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Sociodemographic characteristics and social exclusion among the oldest old

RESEARCH ARTICLE

Sociodemographic characteristics and social exclusion among the oldest old

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Abstract

Objectives: The socioeconomically disadvantaged oldest old (people aged 85 years and over) are more vulnerable to social exclusion than the general population. Using a population representative sample, this paper examined associations between sociodemographic characteristics and social exclusion among the oldest old.

Methods: This cross-sectional study included 307 participants aged 85 years and over from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. Sociodemographic characteristics were measured using household composition, country of birth, housing tenure, income, education and neighbourhood-level disadvantage. Three social exclusion domains were derived representing unsupportive relationships, neighbourhood exclusion and community disengagement. Analysis was undertaken separately for men and women.

Results: Among men, living alone was associated with higher levels of unsupportive relationships ($\beta = 11.6$, 95%CI 2.1, 21.0) and having a lower income was associated with lower levels of neighbourhood disunity ($\beta = -16.7$, 95%CI −31.2, −2.2). Among women, living alone was associated with lower levels of community disengagement ($\beta = -7.2$, 95%CI −13.4, −0.9) and neighbourhood disadvantage was associated with lower levels of neighbourhood disunity ($\beta = -10.4$, 95%CI −19.6, −1.2). Both men and women with lower levels of education had higher levels of community disengagement (men: $\beta = 8.3$, 95%CI 1.9, 14.7; women: $\beta = 17.0$, 95%CI 8.6, 25.5).

Conclusions: This study showed few and unexpected associations between sociodemographic characteristics and social exclusion among oldest-old Australians, suggesting a homogeneous effect of advancing age. Government approaches aimed at reducing social exclusion in this age group should consider gender and taking action across all socioeconomic stratification. Further research is warranted to understand the underlying mechanisms linking sociodemographic characteristics to social exclusion.

[Correction added on 20 May, after first online publication: CAUL funding statement has been added.]

1 | INTRODUCTION

The oldest old (85 years and older) are the fastest growing age group in many countries worldwide, including Australia.[1,2] In 2017, the number of Australians aged 85 and over was 493,000. By 2036, it is projected that people living past 85 will more than double, reaching approximately one million.[2] Studies confirm a dose–response relationship between age and social exclusion—the older the person, the more likely they are to experience exclusion.[3,4] The World Health Organization posits social exclusion as an impediment to healthy ageing and quality of life.[1]

Social exclusion has been defined in numerous ways; however, it is typically conceptualised as multidimensional disadvantage with regard to material resources, social and economic participation, and personal growth, which accumulates over time and impacts negatively on health and well-being.[5] The processes that may lead to increased vulnerability to social exclusion among the oldest old can be age-related characteristics including poor health and cumulative disadvantage whereby economic inequalities in younger ages become more pronounced in later life (e.g. superannuation), discrimination (e.g. ageism) and inaccessible infrastructure.[6,7]

Social exclusion is a complex social phenomenon that cannot be directly observed, but can perhaps be understood as a series of constructs or components.[6] Older-age exclusion researchers emphasise the importance of including measures on domains or constructs that help to explain an older individual's different experiences and vulnerability to social exclusion.[6–9] For the purpose of this manuscript, guided by conceptual frameworks [6,9], we consider three domains of social exclusion: unsupportive relationships, neighbourhood exclusion and community disengagement. These are key areas that have been identified as priorities for further research.[9]

Unsupportive relationships and loneliness have been shown to influence the risk of becoming socially excluded in older age.[10] Population studies of adults have found that those with lower socioeconomic position (SEP) report fewer networks and lower levels of support, relative to those with higher SEP.[11,12]

Particular neighbourhood characteristics have been shown to influence social participation of older adults, including those aged over 85.[13,14] Low levels of trust, safety and support are reported by older people living in socioeconomically disadvantaged neighbourhoods.[15] These

Policy Impact

There is little research that specifically examines social exclusion among people assumed to be vulnerable—those aged 85 years and older. This paper develops new measures for social exclusion and analyses sociodemographic vulnerability to social exclusion. The findings support a multi-level policy response that includes prevention of socioeconomic inequalities over the life course as well as interventions to address social support needs and age-friendly neighbourhoods—importantly across all sociodemographic stratification.

