

Heterogeneity in needs and purchases in Australian retirees

Anthony Asher¹  | Tim Boonen² | Le Chang³ | Gaurav Khemka³  | Steven Roberts⁴

¹School of Risk and Actuarial Studies, University of New South Wales, Sydney, New South Wales, Australia

²Department of Statistics and Actuarial Science, The University of Hong Kong, Hong Kong, China

³Research School of Finance, Actuarial Studies and Statistics, Australian National University, Acton, Australian Capital Territory, Australia

⁴College of Business and Economics, Australian National University, Acton, Australian Capital Territory, Australia

Correspondence

Anthony Asher, School of Risk and Actuarial Studies, UNSW Business School, UNSW Sydney, Sydney, NSW 2052, Australia.

Email: a.asher@unsw.edu.au

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Abstract

To plan for retirement, it is important to understand how needs and purchases may change. We use data from a survey of elderly Australians to see how needs and purchases changed in different categories of goods and services. We looked especially at those who had experienced financial or health shocks. Our analysis shows variation in people's experiences, particularly for health costs, which increase with age. Having private health insurance appears to increase the level and volatility of health costs – presumably as a result of out-of-pocket costs. This information can be useful for financial advisors and superannuation trustees.

KEYWORDS

affordability, gender of decision maker, retirement expenditure, text analysis

JEL CLASSIFICATION

D12, E21, J14, J16

1 | INTRODUCTION

There is a general belief that financial advice is necessary for individuals in defined contribution retirement funds to adequately prepare for retirement, if they must fund their expenditure by withdrawals from an accumulation account (Mitchell & Smetters, 2013). Our focus is on patterns of financial spending during retirement, including the effects after a financial or health shock, in order to assist the retirement industry to provide advice and appropriate products to assist retirees in navigating their retirement years. This is important because retirees have difficulty returning to the workforce to supplement any losses (Johnsen & Willén, 2022).

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While there is a significant literature on financial choices before and at retirement (Beshears et al., 2018), evidence on post-retirement spending is less common. A Malaysian survey by Ong et al. (2008) finds little change in spending patterns over the retirement years. Maddock and Auster (2016), using HILDA survey data, and Asher et al. (2017), using a large sample of Age Pension recipients, find slightly different consumption patterns of Australian age pensioners that vary based on their age and financial means. However, using more disaggregated data in a longitudinal survey of UK retirees, Brancati et al. (2015) identify five distinct groups with differing patterns of expenditure based on age and category of expenditure. Balnozan et al. (2020) identify groups with different patterns of drawdown from retirement accounts in a longitudinal sample of Australian pension accounts but was not able to find any explanatory correlates.

This study contributes to this literature by analysing reported changes in needs and affordability across different categories of consumption after retirement. Our data also allow us to extend our analysis to separately consider these changes for retirees who had suffered financial or health shocks. In our analysis, we highlight the heterogeneity of experiences and confirm the importance of health and related costs particularly for the 20 percent of our survey experiencing a health shock. These findings provide valuable additional information about post-retirement spending for trustees developing strategies to implement the Retirement Income Covenant (APRA, 2022) and for financial advisors assisting individuals with retirement planning.

Our main finding is a significant difference between two groups: one that experienced an increase in health expenditure and another that did not. This difference appears to be between groups who had private health insurance and those who did not and instead rely on Medicare. In Australia, private health insurance is community rated and widely accessible, and hence these findings indicate that those who can afford private health care tend to increase spending on medical and health either through increased premiums or additional out-of-pocket spending while those who rely only on Medicare are likely constrained by their financial situation and cannot spend more on their health even if they may want to. This finding is consistent with Ameriks et al. (2020), who show this analytically in a life-cycle model. Our findings have important implications for the design and affordability of private healthcare benefits.

We also note that Yates and Bradbury (2010) find a significant difference between renters and homeowners, however our sample included very few renters (we only consider retirees, and the demographic of renters is skewed towards younger ages since they have not had sufficient time to accumulate wealth). Based on the data in our sample, we were unable to identify any other criteria that trustees could use to differentiate between different cohorts.

The structure of this paper is as follows: in Section 2, we describe the survey data used in the study. In Section 3, we outline the models employed in the subsequent analysis. The appendix provides a summary of the explanatory variables utilised in this paper, along with a description of the weighting method utilised to make the sample more representative of the retired population. In Section 4, we present the results of our analysis, including the analysis of text responses. Finally, in Section 5, we summarise the implications of our findings and conclude.

2 | OUR SURVEY IN THE LIGHT OF PREVIOUS LITERATURE

2.1 | Our survey

In this study, we utilise data from a survey of elderly Australians, as described in Higgins and Roberts (2011) and also utilised by Preston (2011) and Xue et al. (2019, 2020, 2021). The structure of Australian retirement funds is typical of defined contribution arrangements with minimal take-up of longevity options in retirement. The survey, which includes 87 questions

with multiple or textual responses, provides a rich dataset for investigating a variety of relationships. Our analysis can inform the development of financial advice tailored to individuals with different characteristics and capabilities, as well as guide changes to welfare policy and financial institution offerings. Complementing previous research, we examine the affordability of changes in needs after retirement and provide a thorough analysis of text responses to understand the reasons for changes in consumption.

Our focus is on survey questions related to whether respondents' needs and purchases changed in retirement. We examine six categories of expenditure that are likely to vary in response to changes in circumstances: food, alcohol and tobacco, housing, household expenses, medical expenses and gifts. As possible explanatory variables, the survey included information on age, other individuals in the household, sex, wealth, home ownership, financial literacy and awareness, postcode as well as perceived health and financial wellbeing. The survey also includes questions for those who report experiencing health and financial shocks, which may well accelerate the pace of any changes. These data were chosen as being readily answered in a questionnaire, and had been found, as in the literature reported below, to relate to financial wellbeing and behaviour in retirement.

2.2 | Insights from previous literature

As previously mentioned, there is limited empirical literature on consumption changes after retirement, and our aim was to consider what factors might lead to changes in the consumption of particular categories in order to assist retirees in their planning.

2.2.1 | Health

There are variations in the way that healthcare costs increase with age and the need for precautionary savings to cover them. Abdel-Ghany and Sharpe (1997) and Di Matteo (2005) find a positive correlation between the age of retirees and their expenditure on health and medical services in the United States and Canada, respectively. De Nardi et al. (2010) show that precautionary savings are higher after retirement in order to prepare for these anticipated increases. However, Maynard and Qiu (2009) find that in the United States, the relationship between age and healthcare expenditure depends on levels of insurance. van Ooijen et al. (2015) find that in the Netherlands, which has a generous pension system and almost complete coverage of the public health insurance system, there is still a high level of precautionary savings, while Nakajima and Telyukova (2013) show that retirees in countries with non-means-tested medical and care insurance significantly decumulate assets in older age.

In Australia, individuals can choose to rely on publicly funded healthcare with longer waiting lists or use private providers, with the latter option often requiring private health insurance (Duckett, 2005). Private insurance in Australia is associated with higher out-of-pocket costs and premiums that were rising at the time of the survey. McRae et al. (2013) find that the average annual out-of-pocket costs for private healthcare in Australia were \$1400, although 5 percent of their sample paid over 20 percent of their income in out-of-pocket costs. It is likely that these 5 percent of their sample had private insurance coverage, as the national Medicare program should cover all costs for those using public healthcare. Our results are consistent with those of McRae et al. (2013) and show that those with private insurance are more likely to report increased medical expenditure.

We also examine the impact of financial and health shocks, with the latter also expected to have a negative impact on wealth (Aguila et al., 2011; Hurd & Rohwedder, 2013). Smith (1999) notes that the reduction in wealth is greater than can be explained by out-of-pocket medical

costs or reduced income. Lillard and Weiss (1997) suggest that the marginal utility of other consumption increases, implying that retirement finances would be optimised if medical costs were fully insured, even if other consumption is reduced to pay for health insurance premiums. The situation may be different in Australia. Our findings highlight the need for further research to help advisors develop strategies for managing medical costs and potentially insurance arrangements that protect against cutting back on expenditure on food and housing costs.

2.2.2 | Wellbeing

Amorim and França (2019) suggest that wellbeing in retirement can be represented by ‘five dimensions: demographic variables, personal resources, previous work characteristics, ability to do activities, and characteristics of retirement.’ Xue et al. (2020) analysed the responses from our survey and find that financial wellbeing was positively related to outright home ownership, age, being married, education and health as well as to an index as to whether their consumption needs were met.

2.2.3 | Financial literacy

Lusardi and Mitchell (2023) provide an up-to-date survey of the international literature on financial literacy and its positive impact on objective and subjective wellbeing. Their findings are confirmed by the analysis of Xue et al. (2020, 2021) based on the same survey data of elderly Australians. In their analysis, they also found that the more financially literate respondents are more likely to cut back on spending where necessary, and consequently be better able to afford less essential items such as alcohol and gifting. Our results confirm greater expenditure on essentials, but seem to indicate lower expenditure on non-essentials (gifts and alcohol). Possible reasons may arise from our smaller subsample having rejected those with missing variables, or because we are using more variables that have a direct impact on these spending categories.

2.2.4 | Gender

Kim et al. (2017) provide a comprehensive review of the cultural and economic factors influencing different gender roles in decision-making. They argue that male spouses are generally more involved in household financial decision-making, while women are generally more risk averse. Understanding the household gender composition is important for a counsellor to give proper financial advice at retirement. Babiartz et al. (2012) highlight the importance of power inequalities and the financial vulnerability of wives, particularly after the death of their husbands.

2.2.5 | Gifts

Gifts and donations are discretionary but may be driven by other factors. There is evidence that any type of spending on others increases one's own happiness (Dunn et al., 2008), which may explain this finding. This is consistent with the findings of McConnel and Deljavan (1983), who find that retirees tend to spend a lower proportion of additional income on necessities but a greater proportion on gifts and donations compared to those nearing retirement. Schaller and Eck (2019) report that giving increases following spousal death, which is consistent with increased giving by singles.

2.2.6 | Tenure

Yates and Bradbury (2010) find that renters are more likely to be impoverished in Australia, and the Productivity Commission (2022) reported that this may have worsened due to a rental shortage. Based on a survey among Australian households, Spicer et al. (2016) find that households at older ages decrease their exposure to risky investments, while maintaining ownership of their house. Moreover, they find that households who run down financial assets do not reduce homeownership rates or housing equity.

2.2.7 | Food

The non-affordability of food expenditure declined, indicating that our group of elderly Australians was able to better manage these costs. This is consistent with the findings of Aguiar and Hurst (2005), Aguila et al. (2011) and Li et al. (2015), who suggest that retirees have more leisure time and are able to shop more frequently and efficiently, as well as cook at home more often. Burzig and Herrmann (2012) provide a more nuanced analysis with their finding that the proportion of expenditure on food consumed at home, in a German sample, does not change but the probability of eating out increases with retirement – indicating greater affordability. These results appear a little at odds with Maddock and Auster (2016), but their analysis is about average expenditure on food, which does not decline. We identified a significant proportion of the aged for whom this is not true. At the opposite end of the income spectrum, those from more affluent neighbourhoods and those reporting a higher level of financial well-being reported a greater need for food consumption, with the latter group and those who are financially aware also reporting greater expenditure on food and alcohol. This may be related to social opportunities and the pressure to entertain and eat out. Preston (2011) finds that the subjective financial wellbeing of survey respondents was connected to the desire to ‘keep up with the Joneses’. Retirees should be aware of the impact of such comparisons and expectations from neighbours on their subjective wellbeing.

2.3 | The data

The present study utilises data collected from a survey titled ‘Expenditure Needs, Financial Actions, and Financial Well-being in Later Life’, which was distributed to 15,000 members of National Seniors Australia in August 2010. Of the participants, 3485 individuals completed the survey, representing a response rate of approximately 23 percent. A detailed analysis of the survey can be found in Higgins and Roberts (2011), along with the original survey questions.

To assess the needs and purchases of retirees,¹ the following questions were included in the survey:

Question 2.1: ‘Has your household's need for the following goods or services increased, decreased, or stayed the same since before you retired from paid work?’

Question 2.2: ‘Does your household purchase approximately the same quantity, more, or less of the following goods and services now than it did before you retired from paid work?’

¹Text reproduced verbatim from the survey are in single quotations. The survey is reproduced in its entirety in the appendix of Higgins and Roberts (2011).

Goods and services were categorised as follows:

1. **Food:** This includes food and non-alcoholic beverages for meals at home and meals out.
2. **Alcohol and tobacco:** All alcoholic beverages and tobacco.
3. **Housing:** This includes housing and utility costs: e.g., rent and mortgage repayments, house and contents insurance, rates, land tax, repairs and maintenance.
4. **Household:** This includes household goods: e.g., kitchen and laundry appliances, household non-durables and household services.
5. **Medical expenses:** This includes medical and health expenses including accident and health insurance, fees and nursing home charges.
6. **Gifts:** Gifts, donations, cash or other gifts to charity, family or friends.

