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

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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

Education | Social and Behavioral Sciences

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

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2

3 **ABSTRACT**

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7

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20 included participants living in rented accommodation (OR 4.10, 95% CI: 2.83, 5.89) and those living

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23 Conclusions: A relatively high level of food insecurity among this representative population of older

24 Australians should be an issue of concern for policy makers and health and welfare service providers.

25 Addressing food insecurity should be a priority of integrated national food and nutrition policies and

26 this should in turn inform health and welfare service provision to this vulnerable population.

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28

29

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

64 item tool (last 8 questions asked if children are part of the household) (11-12). Food security status

65 is monitored annually in the USA and is able to determine the severity as well as food insecurity

66 status (12).

67

68 The single item measures the financial ability to buy food but does not address the physical issues of

69 accessing nutritionally adequate food or anxiety about acquiring food which may be more important

70 factors for older adults (13-14). Including these characteristics provides greater knowledge of the

71 detrimental outcomes of being food insecure. It has been suggested that poor diet may contribute

72 negatively to the health status of older adults by increasing the risk of developing chronic diseases

73 and/or exacerbating existing conditions (15). The aim of this study was to determine the prevalence

74 of food insecurity among an older Australian population using a comprehensive measure as well as

75 examine the characteristics associated with food insecurity from demographic, lifestyle and health

76 factors.

77

78

79 **METHODS**

80 *Study*

81

82 The Blue Mountains Eye Study (BMES) is a population based cohort study of vision and common eye

83 diseases in residents west of Sydney aged 49 years and over. Full details of the study design have

84 previously been reported (16). Of the identified 4433 eligible community living residents, 3,654

85 (82.4%) (BMES1) participated in baseline clinic visits (1992-1994). After five years, all participants

86 from BMES1 were invited to attend repeat visits during 1997-1999 and 2335 (75.1%) survivors were

87 examined (BMES2A). In 1999 a repeat door-to-door census in the same area was conducted and a

88 further 1174 (85.2%) participants were recruited from 1378 eligible residents who had moved into

89 the study area (BMES2B). Cross Section 2 is made up of a combination of BMES2A and BMES2B with

90 a total of 3509 participants examined. The study followed the recommendations of the Declaration

91 of Helsinki and was approved by the Sydney West Area Health Service Human Research Ethics

92 Committee. All participants provided written informed consent.

93

94 *Food Security Survey*

95 The food security survey was included in the data collection for Cross Section 2. It comprised 12

96 statements relating to individual and household food situations and participants responded either

97 "never true", "sometimes true" or "often true". Participants were coded as food secure if they

98   answered "never true" to all 12 statements and food insecure if they answered any one of the

99   statements "sometimes true" or "often true". The first 10 statements were adapted for an elderly

100   population by Wolfe et al (14) from the Radimer/Cornell hunger and food insecurity measures (Table

101   1) (17). Wolfe et al (14) reported good sensitivity when the results from the tool were compared to

102   food security status assessed during in-depth interviews of 24 participants aged between 60 and 89

103   years. The last two statements (K. and L. in Table 1), also based on Radimer's research, were

104   designed to measure household and individual food insufficiency in the Queensland Regional Survey

105   in 1993 (18). The last two items were validated by comparing results to income and fruit and

106   vegetable intake and both were strongly associated (18).

107

108   *Analysis variables*

109   During the clinic visits, participants completed interviewer–administered questionnaires that asked

110   about lifestyle, demographic factors and full medical history in addition to the food security survey.

111   Housing tenure was collapsed into three types; participants who owned their house or apartment;

112   participants who rented their house or apartment; and other. Similarly, living arrangement was

113   reduced to living with a spouse; living alone; or living with others. Income was not measured directly

114   but participants were asked about their source of income and whether they received a government

115   pension. Other sociodemographic variables included age, gender, marital status and degree of

116   education attained. Body Mass Index (BMI) was calculated from height and weight measurements

117   (kg/m^2) taken during clinic visits. Participants self reported any history of acute myocardial infarction

118   (AMI), stroke, arthritis, asthma and cancer if previously diagnosed by their doctor, with self rated

119   health reported as excellent, good, fair or poor. Hypertension was defined if participants recorded a

120   systolic blood pressure ≥160mmHg or diastolic blood pressure ≥100mmHg at the clinic visit or were

121   using antihypertensive medication. Walking disability was assessed by examiners during clinic visits

122   as any subject who had walking difficulties or used a cane/crutches/walker or a wheel chair.

123

124   *Statistical Analysis*

125   All statistical analyses were performed using SAS (version 9.1; SAS Institute, Cary, NC, USA).

126   Descriptive statistics for group differences between food insecurity and a range of sociodemographic

127   and health variables were analysed using Chi-square tests. Variables were included in the analyses if

128   they were associated with, or known potential risk factors for food insecurity as described in the

129   literature.