Practice Impact

As the risk and meaning of social exclusion is likely to change across the life course, and be influenced by gender, further research is warranted to understand the nuanced experience of oldest old social exclusion. A key priority is to co-design measures of social exclusion with older people, so that policy is informed by evidence. The results of future research could inform health and social service providers on factors associated with social exclusion in men and women aged 85 and older.

findings reinforce the tendency of socioeconomically disadvantaged oldest old to curtail their engagement or movement within their neighbourhood resulting in social withdrawal. This diminishes their access to resources, information and support.[15]

And lastly, there is evidence that community disengagement is an important aspect of social exclusion as it denotes an inability to fully access the cultural fabric of society.[8] Population studies of adults report that those with lower SEP are less socially active in their communities relative to those with higher SEP.[11,12] Participating in community life not only strengthens neighbourhood cohesion, but also can provide mental stimulation and purpose, and help reduce social isolation and physical and mental decline.[16]

Another key aspect of how oldest old are likely to experience social exclusion is through gender. It is likely that women and men in the community experience social exclusion in different ways, due to (i) life expectancy and morbidity, (ii) participation in economic and social life, (iii) caring responsibilities[17] and (iv) experience of their neighbourhoods.[18] Over the life-course, for example,

women experience greater poverty than men, but men are more likely to be lonely.[19] The gender difference in poverty is likely to be a product of women's lower labour force participation and interrupted careers due to childbearing and childrearing.[20] Findings on the association between gender and social exclusion are mixed. Some studies report that social exclusion is more common among women than men in older-age groups.[8] However, other studies argue that these differences are likely to be a product of gender bias, because women tend to outlive men[4] and are more likely to be widowed and living alone at older ages.[21] Nonetheless, the World Health Organization posits gender as a key determinant of healthy ageing.[1]

Despite the likelihood that sociodemographic characteristics predispose the oldest old to social exclusion, and that the presence of supportive relationships, neighbourhood cohesion and community participation may protect against social exclusion, and limited supporting evidence exists. Studies of older-age social exclusion and sociodemographic associations have focused on cohorts aged 65 and older.[6,8,22] There are also differences in the conceptualisation and measurement of social exclusion between studies and differences of survey designs.[6,9,23] Given the current knowledge gap, and the likelihood that oldest old men and women experience and participate differently in society, the aim of this study was to investigate associations between sociodemographic characteristics and social exclusion among oldest old men and women.

2 | METHODS

2.1 | Data

The data come from the Household, Income and Labour Dynamics in Australia (HILDA) Study. Conducted annually since 2001, HILDA is a representative panel study of private households in metropolitan neighbourhoods. Within a household, all persons aged 15 and older are invited to participate. Data are collected annually via a combination of telephone and face-to-face interviews and self-completed questionnaires. Information about the design, participants, response and retention rate is reported elsewhere.[24] This cross-sectional analysis used data from the self-administered questionnaire used in Wave 16 (collected between July 2016 and February 2017). Wave 16 of the self-administered questionnaire was chosen because it is the most recent wave that contains a neighbourhood environment supplement. Participants gave their written informed consent prior to their involvement in the HILDA Study. Approval to use HILDA's de-identified data was granted from Australian Catholic University Human Research Ethics Committee register number: 2018–280H.

2.2 | Measures of social exclusion

Three measures of social exclusion were examined: perceived unsupportive relationships, neighbourhood exclusion, and community disengagement.

Perceived unsupportive relationships: We created a scale of perceived unsupportive relationships using ten survey items that were rated on a Likert scale ranging from strongly disagree (1) to strongly agree (7). These items were used in a principal components analysis (PCA) with Varimax rotation. Positively phrased questions were reverse-coded. Five items loaded onto one factor and were retained to generate a standardised scale (Cronbach's alpha = 0.74), which were transformed to range from 0 to 100. Higher scores indicate heightened perceptions of unsupportive relationships and hence greater vulnerability to social exclusion. The five items were 1) People do not come to visit me as often as I would like; 2) I often need help from other people but can't get it; 3) I don't have anyone that I can confide in; 4) I have no one to lean on in times of trouble; and 5) I often feel very lonely.