Respondents were asked to select from one of four options: 'increase', 'stay the same', 'decrease', or 'not sure'. In the analysis, observations in which respondents either did not respond or answered 'not sure' to any of the categories in Questions 2.1 and 2.2 were discarded.² Finally, only those who had already retired were included in the analysis, resulting in a dataset of 1762 responses.

A total of 11 potential explanatory variables were chosen for analysis, with sufficient observations to provide meaningful results. The reduction of the dataset as new explanatory variables were taken into consideration³ is illustrated in Figure AI in Appendix A. The descriptions of the explanatory variables, including their labels used in the tables and corresponding survey question numbers, are provided below.

We include eight categorical variables describing the respondent:

1. Current state of financial wellbeing (*Wellok* or *Wellgood*): (Q1.1) the baselines for subjective financial wellbeing are somewhat poor/very poor. *Wellok* corresponds with the answer neither good nor poor, and *Wellgood* corresponds with the answers very good/fairly good.
2. Impressions of risk (*Finlit1* or *Finlit2*): (Q3.11 and Q3.12) Our measure of financial literacy is evaluated by two questions that test knowledge of commonly used investment terms. Answered both questions correctly (*Finlit2*), answered one question correctly (*Finlit1*) and all others (including 'do not know') is the baseline.
3. Tenure (*Mortrent*): (Q 9.3) Whether the home is owned outright (0) or mortgaged/rented (1). We combine the categories mortgaged and rented since there were only 31 renters in the responses we used.
4. Financial awareness (*Finawar*): (Q6.8, Q6.9 and Q6.10) This is a composite index defined by three questions: frequency of checking superannuation balance (Q6.8), awareness of media issues and their use in financial decision-making (Q6.9), and use of professional help (Q6.10). At least two of the three questions answering yearly or more frequently were considered financially aware (1); others were classified as unaware (0).
5. Self-perceived health (*Averagehealth* or *Poorhealth*): (Q10.7) The base condition of self-perceived health status is excellent/very good with good health shown as *Averagehealth* and fair/poor shown as *Poorhealth*.

²We redid our analysis, classifying the responses 'not sure' and 'stay the same' into one category; the results do not change much, and we show this robustness check in the Appendix S1.

³We excluded net household wealth from the analysis. Due to missing values, including this variable would have reduced the number of observations in our analysis from 1275 to 1026 and net household wealth was strongly correlated with income. We were not confident about the accuracy of some of the answers to questions on insurance, gambling, housing wealth, smoking and inheritance, and these variables were not included in the analysis.

6. Government Age Pension (*NoPension*): (Q8.2) The respondent receives full or partial Age Pension (0) or does not receive any Age Pension (1).
7. Responsible for money management (*Singmal*, *Singfem*, *Coupfem* or *Jointmgt*): (Q6.7) Sex of the money manager in the household – male in a couple household (baseline), single male (*Singmal*), single female (*Singfem*), female in a couple household (*Coupfem*) or jointly managed (*Jointmgt*).⁴
8. Meet the costs of essential living (*Mcost1* or *Mcost2*): (Q1.3) How often does the respondent meet the costs of essential living from their own perspective: none/a little/some of the time (baseline), most of the time (*Mcost1*) or all of the time (*Mcost2*).

We include the following continuous variables:

1. Age (*Age*): (Q10.1) Age of the survey respondent. We also include an age-squared (*Age_sq*) term to capture any quadratic relationship.
2. Income of the household (*Income*): (Q8.3) We use the natural logarithm of the reported total household yearly income (including the Age Pension) before taxes (in Australian \$10,000s).
3. Postcode (*Postcode*): We match the reported postcode with the Socio-Economic Indexes for Areas (SEIFA) classification (Australian Bureau of Statistics, 2008), with higher numbers in the classification corresponding to neighbourhoods with higher socio-economic levels, which thus becomes a measure of peer effects (Preston, 2011).

We restrict our final data set to responses where there are no missing values across any of the 11 explanatory variables. Our final sample comprises a total of 1275 observations. In Appendix A, we provide graphical representations of the explanatory variables in our final sample in Figures A4–A9.

2.4 | Selected descriptive statistics

Figure 1 presents tabular representations of the final sample, combining responses to Questions 2.1 and 2.2 for all six categories of expenditure. The central cell of each table indicates that, for the largest group of respondents, needs and purchases remain relatively unchanged after retirement for all categories except for health expenditure, where the largest group reported an increase in needs and purchases. There are significant numbers of respondents who reported a decrease in both needs and spending in the categories of food, alcohol and tobacco, and gifts. The relatively large increase in needs and purchases for housing and household categories may potentially be attributed to an increase in time spent at home after retirement. Interestingly, for this elderly sample, only about half of respondents reported increases in need and expenditure on medical costs, due to either relatively good health or government-funded Medicare covering the increase in medical costs.

A separate analysis was conducted to compare those with and without private health insurance. Among the 78 percent of respondents who reported having private health insurance, 50 percent reported an increase in medical expenditure compared to 45 percent of those without private insurance. On the other hand, only 3 percent of those with private insurance reported a reduction in medical expenditure, compared to 16 percent of those without private insurance. On balance, this suggests that private health insurance does slightly smooth medical expenditure, but at a much higher level.

⁴To construct this covariate, we use the responses to Questions Q10.2 (Sex) and Q10.3 (Marital status). Here, the responses of single, widowed and separated are grouped as 'single' and the responses of married or de facto are grouped as 'couple'.

Food				Alcohol and tobacco			
	Need Decreased	Need Same	Need Increased		Need Decreased	Need Same	Need Increased
Purchase Decreased	192	102	22	Purchase Decreased	418	86	14
Purchase Same	53	756	64	Purchase Same	32	658	13
Purchase Increased	4	30	52	Purchase Increased	1	18	35

Housing				Household			
	Need Decreased	Need Same	Need Increased		Need Decreased	Need Same	Need Increased
Purchase Decreased	124	43	24	Purchase Decreased	128	56	35
Purchase Same	37	605	132	Purchase Same	44	641	108
Purchase Increased	10	55	245	Purchase Increased	6	47	210

Medical expenses				Gifts			
	Need Decreased	Need Same	Need Increased		Need Decreased	Need Same	Need Increased
Purchase Decreased	44	15	13	Purchase Decreased	382	46	9
Purchase Same	4	488	87	Purchase Same	22	619	17
Purchase Increased	2	44	578	Purchase Increased	3	27	150

FIGURE 1 Responses for Questions 2.1 (needs) and 2.2 (purchases). For each of the six categories, a two-way table of responses is provided, with needs on the x -axis and purchases on the y -axis.

This suggests that private health insurance may slightly mitigate the impact of increased medical expenditure, but at the added cost of premiums. To further investigate the reasons for reductions in expenditure, we analysed the responses of those who experienced financial or health shocks in the six expenditure categories mentioned above. Question 4.4⁵ asked: ‘If your household suffered major financial losses during the last five years, please answer the following question: Did your consumption of goods and services increase, decrease, or remain the same following the major financial loss?’ In Question 4.5, ‘financial losses’ was replaced with ‘suffered a serious illness or disability’. Figure 2 illustrates the number of respondents who reduced their expenditure by category after experiencing financial losses or negative health shocks. The first two rows show those who experienced either a financial loss or a health shock. The last two rows show the numbers of those who experienced both shocks and their responses to each of the two questions – the difference between the rows arises because some respondents who experienced both shocks completed the answers to the two questions differently. The responses to both these questions indicate that the discretionary categories of gifts and alcohol and tobacco are more likely to be reduced. Unsurprisingly, 72 percent of those who experienced medical setbacks reported an increase in medical costs, compared to just over 40 percent for the overall sample, and those who experienced a financial loss.

There is therefore significant heterogeneity in the way in which expenditure varies after retirement, and it is thus worthwhile attempting to discover the causes.

3 | MODEL DESCRIPTION

We first analyse the factors that affect the change in needs and purchases asked in Questions 2.1 and 2.2. The dependent variable has values of 0 (decrease), 1 (stay the same) or 2 (increase). In line with this clear ordering of the dependent variable, we employ an ordered logit model for

⁵Text reproduced verbatim from the survey are in single quotations.

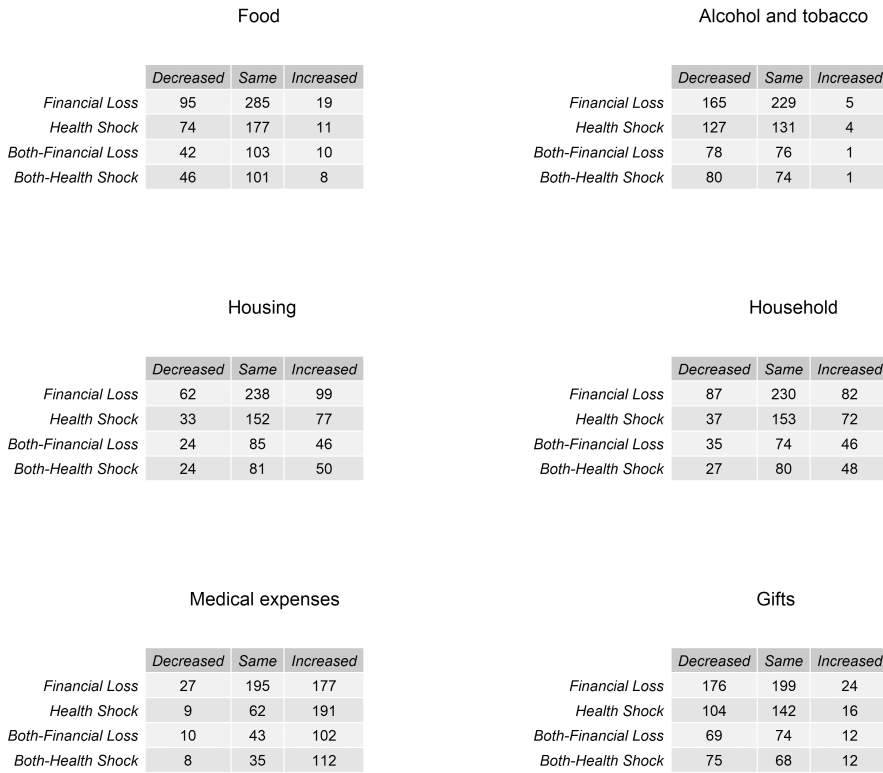


FIGURE 2 A tabular representation of the responses for Questions 4.4 (financial loss) and 4.5 (health shock).

each of the six categories of goods and services. This model is fitted to the responses for needs and purchases separately and has the following form:

$$\text{logit}[P(Y^{(j)} \leq k)] = \alpha_k^{(j)} - \sum_{i=1}^{19} X_i \beta_i^{(j)}, \quad j = 1, \dots, 6, \quad k = 0, 1, \quad (1)$$

where $Y^{(j)}$ represents the need or purchase for the j th category of goods and services, and $\alpha_k^{(j)}$ is the intercept parameter for the j th category for $j = 1, \dots, 6$. The $\text{logit}[P(Y^{(j)} \leq k)]$ defines the log odds of being no greater than a particular level k for the dependent variable $Y^{(j)}$ such that

$$\text{logit}[P(Y^{(j)} \leq k)] = \log \frac{P(Y^{(j)} \leq k)}{P(Y^{(j)} > k)}.$$

We consider the same set of the covariates $X_i, i = 1, \dots, 19$ for each category of goods and services. These 19 covariates, as discussed in Section 2, comprise eight categorical variables (leading to a total of 15 covariates, as some covariates have more than two possible realisations), the three continuous variables and the square of the age variable.

