optimal health and well being.

This study has a number of strengths and limitations. Strengths of this study include its high response rate from participants in a population-based cohort as well as detailed data collection enabling the assessment of a wide range of potential risk factors. The measurement tool has been adapted and validated for use in a number of different populations enabling a number of comparisons to be made although not within Australia(31-32). Limitations include the statements used to measure food insecurity, although a more comprehensive measure, still predominantly

focused on the economic ability to acquire food. Other factors, for example, physical access to food stores or physical limitations for preparing and cooking meals may influence food insecurity status in older adults more than low income. The age of the data is a limitation, however, more recent evidence on food security status indicate that prevalence rates in Australia have not improved (20, 33). A further limitation was lack of income data collected in this study as it is known that low income is a major predictor of food insecurity. Source of income was used as an indirect measure and may be more relevant in an older adult population, as Government pensions are the main source of income for the majority of people aged over 65 before superannuation and investments(7).

In conclusion, the prevalence of food insecurity is likely to have been underestimated in national surveys. Addressing the needs of sub groups of the older Australians who are at greater risk of food insecurity, to ensure their ongoing health, will require a coordinated approach both nationally and at a local level. The next step will be to examine the effect of food insecurity on health over time.

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Table 1: BMES 12-item food security survey

Question	Participants who responded 'sometimes true' or 'often true' %
A. I worry whether my food will run out before I get money to buy more	7.5
B. I worry about whether the food that I can afford to buy for my household will be enough	8.8
C. The food that I bought just didn't last, and I didn't have money to get more	5.3
D. I ran out of the foods that I needed to put together a meal and I didn't have money to get more	5.2
E. We eat the same thing for several days in a row because we only have a few different kinds of food on hand and don't have money to buy more	7.3
F. I am often hungry, but I don't eat because I can't afford enough food	1.8
G. I eat less than I think I should be cause I don't have enough money for food	2.8
H. I can't afford to eat properly	4.3
I. Sometimes people lose weight because they don't have enough to eat. In the past year, did you lose weight because there wasn't enough food?	1.0
J. In the past year, have you had hunger pangs but couldn't eat because you couldn't afford food?	1.4
K. In the last 12 months, were there times that your household ran out of food and there wasn't money to buy any more food?	3.0
L. In the last 12 months, has anyone in your household eaten less than they should because you couldn't afford enough food?	2.3

Questions A-J adapted from Radimer/Cornell Measures of Hunger and Food Security (14).
Questions K & L Food insufficiency items (18)

Table 2: Prevalence of food insecurity in an older adult cohort (n=3068)

Subgroup	Any level of food insecurity, % (n)	X², P-value
All	13.0 (398/3068)	
Age Less than 70yrs 70+ years	15.7 (301/1916) 8.4 (97/1152)	33.86 (df=1), <.0001
Gender Male Female	9.4 (123/1313) 15.7 (275/1755)	26.42 (df=1), <.0001
Smoking Status Non Smoker Current Smoker	11.8 319/2757) 25.6 (78/305)	47.72 (df=1), <.0001
Marital Status Currently married Never married Divorced/Separated Widowed	9.2 (176/1921) 16.3 (40/246) 26.8 (104/388) 14.9 (75/502)	94.85 (df=3), <.0001
Housing tenure Owns home Rents home Other	10.8 (299/2774) 43.6 (82/188) 16.4 (17104)	169.16 (df=2), <.0001
Living Arrangement Living with spouse Living alone Living with others	8.9 (167/1868) 18.4 (145/788) 20.9 (84/402)	69.93 (df=2), <.0001
Qualification Post high school High school or less	11.6 (217/1878) 14.8 (152/1027)	6.31 (df=1), 0.01
Pension Pension and other income Other income only Unknown source Pension only	9.1 (41/450) 5.7 (32/562) 9.9 (59/594) 19.7 (238/1207)	61.25 (df=1), <.0001
BMI <20 ≥ 20- <25 ≥ 25 - <30 ≥ 30	10.8 (8/74) 12.3 (101/819) 10.9 (142/1306) 17.6 (128/726)	19.68 (df=3), 0.0002
Self rated Health Excellent/Good Fair/Poor	11.4 (278/2441) 19.5 (119/611)	28.25 (df=1), <.0001
Walking disability No Yes	12.6 (359/2846) 17.6 (39/222)	4.48 (df=1), 0.03
Arthritis No Yes	11.3 (203/1796) 15.4 (189/1231)	10.63 (df=1), 0.001
Asthma No Yes	12.3 (329/2677) 17.9 (65/364)	8.81 (df=1), 0.003
Number of health conditions Less than 2 2 or more	11.9 (196/1652) 14.3 (202/1416)	3.89 (df=1), 0.05

Table 3: Characteristics associated with food insecurity after Multivariate Logistic regression modelling

Risk factor	Multivariate Odds Ratio (95% confidence interval)
Age	
Less than 70 years	2.43 (1.80, 3.28)
70 plus years	1.0
Gender	
Female	1.67 (1.27, 2.19)
Male	1.0
Smoking status	
Current smoker	2.22 (1.59, 3.12)
Non smoker	1.0
Marital Status	
Currently Married	1.0
Never married	1.35 (0.89, 2.07)
Separated/divorced	1.91 (1.38, 2.64)
Widowed	1.41 (0.98, 2.01)
Housing tenure	
Rent home	4.10 (2.83, 5.89)
Own home	1.0
Income source	
Pension only	1.90 (1.30, 2.78)
Other source only	0.54 (0.32, 0.91)
Pension and other source	1.0
Self reported health	
Fair/Poor	1.59 (1.20, 2.10)
Excellent/Good	1.0