Neighbourhood exclusion: neighbourhood exclusion indicators were compiled by deriving scales using nine items relating to observed neighbourhood characteristics of safety, amenity and neighbourhood disunity. Survey items were rated on a Likert scale ranging from never happens (1) to very common (5). Positively phrased statements were recoded, so that a higher score indicated a higher degree of perceived exclusion. These measures were treated in an identical manner to that described for the perceived unsupportive relationships scale. A principal components analysis of the nine items indicated three clear groups with sufficient scale reliability. These scales were subsequently classified as 'perceived noise' (Cronbach's alpha = 0.62), 'perceived crime' (Cronbach's alpha = 0.87) and 'perceived disunity' (Cronbach's alpha = 0.80). The two items for 'perceived noise' were loud traffic noise, and noises from airplanes, trains or industry. The five items for 'perceived crime' were teenagers hanging around the streets, people being hostile or aggressive, vandalism and deliberate damage to property, burglary and theft, and rubbish and litter lying around. The two items for 'perceived disunity' (reverse coded) were neighbours helping each other out, and neighbours doing things together.

Community Disengagement: a community disengagement index was constructed by summing three items measuring attendance in cultural or leisure activities, for which people have to leave the home. Respondents were asked to indicate the frequency that they participate in activities such as (1) going to the movies, concerts, theatre or performing arts; (2) attending museum or art gallery; and

(3) attending educational lectures or courses. Responses ranged from most days (1) to not at all (7). The index was converted to range from 1 to 100, with higher scores denoting less participation in the community and hence a greater vulnerability to social exclusion.

2.3 | Sociodemographic characteristics measures

Household composition recognising that the perception of social exclusion may differ by household composition survey responses was coded into 'living alone' or 'multiple-person households' (do not live alone).

Country of birth was used as a proxy indicator for English proficiency. Respondents were grouped according to whether they were born in a country where English was the main language spoken.

Housing tenure was derived from a question with three main categories: (1) own/currently paying off mortgage, (2) rent or pay board or (3) live here rent free. The latter two categories were recoded into 'do not own home'.

Income was measured by grouping annual equivalised household (disposable) income into quantiles and viewed as an indicator of the economic resources available in a household. For a lone person household (common among our sample) annual equivalised income was equal to total household income.

Level of education was obtained from the recorded highest education level achieved, using a nine-category measure, that was subsequently coded as completed below Year 11 (the lowest option available in HILDA) or completed Year 11 and higher. In Australia in the 1930s and 1940s, schooling was only compulsory for primary school students; hence, our measure reflects the historical norm of the level of education completed among persons aged 85 and older.

Neighbourhood disadvantage was based on the household's residential address and categorised into quintiles of disadvantage using the Socio-Economic Index for Areas (SEIFA) Index, developed by the Australian Bureau of Statistics.[25] In an attempt to differentiate between less and more extreme levels of disadvantage, neighbourhoods were dichotomised into the categories most disadvantaged (i.e. Quintile 5) and least disadvantaged (i.e. Quintiles 1–4).

2.4 | Data analysis

Wave 16 of HILDA included 315 respondents aged 85 years or more who had completed the self-administered survey. Of these, eight had incomplete data on the

sociodemographic variables (i.e. income and housing tenure) and hence were excluded. Our analysis was restricted to participants who responded to each item comprising the social exclusion measures; thus, 19 participants were excluded due to missing information on the perceived unsupportive relationships scale (6.2% missing). Participants who had missing information or chose the 'don't know' response on items on the three scales that measure different aspects of the neighbourhood environment were omitted from the analyses. This resulted in final analytic samples of 266 for the neighbourhood disunity indicator (13.4% missing), 293 for the neighbourhood noise indicator (4.6% missing) and 265 for the neighbourhood crime indicator (13.7% missing). Ten participants had missing data on the community disengagement index (3.3% missing). Logistic regression controlling for age and gender was used to examine the characteristics of those excluded from the analysis. There were no significant differences on sociodemographic characteristics between the included and excluded participants.

A one-way analysis of variance (ANOVA) was undertaken as preliminary descriptive analysis to determine whether there were any statistically significant mean differences between groups based on their sociodemographic characteristics. Robust standard errors were also calculated to minimise clustering/degree of dependence of the household sampling unit used in HILDA. We undertook multiple linear regression between sociodemographic characteristics and each of the five measures of social exclusion, controlling for age. Higher-level SEP categories and the most advantaged neighbourhoods were the reference groups. The results are presented as regression coefficients and their 95% confidence intervals. All analyses used STATA version 15.1 (StataCorp).