130

131 Multiple logistic regression was used to develop models to predict food insecurity status with odds

132 ratios (OR) and 95% confidence intervals reported here. Independent variables with a univariate p

133 value of less than 0.25 were included in the initial model. Backward stepwise regression was used to

134 exclude variables that were not statistically significant predictors of food insecurity in this population

135 after adjusting for other factors. Goodness-of-fit was assessed using the Hosmer and Lemeshow test

136 (19).

137

138 **RESULTS**

139

140 The food security questionnaire was completed by 3,068 (87.4%) Cross Section 2 participants. A

141 description and summary of responses to the individual statements are shown in Table 1. A higher

142 number of participants reported anxiety about running out of food or being unable to afford enough

143 food for the household compared to other statements. In addition, 7.3% of participants reported a

144 lack of variety in their diet.

145

146 *Prevalence of food insecurity*

147 Overall, the prevalence of reporting any level of food insecurity was 13.0% from the 12-item tool.

148 Statement K, 'In the last 12 months, were there times that your household ran out of food and there

149 wasn't money to buy any more food?', is similar to the single item used in previous Australian

150 surveys and we found that 3% of participants responded 'sometimes' or 'often' true to this

151 statement.

152

153 Table 2 gives the prevalence of food insecurity by sociodemographic and health characteristics. A

154 higher proportion of adults aged between 49 and 70 years (15.7%) compared to those aged 70 plus

155 years (8.4%) and more females (15.7%) than males (9.4%) reported being food insecure (Table 2).

156 People in rental accommodation were four times more likely to report some level of food insecurity

157 than home owners (43.6% vs 10.8%). Participants were significantly more likely to report being food

158 insecure if they were obese (BMI ≥30) (p=0.0002), rated their health as poor or fair (p<.0001), had

159 two or more health conditions (p=0.05) or had a walking disability (p=0.03). There was no difference

160 in prevalence of food security between those who had a history of hypertension, diabetes,

161 myocardial infarction, stroke or cancer compared to those with no history of these conditions (data

162 not shown).

163

164 *Factors for food insecurity*

165 All the variables included in Table 2 were significantly related to food insecurity, as the dependent

166 variable, and included in the multivariate logistic regression initial model. These variables included

167 gender, age, smoking status, marital status, living arrangement, home tenure, education, pension,

168 BMI, walking disability, self reported health, the presence of two or more chronic conditions, self

169 reported arthritis and asthma.   Only risk factors that remained significant in the final model are

170 shown in Table 3, with the strongest predictors for reporting food insecurity as follows: living in

171 rented accommodation (OR 4.10 95% CI: 2.83-5.89), age between 49 and 70 years (OR 2.43, 95% CI:

172 1.80-3.28), receipt of a pension only (OR 1.90 95% CI: 1.30-2.78) and being a current smoker (OR

173 2.22 95% CI: 1.59, 3.12). The final model satisfied the Hosmer-Lemeshow goodness-of-fit test. When

174 the data were stratified by gender and age group (aged less than 70 years versus 70 plus years) three

175 common risk factors were found amongst the four groups: living in rented accommodation, receipt

176 of a pension and being a current smoker (Data not shown).

177

178 **DISCUSSION**

179

180 The prevalence of any level of food insecurity (13%) in a cohort of older adults was considerably

181 higher than previous findings in older Australian populations which ranged from 2.0% to 4.5% in

182 similar age groups (9-10, 18). The higher prevalence can be explained by the more comprehensive

183 measurement tool compared to the single item used by others. When the single statement K from

184 the study tool was compared to the single item commonly used in previous studies, our results are

185 similar. The prevalence of food insecurity described here is lower than the 5% reported in the

186 general Australian population using a single item(10) but that is to be expected as the single item

187 only addresses the ability to afford food, affecting a higher proportion of younger adults, whereas

188 older adults may have different risk factors for food insecurity such as physical limitations (20-22).

189 Our results provide insight into the more complex nature of food insecurity in terms of anxiety about

190 acquiring food, and achieving a nutritious diet that is sufficient to meet the needs of an older person

191 as opposed to just the ability to afford food.

192

193 Results from the 18 item US Household Food Security Survey Module (HFSSM) in 2009 reported a

194 14.7% prevalence of household food insecurity in the US population(12), consistent with our results

195 from the 12 item tool. In Australia, using a similar tool to the HFSSM, Nolan et al (23) found that

196 over the previous year, 21% of households reported some level of food insecurity in three

197 disadvantaged areas of Sydney. Again, in disadvantaged urban areas of Brisbane, the reported

198 prevalence of food insecurity was 25% (24). These results were significantly higher than the level

199 reported when answering the single item question, suggesting that to date measurement of food

200 insecurity in Australia has been limited, and that particular subgroups are at greater risk. Higher

201 levels of food insecurity have been reported in disadvantaged areas as low income is a major risk

202 factor. The Blue Mountains region, in contrast, has a relatively higher socioeconomic status

203 compared to both New South Wales and Australia as a whole (25). Indeed, our population was

204 found to be representative of the region's population at the time (26), yet 1 in 8 older adults in our

205 study reported some level of food insecurity.