The parameter of interest $\beta_i^{(j)}$ is the regression coefficient corresponding to X_i for the j th category. When X_i increases by one unit, the log of odds, $\text{logit}[P(Y^{(j)} > k)]$ (or $-\text{logit}[P(Y^{(j)} \leq k)]$),

increases by $\beta_i^{(j)}$. That is, a positive $\beta_i^{(j)}$ implies that the respondent households with a higher value of X_i are more likely to increase their needs or purchases for the j th category of goods and services. As an example, consider analysing responses for *needs* for the medical expenses, category $j=5$. Consider one respondent who owns a house outright (Tenure=0) and one respondent who has a mortgage or is renting (Tenure=1). If $\beta_{\text{Tenure}}^{(5)}$ is found to be 0.5, we have, *ceteris paribus*,

$$\log \left[\frac{P(Y_{t=1}^{(5)} = 2)}{P(Y_{t=1}^{(5)} = 0) + P(Y_{t=1}^{(5)} = 1)} \right] - \log \left[\frac{P(Y_{t=0}^{(5)} = 2)}{P(Y_{t=0}^{(5)} = 0) + P(Y_{t=0}^{(5)} = 1)} \right] = 0.5,$$

where $Y_{t=1}^{(5)}$ and $Y_{t=0}^{(5)}$ define the dependent variable for the mortgagee/renter and owner respondent, respectively, and noting that $\log \left[\frac{P(Y_{t=1}^{(5)} > 1)}{P(Y_{t=1}^{(5)} \leq 1)} \right] = \log \left[\frac{P(Y_{t=1}^{(5)} = 2)}{P(Y_{t=1}^{(5)} = 0) + P(Y_{t=1}^{(5)} = 1)} \right]$. The ef-

fect on the probability is non-linear, which also guarantees predictions of such probabilities to be $[0,1]$ -valued.

Second, we create a novel model of affordability by creating a dependent variable given by the difference between needs and purchases for each of the six categories. If this variable is positive (negative), it indicates that needs are increasing (decreasing) more than purchases. We refer to this ordinal variable as the non-affordability index, as it measures potential non-affordability and serves as a potential source of financial stress. This variable captures the situation where needs and purchases change in opposite directions but are not significant individually.

In line with the natural ordering of the non-affordability index, we also use an ordered logit model to fit this dependent variable for each of the six categories of goods and services:

$$\text{logit}[P(Z^{(j)} \leq k)] = \eta_k^{(j)} - \sum_{i=1}^{19} X_i \gamma_i^{(j)}, \quad j = 1, \dots, 6, \quad k = -2, 1, 0, 1. \quad (2)$$

In the model of Equation (2), the dependent variable is replaced by $Z^{(j)}$, the non-affordability index for the j th category of goods and services, which ranges from -2 to 2 .

To make inferences about the Australian population, we adjust the observations using appropriate weights to minimise bias. The survey was designed using a stratified random sample based on population-level age, gender and state/territory of residence (Higgins & Roberts, 2011). In our analysis, we construct the weights assigned to each observation using the methods proposed by Korn and Graubard (1991), Yansaneh (2003) and Holtfreter et al. (2009). These weights take into consideration the original stratification and are then adjusted for the non-response rate. We also make a post-stratification adjustment to limit the analysis to retirees. A comprehensive description of the method can be found in Appendix B.

Standard statistical techniques cannot be used to calculate the standard errors of the coefficient estimates in the models described above, so we use a jackknife method to compute the standard errors of the coefficient estimates for each of the models. The details of this method are provided in Appendix C.

In order to examine the factors that influence the consumption of goods and services following a shock, we utilised an ordered logit model (as outlined in Equation (1)) to analyse the change in consumption that occurred in response to a financial loss or negative

health shock for each of the six categories of goods and services. The dependent variable in this model had three possible outcomes: a decrease in consumption (0), no change in consumption (1) or an increase in consumption (2). For reference, a visual representation of the correlations among the explanatory variables can be found in Appendix D. This information is provided to alert the reader to potential distortions of the coefficients due to collinearity.⁶

4 | RESULTS

4.1 | Spending and affordability

Our initial findings examine changes in needs, consumption and affordability for all six consumption categories, as presented in Tables 1–3, respectively. Table 3 presents the non-affordability index, which is calculated as the change in needs minus the change in purchases for each response. Positive values indicate that needs (Table 1) are less likely to be fulfilled, while purchases (Table 2) and non-affordability (Table 3) increased.

The tables show the parameter estimates of the ordered logit model (as outlined in Equations (1) and (2)). Significant parameters at 5% and 1% levels of significance are highlighted in bold. About half of the 27 items with coefficients significant at the 5% level may be spurious, as one would randomly expect 17 such readings when estimating 342 parameters across the three tables (excluding the obviously significant intercepts). Therefore, we will primarily focus on the 19 items that are significant at the 1% level.

The low values of R^2 in the tables indicate that our variables only explain a small proportion of the actual differences between people's needs and spending. This low R^2 is a potentially important finding for trustees, as it suggests that our covariates will not identify cohorts of members with distinct expenditure patterns in retirement. Members need to be treated individually.

The results are perhaps best understood by examining the effect of our different covariates on the items of expenditure.

4.1.1 | Health

Of the results, health status appears to have the most significant impact, with similar results appearing in the first two tables. Poor health not only significantly increases the need for, and expenditure on, medical costs but also for housing and household goods. These housing-related costs may be related to the need for modifications to housing or, in some cases, the payment for additional accommodation if one member of a couple requires aged care outside the home. Poor health is also associated with a reduction in the need for and expenditure on alcohol and tobacco. The effect sizes are relatively high. Using plausible values for the other variables, those in good health have a 22 percent probability of an increase in the need for health expenditure, those in average health have a 33 percent probability, and those in poor health have a 49 percent probability. Similar results are found for changes in purchases.

⁶We have performed a number of robustness tests of the results presented in this paper, by redoing the models without health; *Mcost*; and wellbeing variables. In each instance, the model coefficient estimates were robust. Full output is available in Appendix S1.

TABLE 1 Parameter estimates for the ordered logit model, where the dependent variable is the increase in needs after retirement (Question 2.1).

	Food and non-alcohol	Alcohol and tobacco	Housing and utilities	Household goods and services	Medical care and health	Gifts/donations
<i>Intercept – 0 1</i>	2.201** (0.008)	5.653** (0.008)	-0.486** (0.008)	0.531** (0.008)	9.430** (0.008)	-1.572** (0.008)
<i>Intercept – 1 2</i>	5.559** (0.097)	9.332** (0.115)	2.149** (0.086)	3.217** (0.087)	12.724** (0.124)	1.254** (0.094)
<i>Wellok</i>	-0.232 (0.421)	-0.003 (0.327)	-0.438 (0.348)	-0.159 (0.346)	-0.16 (0.348)	0.344 (0.338)
<i>Wellgood</i>	0.126 (0.427)	0.166 (0.339)	-0.504 (0.355)	-0.339 (0.349)	-0.235 (0.354)	0.939* (0.366)
<i>Finlit1</i>	-0.114 (0.218)	-0.051 (0.193)	0.277 (0.194)	0.397* (0.191)	0.258 (0.199)	-0.029 (0.187)
<i>Finlit2</i>	0.007 (0.185)	0.201 (0.179)	0.333* (0.17)	0.217 (0.186)	0.131 (0.176)	-0.022 (0.173)
<i>Mortrent</i>	0.038 (0.295)	-0.242 (0.243)	0.316 (0.248)	0.158 (0.26)	0.387 (0.243)	0.541* (0.272)
<i>Finawar</i>	0.266 (0.262)	0.378 (0.21)	0.21 (0.226)	0.141 (0.227)	0.314 (0.229)	0.361 (0.221)
<i>Averagehealth</i>	0.016 (0.164)	-0.128 (0.167)	0.382* (0.16)	0.384* (0.168)	0.577** (0.16)	0.041 (0.156)
<i>Poorhealth</i>	0.074 (0.271)	-0.624** (0.2)	0.654** (0.202)	0.807** (0.213)	1.206** (0.235)	-0.018 (0.211)
<i>NoPension</i>	-0.175 (0.202)	0.331 (0.181)	0.133 (0.174)	-0.093 (0.189)	0.016 (0.188)	0.125 (0.191)
<i>Singmal</i>	-0.337 (0.258)	-0.048 (0.309)	-0.288 (0.275)	-0.339 (0.29)	-0.602 (0.334)	0.515 (0.278)
<i>Singfem</i>	-0.29 (0.238)	-0.226 (0.226)	0.638** (0.218)	0.459* (0.222)	-0.121 (0.23)	0.702** (0.225)
<i>Coupfem</i>	-0.282 (0.282)	-0.233 (0.256)	0.596* (0.234)	0.346 (0.266)	0.318 (0.262)	0.208 (0.236)
<i>Jointmgt</i>	0.08 (0.134)	-0.108 (0.166)	0.255 (0.149)	0.15 (0.153)	0.192 (0.169)	0.254 (0.166)
<i>Mcost1</i>	-0.033 (0.384)	-0.398 (0.322)	0.102 (0.367)	-0.044 (0.352)	-0.112 (0.332)	-0.189 (0.326)
<i>Mcost2</i>	-0.14 (0.403)	-0.222 (0.338)	-0.223 (0.375)	-0.362 (0.373)	-0.509 (0.339)	0.221 (0.343)
<i>Age</i>	0.036 (0.153)	0.159 (0.126)	0.014 (0.113)	0.052 (0.124)	0.288* (0.132)	-0.119 (0.122)
<i>Age_sq</i>	0 (0.001)	-0.001 (0.001)	0 (0.001)	0 (0.001)	-0.002 (0.001)	0.001 (0.001)

TABLE 1 (Continued)

	Food and non-alcohol	Alcohol and tobacco	Housing and utilities	Household goods and services	Medical care and health	Gifts/donations
<i>Income</i>	0.06 (0.132)	0.182 (0.132)	0.082 (0.139)	0.162 (0.136)	-0.022 (0.139)	0.409** (0.13)
<i>Postcode</i>	2.307* (1.07)	0.354 (1.048)	-0.128 (0.976)	-0.699 (1.039)	1.241 (1.077)	-0.458 (1.069)
Pseudo R^2	1%	4%	3%	3%	7%	7%

Note: The standard errors of the parameter estimates are in parentheses. *, ** in bold indicate statistical significance at the 5% and 1% levels, respectively.

4.1.2 | Wellbeing⁷

Perceptions of wellbeing are related to little increase in needs – except perhaps for giving – and significant increases in expenditure in categories other than housing and medical costs. Table 3 shows consequent increases in affordability. Of interest is that the probability of spending on housing does not increase but that household goods and services do although these two categories seem to respond similarly to other explanatory variables. Wellbeing, therefore, does not seem to lead to spending more on housing nor, possibly, vice versa. Using plausible values for other variables, positive perceptions of wellbeing reduce the probability of needing to give less from 84 percent to 66 percent. However, large increases in income would be required to produce similar effects. The increase in expenditure presumably reflects a sense of wellbeing. As shown in Figure 2, about, 14 percent of respondents actually increased their giving. The data suggests that couples and those in wealthier postal codes seem to see a greater need to spend on food, which would confirm that social expectations to eat out play a role.

The meeting costs variables were expected to be related to wellbeing but were not significant.

4.1.3 | Financial literacy

Higher financial literacy appears, from our data, to create greater needs and expenditure on housing and household expenditures, which are likely related. The text responses summarised in Section 4.3 suggest that this increased expenditure is related to increased costs, the coefficients are also significant (both at 5%) for those having suffered a health shock. One possible explanation is that the financially literate are more confident in increasing expenditure in these categories given that they are likely to spend more time at home.

We had considered that our financial awareness variable might mediate the impact of financial literacy on expenditure, but the only significant coefficient is on the purchase of food, which we suspect is a random result.

Financial literacy clearly effects people's spending and has a positive impact on their financial wellbeing. Its effects are likely to be persistent over time, so our findings of a limited

⁷We acknowledge that certain expected findings, such as the correlation between poor health and increased medical care, and higher financial wellbeing and increased charitable giving, may raise concerns about potential endogeneity in the model. However, we want to stress that establishing causality is not the objective of our analysis. Instead, we aim to identify observable variables that are associated with the needs, purchases and affordability of different goods and services among elderly Australians. Furthermore, our robustness tests indicate that the significance and impact of the other predictors remain stable even when the aforementioned obvious relationships are excluded from the model.

TABLE 2 Parameter estimates for the ordered logit model, where the dependent variable is the increase in purchases after retirement (Question 2.2).