3 | RESULTS

Descriptive statistics and mean overall scores for each of the social exclusion measures are presented in Table 1. Compared to women, men were more likely to live with others, had similar cultural background, housing tenure and income, and were more likely to have completed higher levels of education. Men scored higher for unsupportive relationships, community disengagement, neighbourhood noise and neighbourhood disunity, while women scored higher for neighbourhood crime.

The mean scores for each of the measures of social exclusion by each of sociodemographic characteristics are presented for men in Table 2 and women in Table 3. Among men, those living alone had statistically significantly higher levels of unsupportive relationships, while those with lower levels of education had higher levels of

TABLE 1 Sociodemographic characteristics and social exclusion scores: Australians aged 85 to 99

	Total $n = 307$	Men (%) $n = 127$	Women (%) $n = 180$
Age[a]	88 (3)	88 (3)	89 (3)
Household composition			
Don't live alone	140 (46)	85 (67)	55 (31)
Live alone	167 (54)[a]	42 (33)	125 (69)
Country of birth			
English speaking	266 (87)	108 (85)	158 (88)
Non-English speaking	41 (13)	19 (15)	22 (12)
Housing tenure			
Own home	235 (77)	101 (80)	134 (74)
Not own home	72 (34)	26 (20)	46 (26)
Annual income			
≥$36,000	78 (25)	30 (24)	46 (26)
$26,000–35,999	76 (25)	37 (29)	40 (22)
$22,101–25,999	77 (25)	35 (28)	41 (23)
≤$22,100	76 (25)	25 (20)	53 (29)
Level of education			
Year 11 and above	179 (58)	73 (57)	55 (31)
Below year 11	128 (42)[a]	54 (43)	125 (69)
Neighbourhood disadvantage			
Least disadvantaged	50 (16)	20 (16)	30 (17)
Disadvantaged	257 (84)	107 (84)	150 (83)
Social exclusion scores		**Mean (SD)**	**Mean (SD)**
Unsupportive relationships ($n = 288$)[b]		32.0 (23.8)	29.5 (22)
Community disengagement ($n = 297$)[c]		86.2 (18.6)	82.6 (23.3)
Neighbourhood noise ($n = 293$)[d]		37.9 (23.3)	37.5 (24.6)
Neighbourhood crime ($n = 265$)[e]		27.4 (22.1)	28.9 (23.8)
Neighbourhood disunity ($n = 266$)[f]		40.4 (25.8)	39.8 (26.4)

[a]Mean age and standard deviation; difference between men and women.

[b]Unsupportive relationships (feeling absence of quality relationships).

[c]Community disengagement (unable to participate in cultural actives in the community).

[d]Neighbourhood noise (feeling that the local area is loud from traffic and industry).

[e]Neighbourhood crime (perception that the local area is untidy and unsafe) and.

[f]Neighbourhood disunity (not feeling a sense of belonging in the local area). The measures were converted to range from 1 to 100, with higher scores denoting greater vulnerability to social exclusion.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

community disengagement. Among women, those living alone had statistically significantly lower levels of community disengagement and those with lower levels of education had higher levels of perceptions of neighbourhood crime and community disengagement, while those in the most disadvantaged neighbourhoods had lower levels of neighbourhood disunity.

Associations between sociodemographic characteristics and social exclusion are presented in Tables 4 and 5 for men and women, respectively.

Men living alone had statistically significantly higher levels of unsupportive relationships, while no associations were found among women. No associations were observed between sociodemographic characteristics and perceived noise for men or women. Lower levels of education were associated with higher neighbourhood crime among women, while no associations were observed among men. Among men, having the lowest annual equivalised income (compared to having the highest income) was associated with lower vulnerability

TABLE 2 Bivariate relationships between sociodemographic characteristics and social exclusion measures, for men