206

207   Burns et al (20) found 3.8% of households in the least disadvantaged areas of Melbourne reported

208 food insecurity due to lack of financial resources. This prevalence is similar to the 3% found in our

209 study from the single item 'K'. There was a significantly higher prevalence of food insecurity in the

210 mid-disadvantaged and most-disadvantaged areas in Melbourne, suggesting that a higher

211 prevalence may also exist in older adults in other areas of Australia (20). However, the results

212 cannot be directly compared as our study population was aged 49 years and over, whereas the

213 Melbourne population was aged 18 years and older. Temple reported the prevalence of food

214 insecurity decreased as amount of income increased in Australian adults aged 55 years and over(10),

215 providing some evidence that our results may be an underestimation of the degree of food

216 insecurity in the general older Australian population

217

218 The strongest predictors for reporting food insecurity in this population were age, living in rental

219 accommodation, receipt of a pension only and being a current smoker. These were also found when

220 examining risk factors in men and women separately and also by younger older (49 years to <70

221 years) and older older (70 years plus) populations. Our findings are consistent with previous

222 research from the US, Canada and Australia (4).

223

224 Similar to other studies of food insecurity in older adults we found that participants aged 70 plus

225 years were less likely to report being food insecure than younger participants aged 49 years to 70

226 years (9-10). Possible explanations for these differences include a higher number owning their home

227 outright, the availability of concessions on reaching official retirement age or possibly those at

228 greater risk are no longer living independently in the community (10). Even if older adults receive

229 government concessions on energy consumption, the food budget is discretionary and other

230 household living expenses are often paid for first, with remaining income allocated to food. Such

231 living expenses include medical expenses in particular out of pocket expenses, heating and/or

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

233   within the limited budget.

234

235

236   Ongoing good health is a priority for older adults not only in terms of preventing disease but being

237   able to live independently within the community. In our cohort, self-reported poor or fair health

238   was an independent risk factor for being food insecure after multivariate adjustment. Previous

239   studies have found that self rated poor or fair health is related to food insecurity as well as poor

240   mental and physical quality of life (1, 28). Wolfe et al (29) reported health problems and physical

241   disabilities affected experiences of food insecurity in an elderly population. Physical limitations or

242   chronic health conditions may limit physical access to food in terms of lifting or being able to carry

243   groceries home or no longer being able to drive (20) However, as these data are cross sectional, it is

244   not possible to determine whether poor health is a risk factor or an outcome of food insecurity.

245   Further longitudinal analysis would enable clearer directional pathways to be determined.

246

247   The benefits of using a more comprehensive measurement tool are the ability to assess anxiety

248   about acquiring food, quantity and quality of food available in addition to food insecurity related to

249   lack of financial resources. The use of a single item assessing only the economic aspects has been

250   described as more of an indicator of food security (30), and does not adequately describe the

251   increasingly complex nature of food security within the population. Results from our study and

252   others (23-24) suggest considerable underestimation of food insecurity in Australia and further

253   research into individual and household food security is essential. With the ongoing debate about

254   the issues of global food availability and high food prices, the Government is proposing an integrated

255   national food policy calling for both adequate quality and quantity of the food supply. To

256   complement the supply side, monitoring the Australian population to ensure all sub groups are able

257   to achieve a safe and nutritious diet is required to aid the development of appropriate interventions

258   for optimal health and well being.

259

260   This study has a number of strengths and limitations. Strengths of this study include its high

261   response rate from participants in a population-based cohort as well as detailed data collection

262   enabling the assessment of a wide range of potential risk factors. The measurement tool has been

263   adapted and validated for use in a number of different populations enabling a number of

264   comparisons to be made although not within Australia(31-32). Limitations include the statements

265   used to measure food insecurity, although a more comprehensive measure, still predominantly

266 focused on the economic ability to acquire food. Other factors, for example, physical access to food

267 stores or physical limitations for preparing and cooking meals may influence food insecurity status in

268 older adults more than low income. The age of the data is a limitation, however, more recent

269 evidence on food security status indicate that prevalence rates in Australia have not improved (20,

270 33). A further limitation was lack of income data collected in this study as it is known that low

271 income is a major predictor of food insecurity. Source of income was used as an indirect measure

272 and may be more relevant in an older adult population, as Government pensions are the main

273 source of income for the majority of people aged over 65 before superannuation and

274 investments(7).

275

276 In conclusion, the prevalence of food insecurity is likely to have been underestimated in national

277 surveys. Addressing the needs of sub groups of the older Australians who are at greater risk of food

278 insecurity, to ensure their ongoing health, will require a coordinated approach both nationally and at

279 a local level. The next step will be to examine the effect of food insecurity on health over time.

280

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

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