	Food and non-alcohol	Alcohol and tobacco	Housing and utilities	Household goods and services	Medical care and health	Gifts/donations
<i>Intercept – 0 1</i>	5.988** (0.009)	9.953** (0.008)	5.611** (0.008)	7.602** (0.008)	11.165** (0.008)	0.895** (0.008)
<i>Intercept – 1 2</i>	9.608** (0.103)	13.668** (0.125)	8.421** (0.087)	10.455** (0.088)	14.127** (0.108)	3.597** (0.092)
<i>Wellok</i>	0.373 (0.348)	0.446 (0.333)	0.04 (0.386)	1.085** (0.34)	0.236 (0.356)	0.581 (0.329)
<i>Wellgood</i>	0.754* (0.356)	0.695* (0.336)	0.1 (0.39)	0.982** (0.349)	0.086 (0.375)	1.226** (0.358)
<i>Finlit1</i>	-0.284 (0.193)	-0.081 (0.202)	0.327 (0.201)	0.455* (0.201)	0.035 (0.193)	-0.11 (0.187)
<i>Finlit2</i>	0.01 (0.193)	0.114 (0.176)	0.252 (0.163)	0.148 (0.174)	0.02 (0.178)	-0.122 (0.17)
<i>Mortrent</i>	0.284 (0.296)	-0.085 (0.258)	0.32 (0.264)	0.457 (0.243)	0.418 (0.243)	0.626* (0.264)
<i>Finawar</i>	0.470* (0.231)	0.359 (0.215)	0.241 (0.233)	-0.087 (0.227)	0.397 (0.236)	0.296 (0.223)
<i>Averagehealth</i>	-0.116 (0.169)	-0.158 (0.164)	0.433** (0.159)	0.348* (0.164)	0.678** (0.164)	-0.069 (0.15)
<i>Poorhealth</i>	-0.336 (0.221)	-0.582** (0.204)	0.498* (0.214)	0.733** (0.21)	1.170** (0.229)	-0.171 (0.217)
<i>NoPension</i>	-0.071 (0.183)	0.456* (0.183)	0.13 (0.183)	-0.053 (0.187)	0.172 (0.187)	0.063 (0.187)
<i>Singmal</i>	0.05 (0.289)	-0.148 (0.303)	0.06 (0.298)	-0.521 (0.29)	-0.398 (0.313)	0.457 (0.278)
<i>Singfem</i>	-0.401 (0.243)	-0.357 (0.23)	0.443* (0.226)	0.235 (0.232)	-0.107 (0.223)	0.587* (0.231)
<i>Coupfem</i>	-0.075 (0.24)	-0.563* (0.264)	0.322 (0.268)	0.179 (0.252)	0.057 (0.278)	0.015 (0.217)
<i>Jointmgt</i>	0.086 (0.16)	-0.189 (0.166)	0.338* (0.156)	0.157 (0.161)	0.21 (0.171)	0.217 (0.166)
<i>Mcost1</i>	-0.032 (0.348)	-0.605 (0.337)	-0.206 (0.386)	-0.259 (0.331)	-0.53 (0.322)	-0.468 (0.322)
<i>Mcost2</i>	-0.024 (0.356)	-0.02 (0.354)	-0.373 (0.387)	-0.388 (0.337)	-0.56 (0.331)	0.083 (0.339)
<i>Age</i>	0.135 (0.146)	0.266* (0.127)	0.168 (0.124)	0.213 (0.133)	0.304* (0.135)	-0.042 (0.118)
<i>Age_sq</i>	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002* (0.001)	0.001 (0.001)

TABLE 2 (Continued)

	Food and non-alcohol	Alcohol and tobacco	Housing and utilities	Household goods and services	Medical care and health	Gifts/donations
<i>Income</i>	0.018 (0.138)	0.179 (0.134)	0.164 (0.145)	0.145 (0.138)	-0.023 (0.133)	0.446** (0.133)
<i>Postcode</i>	1.809 (1.197)	0.321 (1.051)	0.14 (1.107)	0.196 (1.153)	1.744 (1.041)	-0.419 (1.058)
Pseudo R^2	4%	8%	2%	3%	6%	8%

Note: The standard errors of the parameter estimates are in parentheses. *, ** in bold indicate statistical significance at the 5% and 1% levels, respectively.

impact on what are effectively short-term changes to expenditure after retirement are not inconsistent with the established benefits of financial education. This is perhaps confirmed by small effect sizes.

4.1.4 | Gender and households

Although we had a number of gender-related variables, we found little evidence to suggest a significant difference between households. Single females did, however, report greater need for housing, household costs and giving, and spend more in these categories. This combination does not have an obvious explanation. One possible reason is that these additional needs and spending follow the death of a spouse – or greater confidence in spending post-retirement, although it may not necessarily be justified. Answering this question requires the collection of data that can identify those who eventually run short of money.

Our unaffordability index is significant (at 5%) for single males who report a reduction in need for food but greater expenditure. This may reflect loss of a spouse and eating out more subsequently.

As with financial literacy, the impact of gender may not manifest itself in relatively short-term changes to expenditure after retirement. Effect sizes were also small.

4.1.5 | Tenure

Our older sample includes few renters, so we have combined them with retirees who continue to have a mortgage and are therefore also likely to be less well off. Our results do not suggest that this combined group is any more financially stretched than outright owners, with no coefficients significant at the 1% level.

Somewhat surprisingly, those who do not own their homes outright appear, at a 5% level, to have both an increased need for gifts and a tendency to give more to their families. Given that a large proportion (96.3%⁸) of our sample intends to leave a bequest, these respondents may also feel the need to give more to compensate their family for the absence or lower value of a home. A plausible explanation for this result may be the findings of Ameriks et al. (2011) that the bequest motive is frequently a rationalisation of a more powerful precautionary motive, while Piff et al. (2010) find that poorer people are more prosocial, partly as a consequence of a more hostile environment.

⁸Question 6.1 of the survey asked: 'Do you intend to leave an inheritance/bequest?', and 96.3 percent of the responses indicated that they do.

TABLE 3 Parameter estimates of the ordered logit model, where the dependent variable is the non-affordability index as defined in Section 3.

	Food and non-alcohol	Alcohol and tobacco	Housing and utilities	Household goods and services	Medical care and health	Gifts/donations
<i>Intercept - 2 -1</i>	-10.530** (0.01)	-17.617** (0.007)	-13.186** (0.009)	-11.588** (0.009)	-11.317** (0.007)	-13.565** (0.008)
<i>Intercept - 1 0</i>	-7.532** (0.165)	-14.257** (0.103)	-11.133** (0.091)	-8.749** (0.144)	-7.322** (0.145)	-10.312** (0.111)
<i>Intercept - 0 1</i>	-3.172** (0.142)	-8.431** (0.153)	-6.929** (0.096)	-4.371** (0.136)	-1.831** (0.152)	-3.903** (0.208)
<i>Intercept - 1 2</i>	-0.886** (0.254)	-6.108** (0.303)	-4.505** (0.231)	-2.570** (0.211)	0.252 (0.228)	-2.043** (0.206)
<i>Wellok</i>	-0.785* (0.396)	-0.771* (0.38)	-0.285 (0.326)	-1.229** (0.356)	-0.515 (0.417)	-0.148 (0.51)
<i>Wellgood</i>	-0.785* (0.384)	-0.931* (0.4)	-0.476 (0.35)	-1.374** (0.373)	-0.348 (0.436)	-0.368 (0.507)
<i>Finlit1</i>	0.241 (0.226)	0.033 (0.26)	-0.026 (0.227)	-0.078 (0.222)	0.4 (0.311)	0.03 (0.368)
<i>Finlit2</i>	-0.037 (0.216)	0.216 (0.278)	0.16 (0.198)	0.082 (0.214)	0.199 (0.275)	0.34 (0.284)
<i>Mortrent</i>	-0.259 (0.308)	-0.359 (0.367)	0.039 (0.243)	-0.396 (0.313)	-0.043 (0.353)	-0.408 (0.381)
<i>Finawar</i>	-0.22 (0.282)	0.081 (0.268)	0.001 (0.284)	0.373 (0.274)	-0.199 (0.363)	0.129 (0.319)
<i>Averagehealth</i>	0.132 (0.176)	0.014 (0.242)	-0.08 (0.194)	0.148 (0.186)	-0.372 (0.269)	0.46 (0.252)
<i>Poorhealth</i>	0.464 (0.252)	-0.133 (0.276)	0.188 (0.247)	0.183 (0.261)	-0.176 (0.344)	0.493 (0.357)

TABLE 3 (Continued)

	Food and non-alcohol	Alcohol and tobacco	Housing and utilities	Household goods and services	Medical care and health	Gifts/donations
<i>NoPension</i>	-0.188 (0.22)	-0.267 (0.286)	0.006 (0.217)	0.065 (0.207)	-0.377 (0.295)	0.23 (0.306)
<i>Singmal</i>	-0.628* (0.306)	0.18 (0.42)	-0.463 (0.367)	0.275 (0.308)	-0.286 (0.377)	0.181 (0.499)
<i>Singem</i>	-0.034 (0.251)	0.283 (0.309)	0.32 (0.26)	0.335 (0.243)	0.04 (0.37)	0.252 (0.37)
<i>Coupfem</i>	-0.23 (0.323)	0.723 (0.372)	0.523 (0.289)	0.332 (0.301)	0.461 (0.429)	0.574 (0.402)
<i>Jointmgt</i>	-0.039 (0.192)	0.178 (0.259)	-0.048 (0.215)	0.11 (0.195)	0.014 (0.295)	0.113 (0.276)
<i>Mcost1</i>	-0.039 (0.361)	0.376 (0.369)	0.229 (0.369)	0.402 (0.382)	0.796 (0.492)	0.724 (0.417)
<i>Mcost2</i>	-0.062 (0.358)	-0.461 (0.392)	0.11 (0.384)	0.175 (0.404)	0.148 (0.513)	0.277 (0.407)
<i>Age</i>	-0.14 (0.151)	-0.29 (0.166)	-0.228 (0.151)	-0.157 (0.145)	-0.07 (0.197)	-0.228 (0.168)
<i>Age_sq</i>	0.001 (0.001)	0.002 (0.001)	0.002 (0.001)	0.001 (0.001)	0 (0.001)	0.002 (0.001)
<i>Income</i>	0.007 (0.15)	-0.003 (0.176)	-0.162 (0.144)	-0.021 (0.155)	0.015 (0.2)	-0.241 (0.2)
<i>Postcode</i>	0.722 (1.341)	-0.229 (1.542)	-0.721 (1.305)	-1.101 (1.312)	-1.31 (1.655)	-0.017 (1.678)
Pseudo R²	2%	4%	2%	3%	2%	3%

Note: The standard errors of the parameter estimates are in between brackets parentheses. *, ** in bold indicate statistical significance at the 5% and 1% levels, respectively.

Overall, only the health variable appears to produce large effect sizes, suggesting that the other variables will not be a useful way of differentiating different groups of retirees for financial planning purposes.

4.2 | Consumption by age

Figure 3 shows the relationship between age and expenditure in different categories. Medical expenses appear to level off after age 80, which could be due to a cohort effect (where retirees under 80 have more resources) or the greater reliance on Medicare among older individuals. While the relationship between age and charitable giving is not statistically significant, it is consistent with the idea that people think more about giving as their remaining lifetime decreases and their needs for living expenses decrease, as noted by Brancati et al. (2015) and in the previous research reviewed by Bekkers and Wiepking (2011). The figure also shows an increase in housing and household expenditure before age 70, which may suggest that individuals have more time and energy to spend on home maintenance and improvement at this stage. It would have been useful to have data on transport and recreation expenses, which may have followed a pattern of increasing at retirement and then declining – but the results of Brancati et al. (2015) can probably be used by advisors in discussions with clients who enjoy driving.

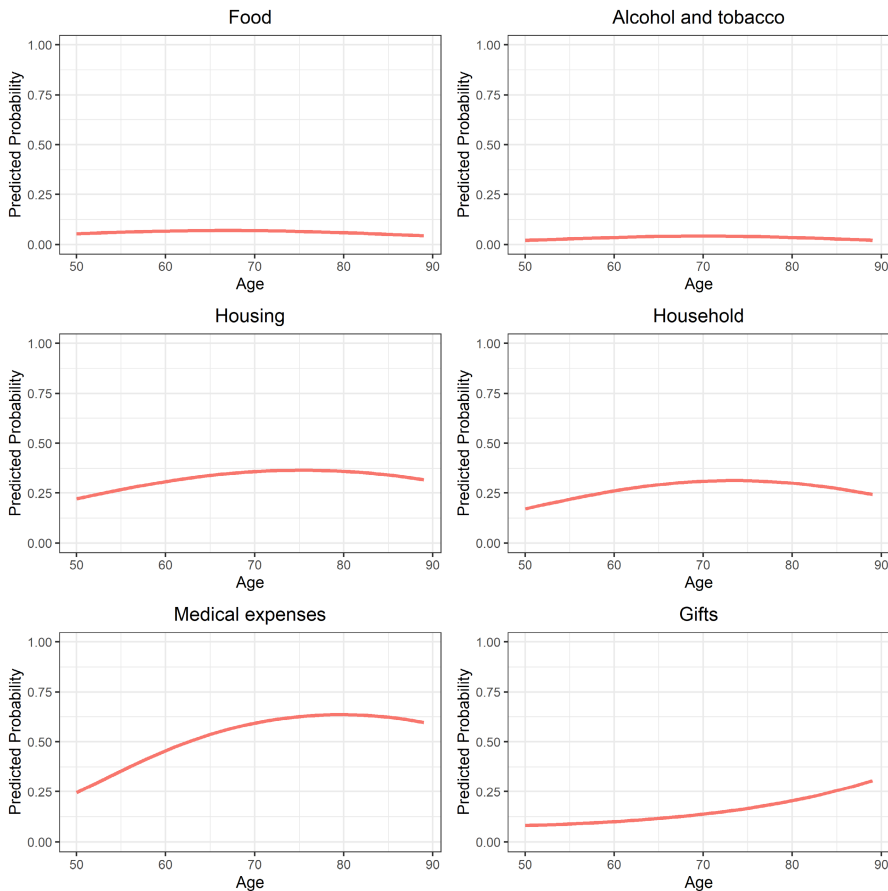


FIGURE 3 Impact of age on predicted probability that household purchases increase after retirement for each category, with categorical variables set at their modal values and continuous variables set at their median values.