	Unsupportive relationships	Neighbourhood noise	Neighbourhood crime	Neighbourhood disunity	Community disengagement
	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
Household composition					
Don't live alone	28.1 (23.5, 32.8)	37.0 (31.5, 42.5)	27.0 (22.0, 31.9)	38.0 (31.6, 44.3)	86.3 (82.6, 90.0)
Live alone	39.4 (31.2, 47.5)**	39.9 (33.7, 46.2)	29.4 (22.0, 36.8)	44.4 (36.8, 51.9)	86.1 (79.6, 92.6)
Country of birth					
English speaking	32.5 (27.8, 37.3)	37.6 (33.1, 42.0)	27.8 (23.6, 32.0)	39.6 (34.3, 44.9)	86.5 (82.8, 90.1)
Non-English speaking	28.5 (19.6, 37.4)	40.6 (27.8, 53.3)	27.9 (13.7, 42.1)	44.4 (31.6, 57.1)	84.7 (77.9, 91.5)
Housing tenure					
Own home	31.6 (26.9, 36.4)	37.7 (33.1, 42.3)	27.8 (23.3, 32.4)	40.6 (35.1, 46.0)	85.2 (81.3, 89.1)
Not own home	33.2 (23.6, 42.7)	39.2 (28.8, 49.6)	27.7 (18.3, 37.3)	38.6 (27.2, 50.0)	90.0 (85.6, 94.4)
Annual income					
≥$36,000	29.1 (21.7, 36.5)	36.7 (29.3, 44.2)	29.8 (22.4, 37.1)	46.8 (38.0, 55.6)	80.7 (72.6, 88.7)
$26,000–35,999	33.9 (26.4, 41.3)	40.7 (33.4, 48.0)	27.3 (19.8, 34.7)	40.0 (33.0, 47.1)	87.6 (82.7, 92.4)
$22,101–25,999	33.4 (24.2, 42.7)	34.3 (25.6, 43.0)	23.6 (15.8, 31.4)	42.7 (31.7, 53.8)	89.4 (83.5, 95.3)
≤$22,100	30.7 (20.6, 40.7)	40.7 (29.8, 51.5)	32.7 (22.1, 43.3)	30.2 (18.5, 41.9)	86.3 (78.5, 94.0)
Level of education					
Yr. 11 and above	32.0 (26.5, 37.4)	39.0 (33.6, 44.4)	28.5 (23.2, 33.8)	43.7 (37.4, 50.1)	82.7 (78.0, 87.4)
Below yr. 11	31.9 (25.2, 38.7)	36.6 (29.9, 43.3)	26.9 (20.4, 33.5)	34.9 (27.4, 42.3)	90.9 (87.0, 95.0)**
Neighbourhood disadvantage					
Least disadvantaged	24.1 (13.1, 35.1)	36.8 (28.3, 45.4)	21.0 (12.9, 29.2)	43.1 (30.9, 55.3)	81.1 (69.5, 92.6)
Most disadvantaged	33.5 (28.9, 38.0)	38.2 (34.1, 42.3)	28.9 (24.4, 33.5)	39.7 (34.4, 45.1)	87.1 (83.9, 90.4)

Note: Mean adjusted for clustering; social exclusion measures range from 0 to 100 with higher scores indicating higher levels of exclusion.

*$p \leq 0.01$, **$p \leq 0.05$, ***$p \leq 0.001$.

to neighbourhood disunity, while women living in the most disadvantaged neighbourhoods perceived less disunity compared to women living in more advantaged neighbourhoods. Both men and women with lower levels of education had higher levels of community disengagement, while women living alone had lower levels of community disengagement.

4 | DISCUSSION

This study was informed by previous conceptualisations of older-age social exclusion.[9] It examined measures of social exclusion on domains that are thought to be relevant to the experiences of the oldest old: perceived unsupportive social relationships and perceived neighbourhood exclusion and community disengagement. As the variation in experience of social exclusion among the oldest old is poorly understood, our analysis aimed to address this gap.

There were few statistically significant associations between sociodemographic characteristics and vulnerability to different dimensions of social exclusion. In

some instances, our results were inconsistent with previous research, which suggests a relationship between low SEP and social exclusion.[3,4] We found that for oldest old males, living alone was associated with higher social exclusion on the perceived unsupportive social relationship domain. This result is consistent with findings from life course studies that report males tend to have more deficiencies in social relationships than females.[19] Conversely, for women, living alone was associated with increased community engagement. It is possible that other factors, such as length of time living in the community and carer responsibility, may confound these results. For example, it may be that primary care givers (older women caring for their husband) have little time to engage in other activities. Living with family may also imply a greater level of care or dependency that restricts ability to engage in the community. Although not stratified by gender, an Australian study found that for older people (65+ years old), factors that increased the risk of social exclusion included carer status, and living with their own children.[22] Our finding suggests that social exclusion measures that equate living alone with social exclusion

TABLE 3 Bivariate relationships between sociodemographic characteristics and social exclusion measures, for women

	Unsupportive relationships Mean (95% CI)	Neighbourhood noise Mean (95% CI)	Neighbourhood crime Mean (95% CI)	Neighbourhood disunity Mean (95% CI)	Community disengagement Mean (95% CI)
Household composition					
Don't live alone	31.6 (25.2, 38.0)	38.6 (32.6, 44.6)	29.1 (21.9, 36.4)	37.5 (31.1, 44.0)	88.1 (83.7, 92.5)
Live alone	28.6 (24.7, 32.6)	36.9 (32.4, 41.5)	28.4 (24.0, 32.9)	40.9 (35.7, 46.1)	81.1 (76.6, 85.6)*
Country of birth					
English speaking	28.5 (25.0, 32.0)	37.9 (34.0, 41.8)	28.7 (24.7, 32.7)	38.4 (34, 42.7)	82.5 (78.7, 86.2)
Non-English speaking	36.7 (26.2, 47.2)	33.9 (22.9, 44.9)	27.9 (16.2, 39.5)	50.2 (38.1, 62.3)	88.2 (80.7, 95.7)
Housing tenure					
Own home	29.3 (25.5, 33.0)	36.6 (32.6, 40.6)	27.9 (23.9, 31.8)	39.4 (34.7, 44.0)	81.2 (76.9, 85.4)
Not own home	30.2 (22.9, 37.6)	39.9 (31.4, 48.3)	31.0 (21.4, 40.6)	41.3 (32.4, 50.3)	88.9 (84.0, 93.8)
Income					
≥$36,000	26.1 (19.2, 33.0)	38.7 (31.5, 45.9)	31.1 (23.4, 38.8)	36.0 (27.5, 44.6)	77.7 (69.0, 86.3)
$26,000–35,999	29.1 (22.8, 35.5)	33.6 (25.9, 41.3)	28.1 (20.2, 36.0)	39.4 (31.1, 47.7)	84.9 (78.6, 91.1)
$22,101–25,999	29.7 (22.7, 36.8)	38.0 (31.5, 44.5)	30.0 (21.9, 38.1)	42.2 (34.1, 50.4)	84.5 (77.9, 91.1)
≤$22,100	32.7 (26.2, 39.2)	38.7 (31.2, 46.3)	25.8 (18.8, 32.8)	41.5 (33.4, 50.0)	85.5 (79.8, 91.2)
Level of education					
Yr. 11 and above	25.6 (20.3, 30.8)	33.3 (27.0, 39.5)	22.9 (17.4, 28.4)	37.2 (29.9, 44.6)	71.3 (63.6, 79.0)
Below yr. 11	31.3 (27.1, 35.6)	39.3 (34.8, 43.8)	31.1 (26.2,35.9)*	41.2 (36.2, 46.2)	88.6 (85.4, 91.7)**
Neighbourhood disadvantage					
Least disadvantaged	28.8 (20.7, 36.9)	33.6 (26.0, 41.2)	21.5 (13.7, 29.2)	48.4 (39.9, 57.0)	82.0 (73.9, 90.1)
Most disadvantaged	29.7 (26.0, 33.3)	38.2 (34.1, 42.3)	29.9 (25.7, 34.1)	38.0 (33.3, 42.6)*	83.4 (79.6, 87.2)

Note: Mean adjusted for clustering; social exclusion measures range from 0 to 100 with higher scores indicating higher levels of exclusion

*$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.

(e.g. as a proxy measure) may miss the nuanced experience of living alone in very old age.

We found that for older males having low income (compared to having high income) was associated with higher levels of perceived neighbourhood cohesion. These results are contrary to what was expected, given previous literature which found that wealth may buffer against social exclusion.[8,26] However, previous studies have used younger aged samples: for example, Barnes' study sample was aged 50 years and over.[8] Financial constraints may prohibit relocation contributing to longer durations to establish subjective perceptions of belonging. In interpreting our surprising result, another important consideration is to recognise the homogeneity, or limited variation in income in the HILDA sample of people aged over 85, which may affect the results by showing little significance of income. For example, annual equivalised income was relatively low compared to the average adult Australian and there was little variation (women: mean $29,988, SD 24.53, and men: mean $34,578, SD 16.54). This may also explain why income was not a significant factor for women.