4.3 | Text responses

Question 2.3 of the survey asked respondents to provide reasons for changes in purchases of three inelastic categories of goods and services (Food, housing and medical expenses) in a free-text response. Initial data cleaning and response categorisation were carried out to facilitate analysis. For example, responses such as ‘less funds for extras’, ‘less funds’, and ‘less income’ would be classified as ‘insufficient funds’. Figures 4–6 summarise the responses. Many respondents provided multiple reasons for changes. For example, ‘rising costs’ and ‘ageing’ were frequently mentioned together in relation to changes in medical expenses. In the analysis of this section, multiple reasons have been counted separately.

For food, the main reason for a decrease in purchases was insufficient funds (30.1%), which is consistent with the findings of Hurd and Rohwedder (2013) and the results presented in Table 2, which showed that those with poorer self-perceived financial wellbeing are more likely to reduce purchases of food. However, a significant proportion of respondents also managed to reduce expenditure through better money management (16.8%), such as shopping frugally and growing their own vegetables.

Changes in lifestyle were cited by 18.3 percent of respondents as a reason for a reduction in food expenses, while 16.0 percent said it was a reason for an increase. Some of these lifestyle factors are discretionary (e.g., eating out more or cooking more at home), while others are non-discretionary (e.g., children moving in and out). The largest group of those spending more on food cited rising costs (43.2%) as the reason, which suggests some financial strain, but it may also be related to the costs of eating out.

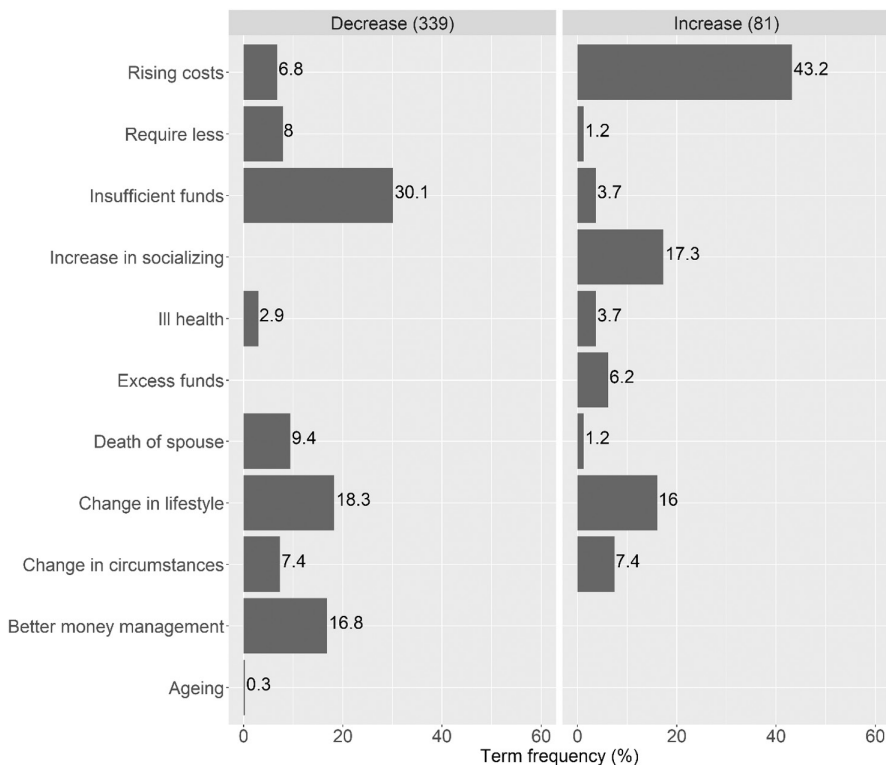


FIGURE 4 Reasons for decrease or increase in Food purchases after retirement.

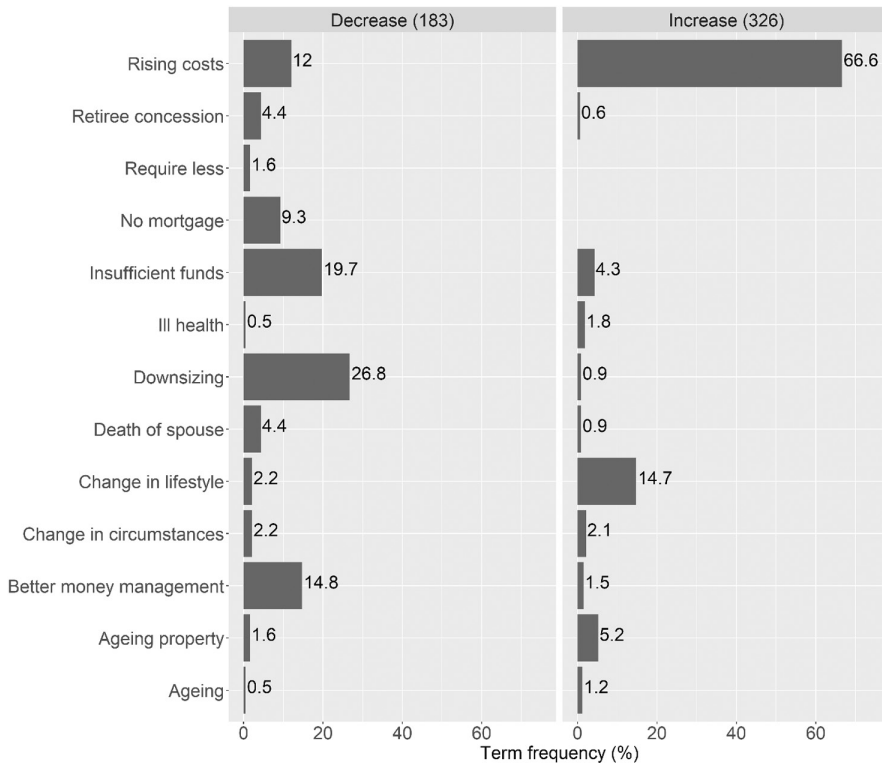


FIGURE 5 Reasons for decrease or increase in Housing purchases after retirement.

For housing, the most commonly cited reason for an increase in purchases was rising costs (66.6%). Changes in lifestyle (14.7%) were a distant second and included responses indicating that retirees stay home more often, resulting in higher utility usage. For a decrease in purchases, the most frequently mentioned reason was downsizing (26.8%), followed by insufficient funds (19.7%) and rising costs (12.0%). These responses – often mentioned together – highlight the heterogeneity of the sample, which includes a small proportion of respondents who report being unable to meet the costs of living. However, for some respondents, better money management (14.8%) was also an important factor in reducing spending on housing expenses. Examples included switching to low-energy appliances, cheaper service providers or providers that offer retiree discounts.

For medical expenses, the most common reasons for an increase in expenditure were ageing (55.3%) and rising costs (31.6%). The most frequently cited reason for a decrease was concessions available to retirees (43.2%), most likely referring to the Commonwealth Seniors Health Card, which is available to pension-age couples with significant financial assets.⁹

4.4 | Response to shocks

Table 4 reports the factors that lead to a greater reduction in consumption of goods and services following a major financial loss. It can be calculated from Figures 1 and 2 that food, alcohol, and gift expenditure are much more likely to be reduced than increased.

⁹<https://www.servicesaustralia.gov.au/individuals/services/centrelink/commonwealth-seniors-health-card/who-can-get-it/income-test>.

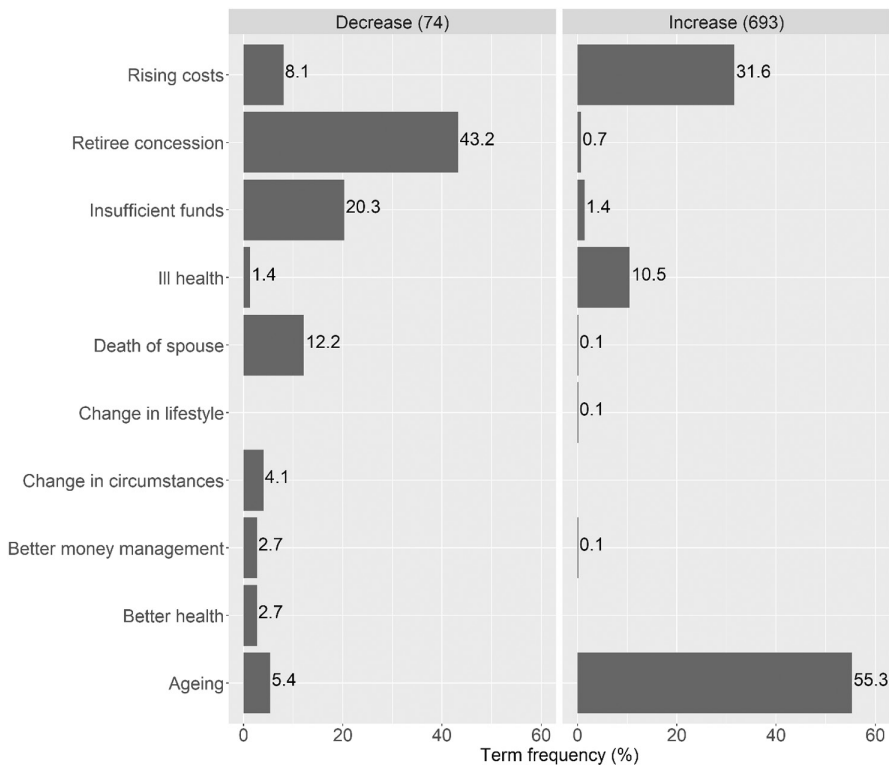


FIGURE 6 Reasons for decrease or increase in Medical expenses after retirement.

These overall trends are captured mainly by the intercepts in the table, while the relative sizes of the coefficients of the explanatory variables are similar, although smaller, than in the whole sample.

The effects of a major illness or disability on consumption can be seen by comparing the relevant rows in Figure 2 with those in Figure 1. Medical costs were obviously significantly more likely to increase, and there was a greater probability of an increase in housing and household costs. Food, alcohol and giving were more likely to decline. Table 5 shows that there is little indication that there were significant differences for any of the groups identified by our categorical variables. Financially literate individuals do appear to be slightly more likely to have increased expenditure on housing (11% vs 6%) and household goods (24% vs. 18%). They were also less likely to have reduced expenditure. This is consistent with the findings of Xue et al. (2021) that financially literate individuals were less likely to unnecessarily reduce expenditure.

The results appear to be consistent with Lillard and Weiss (1997), who suggest that, in the US, the benefits of health insurance could be expanded to include additional household costs. The results in Tables 1–3, however, show that while needs increased, so did purchases, so the costs may well be covered by existing government home care packages. Further research may be needed to confirm this.

These results are consistent with the view that these shocks accelerate changes that would occur over time. Expenditure on all items, with the exception of medical costs for those experiencing health shocks, are more likely to be reported as a reduction.

Almost 40 percent of those experiencing a financial shock also had a health shock – twice the probability of the whole sample experiencing a health shock. This confirms the interaction although not the direction of causation. Interestingly, those reporting a financial shock and

TABLE 4 Parameter estimates for the ordered logit model, where the dependent variable is the increases in purchases after a financial loss (Question 4.4).

	Food and non-alcohol	Alcohol and tobacco	Housing and utilities	Household goods and services	Medical care and health	Gifts/donations
<i>Intercept – 0 1</i>	-5.046** (0.015)	-6.452** (0.014)	6.488** (0.014)	7.982** (0.014)	6.572** (0.016)	-0.011 (0.014)
<i>Intercept – 1 2</i>	-1.228** (0.186)	-1.208** (0.282)	9.369** (0.159)	10.611** (0.151)	9.635** (0.188)	3.542** (0.213)
<i>Wellok</i>	0.619 (0.654)	1.267* (0.542)	0.55 (0.785)	0.603 (0.701)	0.292 (0.7)	1.022 (0.552)
<i>Wellgood</i>	1.273* (0.643)	1.450** (0.559)	0.667 (0.786)	1.06 (0.691)	0.256 (0.727)	1.788** (0.558)
<i>Finlit1</i>	-0.176 (0.425)	0.165 (0.364)	0.455 (0.383)	0.058 (0.414)	-0.083 (0.384)	-0.139 (0.352)
<i>Finlit2</i>	0.087 (0.343)	0.124 (0.329)	0.219 (0.286)	0.083 (0.274)	0.26 (0.297)	-0.486 (0.301)
<i>Mortlrent</i>	0.162 (0.704)	0.027 (0.515)	0.74 (0.555)	0.892 (0.509)	1.203* (0.485)	0.181 (0.509)
<i>Finawar</i>	-0.288 (0.418)	-0.764 (0.414)	0.17 (0.382)	0.207 (0.363)	0.786 (0.422)	-0.323 (0.373)
<i>Averagehealth</i>	-0.408 (0.323)	-0.295 (0.332)	0.347 (0.276)	0.358 (0.266)	0.934** (0.302)	-0.068 (0.31)
<i>Poorhealth</i>	0.086 (0.471)	-0.474 (0.371)	0.609 (0.407)	0.974* (0.425)	1.354** (0.417)	-0.117 (0.343)
<i>NoPension</i>	-0.297 (0.368)	-0.195 (0.359)	-0.063 (0.316)	0.086 (0.34)	0.205 (0.347)	-0.273 (0.334)
<i>Singmal</i>	-0.712 (0.556)	-0.237 (0.671)	-0.162 (0.653)	-0.734 (0.63)	-1.509 (0.788)	-0.713 (0.592)
<i>Singfem</i>	-0.609 (0.541)	-0.615 (0.448)	0.347 (0.456)	0.095 (0.403)	-0.008 (0.396)	-0.15 (0.461)
<i>Coupfem</i>	-1.097* (0.466)	-0.705 (0.55)	0.192 (0.457)	0.426 (0.501)	-0.026 (0.48)	-0.782 (0.49)
<i>Jointmgt</i>	-0.367 (0.281)	-0.639 (0.34)	0.252 (0.292)	0.16 (0.275)	0.663* (0.295)	-0.492 (0.331)
<i>Mcost1</i>	-0.519 (0.704)	0.237 (0.552)	-0.407 (0.724)	0.045 (0.639)	-1.196 (0.613)	-0.21 (0.483)
<i>Mcost2</i>	-0.239 (0.715)	1.15 (0.602)	-0.273 (0.701)	0.057 (0.641)	-1.045 (0.628)	0.358 (0.504)
<i>Age</i>	-0.122 (0.302)	-0.222 (0.246)	0.156 (0.236)	0.163 (0.217)	0.075 (0.221)	-0.028 (0.274)
<i>Age_sq</i>	0.001 (0.002)	0.002 (0.002)	-0.001 (0.002)	-0.001 (0.002)	0 (0.002)	0 (0.002)
<i>Income</i>	-0.124 (0.29)	0.052 (0.252)	0.374 (0.251)	0.186 (0.241)	0.149 (0.223)	0.736** (0.26)

TABLE 4 (Continued)

	Food and non-alcohol	Alcohol and tobacco	Housing and utilities	Household goods and services	Medical care and health	Gifts/donations
<i>Postcode</i>	0.143 (2.246)	0.017 (1.966)	0.297 (1.758)	0.234 (1.722)	3.744* (1.759)	-0.483 (1.854)
Pseudo R^2	5%	12%	3%	5%	11%	11%

Note: The standard errors of the parameter estimates are in parentheses. *, ** in bold indicate statistical significance at the 5% and 1% levels, respectively.

not a health shock were less likely than average to report an increase in medical costs. Some of them may well have given up on their private health insurance.

Our data does not include the gender of the partner who experienced the deterioration in health, so we cannot directly confirm Wu's (2003) finding that the effects are greater when the health of the wife deteriorates than when the husband's health declines.

5 | CONCLUSION

Our study reveals the diverse consumption patterns of Australian retirees and provides insights that can aid future retirees and those who advise them. While we did find some significant effect sizes, our variables only explain a small portion of the heterogeneity in our sample, indicating that trustees may not need to devote significant effort to identifying groups with different expenditure patterns in retirement when preparing for the Retirement Income Covenant.

We find that the majority of retirees report increases in the need for and consumption of medical care, although there is significant heterogeneity, particularly in the analysis of text responses. Those with poorer health not only report an increase in the need for and consumption of medical services, but also in the need for and consumption of housing and related services, and a reduction in the need for and purchases of alcohol and tobacco.

After the need to secure adequate resources to fund the level of desired consumption, perhaps the most important decision is whether to use public or private hospitals and whether to take private health insurance. Our findings show that deteriorating health not only leads to increased medical costs on average, but also to increased housing and household costs, although these increases are partly offset by reduced expenditure on food, alcohol and tobacco. Private health insurers need to be able to demonstrate that the coverage they provide can insure against significant out-of-pocket costs and inform policyholders of the size of contingency funds that they may need to obtain benefit from their insurance.

Of the other results, we do seem to identify changes to consumption that follow the death of a spouse. Single women reported an increase in housing and gifting perceived needs and a slightly lower increase in consumption of these categories suggesting that they could benefit from advice in these areas. The only effect of financial literacy that we identified was a small increase in spending on housing, suggesting that Australian retirees would be able to enjoy higher consumption if they were more financially literate or had access to better financial advice and possibly lifetime products that would allow them to consume more.

Our results also provide valuable information to financial advisors and to superannuation fund trustees providing general information to their members who do not receive personal advice. Probably most important, and apparently not often recognised, the choice of private insurance as against using the public health system is a critical decision for many.

Preparations for the death of a spouse should include properly executed wills and death nominations; mechanisms for the seamless transfer of retirement fund payments; an

TABLE 5 Parameter estimates for the ordered logit model, where the dependent variable is the increase in purchases after a negative health shock (Question 4.5).

	Food and non-alcohol	Alcohol and tobacco	Housing and utilities	Household goods and services	Medical care and health	Gifts/Donations
<i>Intercept – 0 1</i>	11.783** (0.018)	17.612** (0.018)	8.749** (0.019)	-5.985** (0.02)	15.906** (0.021)	12.802** (0.019)
<i>Intercept – 1 2</i>	15.608** (0.223)	22.447** (0.395)	11.766** (0.206)	-2.929** (0.21)	18.388** (0.288)	16.640** (0.266)
<i>Wellok</i>	0.36 (0.82)	1.696* (0.688)	-0.035 (0.854)	0.748 (0.823)	-0.206 (0.92)	0.494 (0.774)
<i>Wellgood</i>	0.612 (0.735)	1.451* (0.716)	-0.466 (0.862)	0.44 (0.846)	-0.633 (0.916)	1.485 (0.825)
<i>Finlit1</i>	0.484 (0.429)	0.141 (0.453)	1.109* (0.443)	0.949* (0.449)	0.925 (0.527)	-0.694 (0.424)
<i>Finlit2</i>	0.532 (0.408)	0.048 (0.41)	0.6 (0.398)	0.377 (0.401)	0.303 (0.4)	-0.68 (0.385)
<i>Mortrent</i>	0.698 (0.845)	-0.033 (0.611)	0.331 (0.549)	0.228 (0.606)	-0.127 (0.723)	0.823 (0.678)
<i>Finawar</i>	-0.234 (0.478)	-0.773 (0.471)	-0.379 (0.439)	-0.296 (0.439)	0.148 (0.437)	-0.384 (0.444)
<i>Averagehealth</i>	-0.282 (0.408)	-0.169 (0.438)	-0.637 (0.441)	-0.782 (0.499)	-0.538 (0.498)	0.182 (0.514)
<i>Poorhealth</i>	-0.234 (0.407)	-0.744 (0.383)	-0.132 (0.424)	0.268 (0.461)	0.121 (0.455)	-0.191 (0.481)
<i>NoPension</i>	0.357 (0.378)	0.051 (0.392)	0.275 (0.394)	0.019 (0.379)	0.347 (0.499)	0.193 (0.41)
<i>Singmal</i>	-0.439 (0.76)	-0.366 (0.714)	-0.777 (0.826)	-0.895 (0.67)	-0.286 (0.8)	-0.221 (0.572)
<i>Singfem</i>	-0.636 (0.562)	-0.499 (0.526)	-0.168 (0.502)	0.576 (0.513)	-0.12 (0.633)	0.534 (0.564)
<i>Coupfem</i>	-0.179 (0.519)	-0.7 (0.604)	0.669 (0.577)	1.550* (0.658)	-0.435 (0.652)	0.177 (0.633)
<i>Jointmgt</i>	-0.368 (0.385)	-0.387 (0.438)	-0.299 (0.382)	0.661 (0.405)	-0.273 (0.46)	-0.344 (0.414)
<i>Mcost1</i>	0.049 (0.761)	0.35 (0.667)	0.361 (0.756)	0.945 (0.773)	-0.588 (0.931)	0.368 (0.699)
<i>Mcost2</i>	0.018 (0.741)	0.249 (0.638)	-0.388 (0.746)	-0.096 (0.736)	-0.835 (0.882)	0.583 (0.656)
<i>Age</i>	0.299 (0.272)	0.383 (0.248)	0.246 (0.222)	-0.227 (0.251)	0.501 (0.285)	0.231 (0.222)
<i>Age_sq</i>	-0.002 (0.002)	-0.003 (0.002)	-0.002 (0.002)	0.002 (0.002)	-0.004 (0.002)	-0.001 (0.002)
<i>Income</i>	-0.02 (0.346)	0.393 (0.272)	0.362 (0.324)	0.366 (0.321)	0.448 (0.409)	0.661* (0.327)

TABLE 5 (Continued)

	Food and non-alcohol	Alcohol and tobacco	Housing and utilities	Household goods and services	Medical care and health	Gifts/Donations
<i>Postcode</i>	1.03 (2.802)	2.827 (2.383)	1.622 (2.165)	0.733 (2.428)	2.286 (2.535)	2.594 (2.14)
Pseudo R^2	3%	10%	7%	10%	7%	14%

Note: The standard errors of the parameter estimates are in parentheses. *, ** in bold indicate statistical significance at the 5% and 1% levels, respectively.

understanding of the changes to the means tests for the Age Pension and aged care and some knowledge of likely changes to social arrangements which differ for singles and couples. Another example is care in choosing a place of residence in that wealthier neighbourhoods may place burdens of expectation on their residents. By combining these findings with those from other studies, we hope to have contributed to a foundation for better advice and improving the financial decision-making of retirees, ultimately enhancing their quality of life.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are not publicly available due to privacy or ethical restrictions. Queries can be addressed to the corresponding author.

ORCID

Anthony Asher  <https://orcid.org/0000-0002-7102-3627>

Gaurav Khemka  <https://orcid.org/0000-0002-1854-3746>

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX A

Explanatory variables used in the study

Figure A1 shows the reduction of our dataset, for the whole sample, as new explanatory variables are taken into consideration and missing values removed. Starting from 1762 observations, by including all the explanatory variables above, we are left with 1275 observations. The number of observations for those experiencing financial loss or health shock were much lower at 399 and 262, respectively. Figures A2 and A3 show the same reduction for the analysis of financial loss and health shock, respectively.

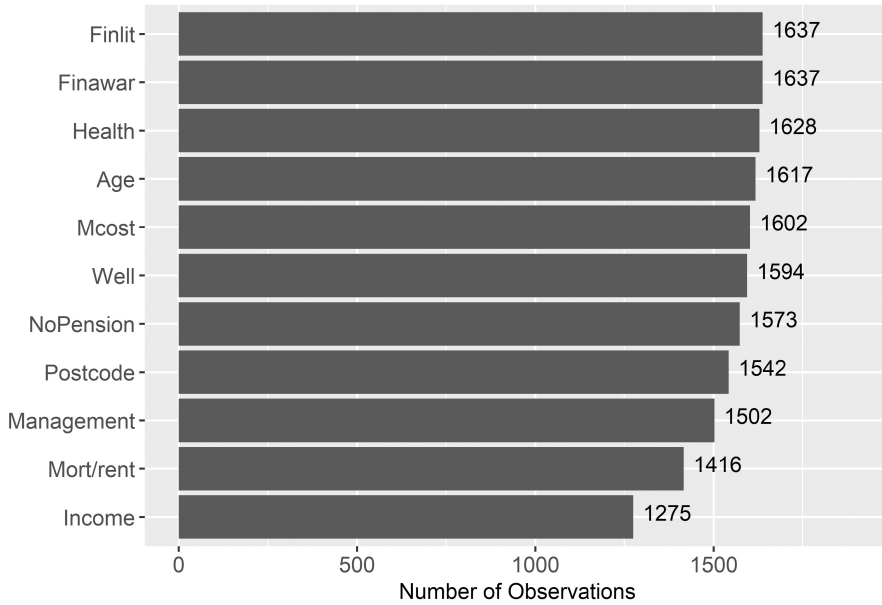


FIGURE A1 The reduction in the number of observations of our dataset for the whole sample as a new explanatory variable is taken into consideration.