Our study found that men and women were more vulnerable to community disengagement if they had lower levels of education. Our finding is consistent with the few studies that include education in a multilevel regression model, with low levels of education being significant risk factors for older-age social exclusion.[22,27]

Regarding perception of neighbourhood disunity, women living in more advantaged neighbourhoods perceived less neighbourhood cohesion. This contradicts another research.[28,29] A possible explanation may lie in the moderating effect of contextual influences such as informal ties with neighbours[30] and gentrification.[29]

Our study has several limitations. First, the approach taken for this paper was cross-sectional. While this has provided an important starting point for understanding associations between sociodemographic characteristics and social exclusion, it has been argued that social exclusion is an experience with many temporal components.[31] For example, social exclusion may occur in alignment with a major transitional event, such as the loss of a spouse or friend or decline in health.[32] Further research examining

TABLE 4 Multivariable associations between sociodemographic characteristics and social exclusion for men

	Unsupportive relationships β (95%CI)	Neighbourhood noise β (95%CI)	Neighbourhood crime β (95%CI)	Neighbourhood disunity β (95%CI)	Community disengagement β (95%CI))
Household composition					
Don't live alone	Ref	Ref	Ref	Ref	Ref
Live alone	11.6 (2.1, 21.0)*	3.4 (−5.0, 11.7)	3.2 (−5.7, 12.2)	6.6 (−3.5, 16.7)	−0.4 (−7.9, 7.1)
Country of birth					
English speaking	Ref	Ref	Ref	Ref	Ref
Non-English	−3.9 (−14.3, 6.4)	2.7 (−10.1, 15.6)	−0.8 (−15.9, 14.3)	4.7 (−9.0, 18.5)	−1.7 (−9.4, 6.0)
Housing tenure					
Own home	Ref	Ref	Ref	Ref	Ref
Not own home	2.0 (−8.8, 12.7)	1.6 (−9.9, 13.1)	−0.2 (−10.8, 10.5)	−2.0 (−14.6, 10.6)	4.6 (−1.2, 10.5)
Income					
≥$36,000	Ref	Ref	Ref	Ref	Ref
$26,000–35,999	3.0 (−7.9, 13.8)	2.7 (−8.4, 13.8)	−3.3 (−13.9, 7.2)	−6.8 (−18.4, 4.8)	8.1 (−1.9, 18.2)
$22,101–25,999	4.0 (−7.6, 15.7)	−2.6 (−13.8, 8.7)	−5.6 (−17, 5.8)	−4.1 (−19.1, 10.8)	8.8 (−1.2, 18.8)
≤$22,100	1.8 (−10.5, 14.1)	3.8 (−9.6, 17.1)	3.5 (−9.6, 16.6)	−16.7 (−31.2, −2.2)*	5.5 (−5.6, 16.5)
Level of education					
Yr. 11 and above	Ref	Ref	Ref	Ref	Ref
Below yr. 11	−0.4 (−8.9, 8.2)	−2.6 (−11.4, 6.1)	−1.8 (−10.2, 6.6)	−8.9 (−18.7, 0.9)	8.3 (1.9, 14.7)**
Neighbourhood disadvantage					
Least disadvantaged	Ref	Ref	Ref	Ref	Ref
Most disadvantaged	9.7 (−2.0, 21.5)	1.4 (−8.3, 11.2)	7.9 (−1.6, 17.5)	6.6 (−3.5, 16.7)	5.9 (−5.7, 17.5)

Note: Linear regression controlling for age and adjusted for clustering; Ref = reference category.

*$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$.