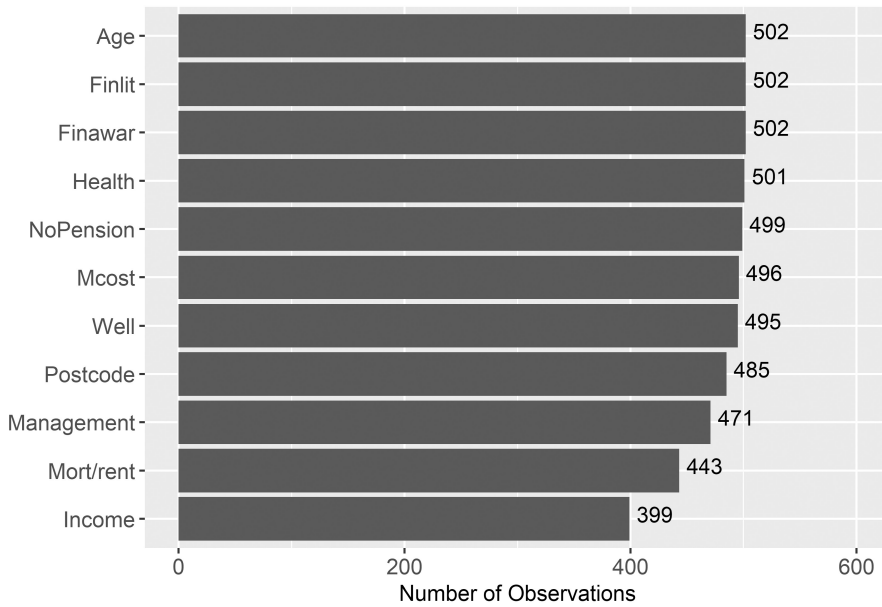


FIGURE A2 The reduction in the number of observations for the financial loss analysis as a new explanatory variable is taken into consideration.

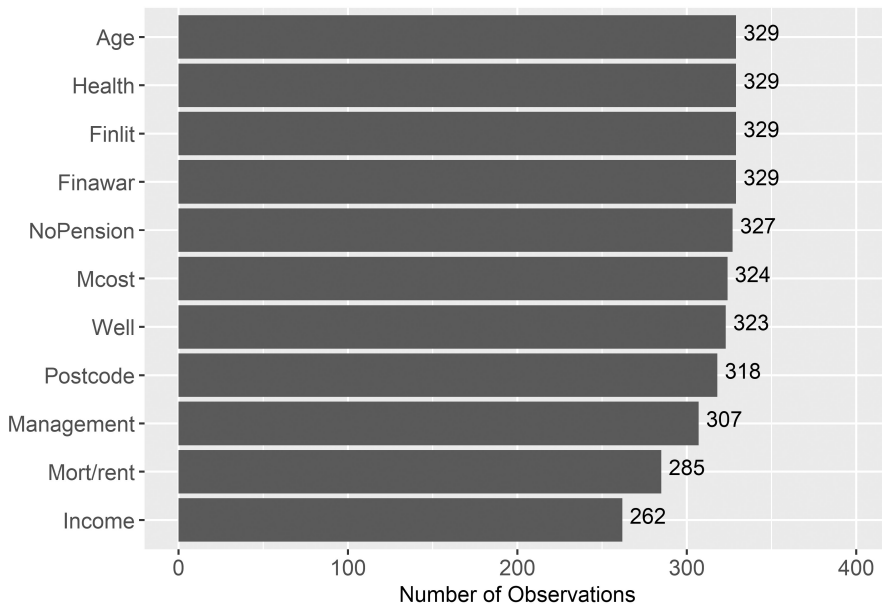


FIGURE A3 The reduction in the number of observations for the health shock analysis as a new explanatory variable is taken into consideration.

Figures A4–A6 provide a graphical representation of our categorical explanatory variables for the whole sample, those who suffered a financial loss and those who experienced a health shock, respectively. From the figures, we can see that compared to the whole sample, for those suffering from a financial loss, the proportion of respondents with ‘good’ self-perceived financial wellbeing is lower. Similarly, for those who experienced a health shock, there was a much larger number of respondents with ‘fair/poor’ self-perceived health than for the whole sample.

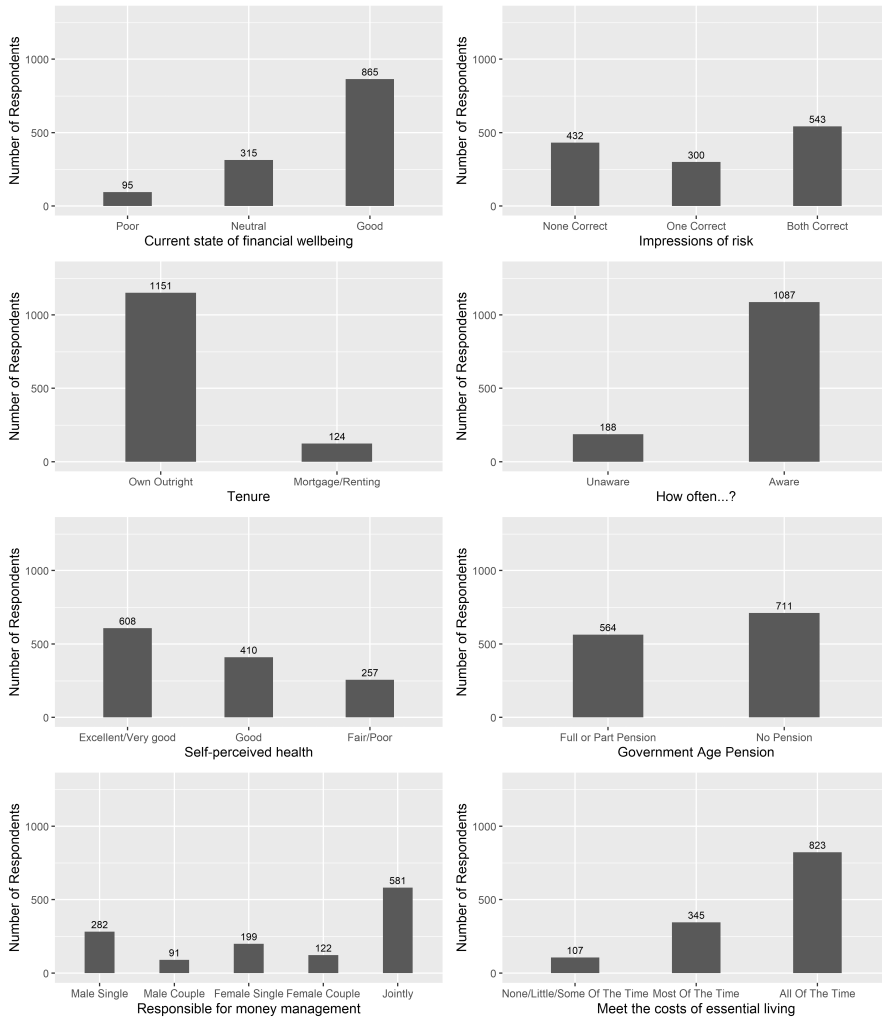


FIGURE A4 A graphical representation of our categorical explanatory variables for the whole sample.

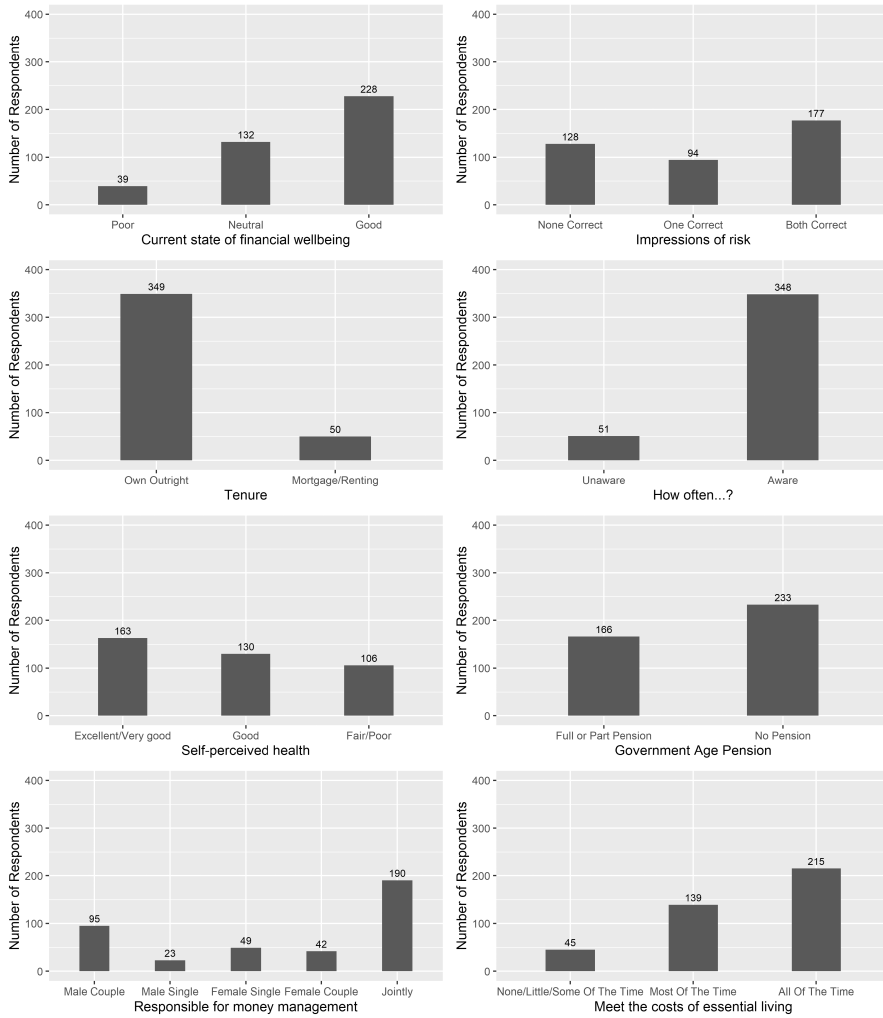


FIGURE A5 A graphical representation of our categorical explanatory variables for those who suffered a financial loss.

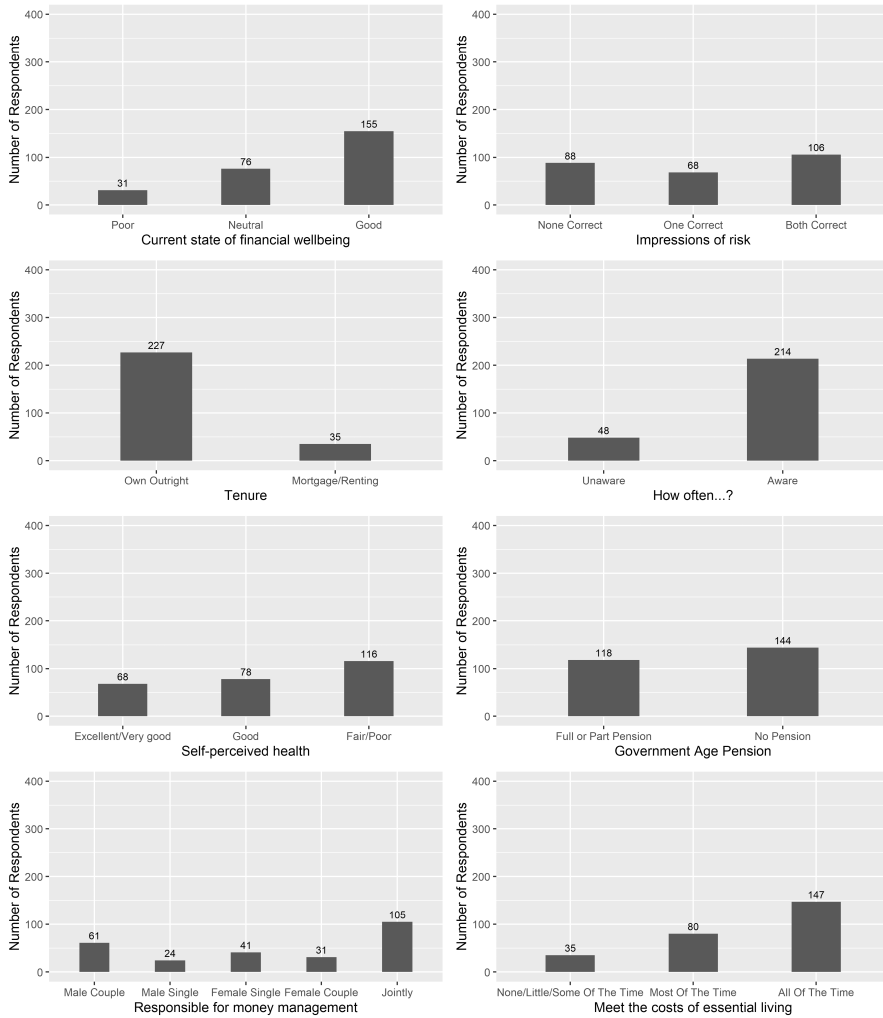


FIGURE A6 A graphical representation of our categorical explanatory variables for those who experienced a health shock.