TABLE 5 Multivariable associations between sociodemographic characteristics and social exclusion for women

	Unsupportive relationships β (95%CI)	Neighbourhood noise β (95%CI)	Neighbourhood crime β (95%CI)	Neighbourhood disunity β (95%CI)	Community disengagement β (95%CI)
Household composition					
Don't live alone	Ref	Ref	Ref	Ref	Ref
Live alone	−2.8 (−10.4, 4.9)	−1.8 (−9.7, 6.1)	−0.8 (−9.4, 7.8)	3.4 (−5.0, 11.9)	−7.2 (−13.4, −0.9)*
Country of birth					
English speaking	Ref	Ref	Ref	Ref	Ref
Non-English	8.5 (−2.4, 19.4)	−4.1 (−15.6, 7.4)	−0.9 (−13, 11.2)	11.9 (−0.7, 24.5)	5.3 (−2.8, 13.4)
Housing tenure					
Own home	Ref	Ref	Ref	Ref	Ref
Not own home	1.7 (−6.7, 9.9)	2.8 (−6.5, 12.1)	3.0 (−7.6, 13.7)	2.2 (−7.6, 12.0)	6.6 (−0.1, 13.3)
Income					
≥$36,000	Ref	Ref	Ref	Ref	Ref
$26,000–35,999	3.2 (−6.2, 12.5)	−5.3 (−16.1, 5.5)	−3.0 (−13.9, 7.9)	3.4 (−9.0, 15.8)	6.8 (−4, 17.5)
$22,101–25,999	3.4 (−6.4, 13.1)	−0.3 (−10.0, 9.3)	−1.0 (−12.2, 10.2)	6.1 (−6.1, 18.3)	7.7 (−3.6, 19.0)
≤$22,100	6.3 (−3.2, 15.8)	0.4 (−9.9, 10.6)	−5.2 (−15.5, 5.1)	5.4 (−6.8, 17.5)	8.7 (−1.7, 19.2)

TABLE 5 (Continued)

	Unsupportive relationships β (95%CI)	Neighbourhood noise β (95%CI)	Neighbourhood crime β (95%CI)	Neighbourhood disunity β (95%CI)	Community disengagement β (95%CI)
Level of education					
Yr. 11 and above	Ref	Ref	Ref	Ref	Ref
Below yr. 11	5.9 (−0.9, 12.8)	6.0 (−1.3, 13.3)	8.1 (0.7, 15.6)*	4.0 (−5.7, 13.7)	17.0 (8.6, 25.5)**
Neighbourhood disadvantage					
Least disadvantaged	Ref	Ref	Ref	Ref	Ref
Most disadvantaged	1.0 (−8.0, 10.1)	4.35 (−4.7, 13.4)	8.4 (−0.4, 17.2)	−10.4 (−19.6, −1.2)***	0.9 (−8.4, 10.1)

Note: Linear regression controlling for age and adjusted for clustering; Ref = reference category.

*$p \leq 0.05$, **$p \leq 0.001$, ***$p \leq 0.01$.

the relationship between temporal components of social exclusion would be of great benefit. Second, the definition and measurement of social exclusion is a methodological challenge for research, and we were limited to those measures available in the HILDA survey, a survey designed for the general population.

Future research should consider other domains important to oldest old social exclusion, such as perceived exclusion from social rights (government pension, housing and health care) and discrimination (ageism)[31], and community engagement measures more relevant to people aged 85 and older, such as faith-based groups and volunteering.[16] It should also seek to explore the mechanisms underlying associations found in the current study and better understand differences between people's perception of their neighbourhood and objective states. Finally, it is plausible that the limited variation in socioeconomic position and experiences of social exclusion may be attributed to survival bias. In advanced age, there is likely to be a narrowing of inequalities in health as those with lower socioeconomic status die at earlier ages.[33]

5 | CONCLUSIONS

There was some evidence of sociodemographic variation in feeling socially excluded in very old age, and this differed by domain of social exclusion and gender. Interestingly, in some instances, disadvantage was a protective factor for vulnerability to exclusion. Our findings support a public health response that includes prevention of socioeconomic inequalities over the life course as well as intervention to address social support needs and age-friendly neighbourhoods—across all sociodemographic stratification. As the risk and meaning of social exclusion is likely to change across the life course, and be influenced by gender, further research is warranted to understand the nuanced experience of

oldest old social exclusion. A key research priority is to increase the representation of oldest old in research, so that policy is informed by evidence.

CONFLICTS OF INTEREST
No conflicts of interest declared.

DATA AVAILABILITY STATEMENT
The data is available through https://dataverse.ada.edu.au/dataverse/hilda.

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