Figures A7–A9 provide a graphical representation of our continuous explanatory variables for the whole sample, those who suffered a financial loss and those who experienced a health shock, respectively. From the figures, we can see a drop in the lower quartile of income for those who suffered either a financial loss or a health shock compared to the whole sample.

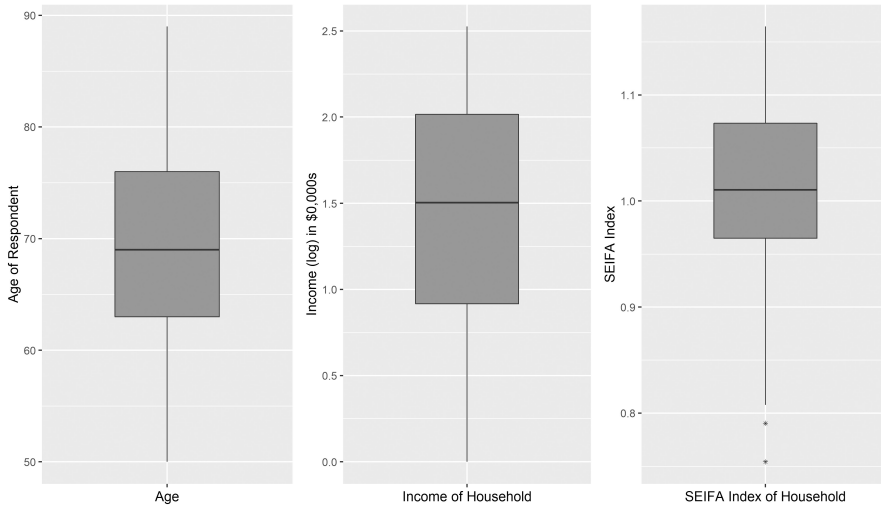


FIGURE A7 A graphical representation of our continuous explanatory variables for the whole sample.

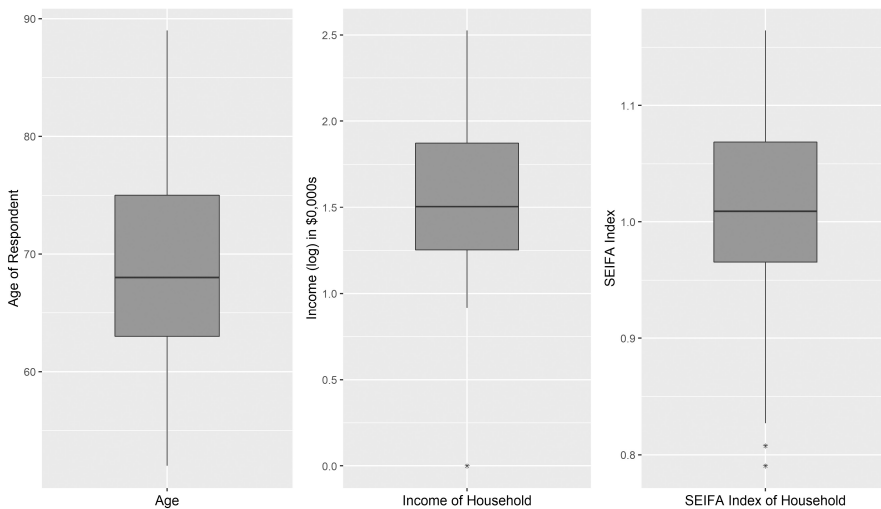


FIGURE A8 A graphical representation of our continuous explanatory variables for those who suffered a financial loss.

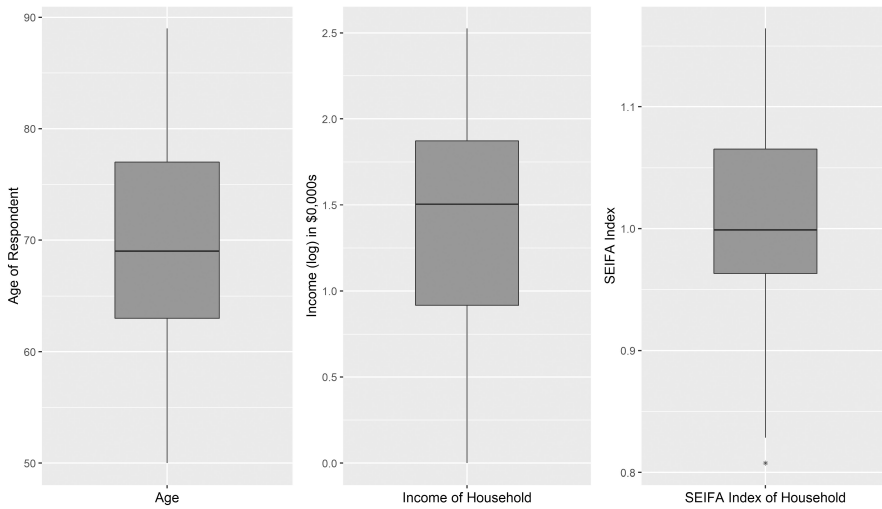


FIGURE A9 A graphical representation of our continuous explanatory variables for those who experienced a health shock.

APPENDIX B

Population weights

As described in Higgins and Roberts (2011), the original survey was sent to 15,000 National Seniors Australia (NSA) members in August 2010. The objectives of this survey were stratified by age (seven age groups: 50–54, 55–59, 60–64, 65–69, 70–74, 75–79, 80+), gender (male and female) and state/territory (the eight states and territories in Australia: NSW, VIC, QLD, SA, WA, TAS, NT and ACT), which resulted in a total of 112 strata. All NSA members were divided into these strata, and from each stratum, members were randomly drawn, proportional to the actual population size in the corresponding stratum based on ABS population statistics (Australian Bureau of Statistics, 2009).

In this study, we are interested in analysing the change in household needs and purchases after retirement (Questions 2.1 and 2.2 in the survey). We further exclude responses that did not answer all questions in our analysis or answered ‘not sure’ in any of the questions, resulting in 1275 responses. A tabular representation of the respondents by each stratum is given in Table B1.

TABLE B1 Number of survey responses used in this study, by stratum.

State	Sex	Age group						
		50–54	55–59	60–64	65–69	70–74	75–79	80+
ACT	Male	1	1	0	6	3	1	4
	Female	1	2	1	3	1	2	0
NSW	Male	10	32	37	39	55	49	54
	Female	10	27	25	31	30	14	20
NT	Male	0	0	1	2	1	0	1
	Female	0	0	1	0	0	0	0
QLD	Male	1	7	22	43	26	22	20
	Female	7	9	21	24	9	7	3
SA	Male	0	7	9	16	17	15	16
	Female	1	10	12	7	6	5	2
TAS	Male	2	5	6	5	7	4	3
	Female	0	1	4	2	5	1	3
VIC	Male	1	18	36	42	38	29	24
	Female	4	7	16	25	21	15	16
WA	Male	2	4	9	19	19	12	19
	Female	2	5	8	9	9	5	4

As we aim to make inferences about the whole population of retirees, we need to further adjust the sampling weights to prevent any bias. In general, the sample weight W_{ij} for the i th respondent in the j th stratum can be computed as the multiplication of three components (Holtfreter et al., 2009; Korn & Graubard, 1991; Yansaneh, 2003):

$$W_{ij} = W_{ij,1} \cdot W_{ij,2} \cdot W_{ij,3}, \quad (\text{B1})$$

where $W_{ij,1}$ is the base weight that corrects the unequal probability of selection for each sample. In our survey design, the NSA members were randomly drawn, proportional to the actual population size in each corresponding stratum. Here, $W_{ij,1}$ is the same for each respondent and equal to 455,354 (the Australian population in December 2009 divided by 15,000 — the number of surveys sent). Since this is a constant and the weights are used to adjust the standard errors of the coefficient estimates, without loss of generality, we can normalise this weight by setting $W_{ij,1}$ to 1.

The second component, $W_{ij,2}$, adjusts for the non-response rate. Here, we compute the non-response rate for the j th stratum by dividing the number of actual responses (from the 1275 observations) in the j th stratum (r_j) by the total number of surveys sent within the j th stratum (n_j). Then, the respondents in each stratum are weighted upwards by multiplying the reciprocal of the non-response rate of their corresponding stratum. We note here that, as shown in Table B1, some strata have zero respondents, which results in an undefined value for $W_{ij,2}$. Moreover, to apply the jackknife variance estimation (Appendix C), we require at least two sample points in each stratum; otherwise, $W_{ij,2}^{(-ij)}$ in Equation (C1) is not defined. Hence, to avoid the possibility of zero or one respondent in any of the strata, we merge all states except NSW into one state category, leading to a total of 21 strata (two gender categories, two state categories and seven age groups).

The third component of the sample weight $W_{ij,3}$ is a post-stratification adjustment. In this study, we only focus on the expenditure pattern of retirees. However, the original stratification

did not consider the retirement status of individuals (at the time of selection). Hence, the post-stratification weights $W_{ij,3}$ are calculated as the ratio of the number of respondents in the j th stratum (m_j) to population retirees in the j th stratum (N_j). This ratio is determined as one minus the participation rate p_j : $W_{ij,3} = 1 - p_j$, where the participation rate for each stratum is published by the Australian Bureau of Statistics (2010). This is similar to the way Australian Institute of Health and Welfare (2021) estimates the number of non-retirees at older age cohorts in the Australian population.

In short, according to Yansaneh (2003), the sample weight for respondents in the j th stratum as in Equation (B1) can be computed by

$$W_{ij} = \frac{n_j m_j}{r_j N_j} = \frac{n_j}{r_j} (1 - p_j). \quad (\text{B2})$$

By using the sample weights this way, we believe that we decrease modelling bias, and the inferences drawn from the available samples in our survey thus represent the overall population of retirees.

Note, the decrease in number of observations in the analysis of those who suffered from financial loss and health shock required further merging and led to the reduction in the number of strata. This information is available from the authors upon request.

APPENDIX C

Jackknife variance estimation with survey data under stratified sampling

The standard errors of the regression coefficients $\hat{\theta} = (\hat{\alpha}, \hat{\beta})$ are computed using the jackknife method (Rao & Shao, 1992; Rust & Rao, 1996). To perform the jackknife variance estimation, we first require the original survey sample weights W_{ij} for respondents $i = 1, \dots, n_j$ and strata $j = 1, \dots, J$, where n_j is the number of respondents in the j th stratum and J is the number of strata. Then, we find the estimator $\hat{\theta}^{(-ij)}$ by omitting the data for the i th respondent in the j th stratum and using the jackknife sample weights when the model is fitted. The jackknife sample weight $W_{hg}^{(-ij)}$ for the h th respondent in the g th stratum is obtained by (Rao & Shao, 1992):

$$W_{hg}^{(-ij)} = \begin{cases} 0 & \text{if } hg = ij, \\ \frac{n_j}{n_j - 1} W_{hg} & \text{if } g = j, \text{ and } h \neq i, \\ W_{hg} & \text{if } g \neq j. \end{cases} \quad (\text{C1})$$

The estimator $\hat{\theta}^{(-ij)}$ with these jackknife sample weights is computed for each sample ij . The resulting jackknife variance estimator for $\hat{\theta}$ is given by

$$\text{var}^*(\hat{\theta}) = \sum_{j=1}^J \frac{n_j}{n_j - 1} \sum_{i=1}^{n_j} (\hat{\theta}^{(-ij)} - \hat{\theta})^2. \quad (\text{C2})$$

More details of the jackknife variance estimation with stratified sampling can be found in Rao and Shao (1992) and Rust and Rao (1996).

APPENDIX D

A correlation analysis of the explanatory variables

A visual representation of the cross-correlations between the explanatory variables for the whole sample is given in Figure D1. The strongest correlation is the necessary one between age and age squared. There are also strong correlations between not having the Age Pension with age and income which are as expected given that the pension is means tested and assets decline with age.

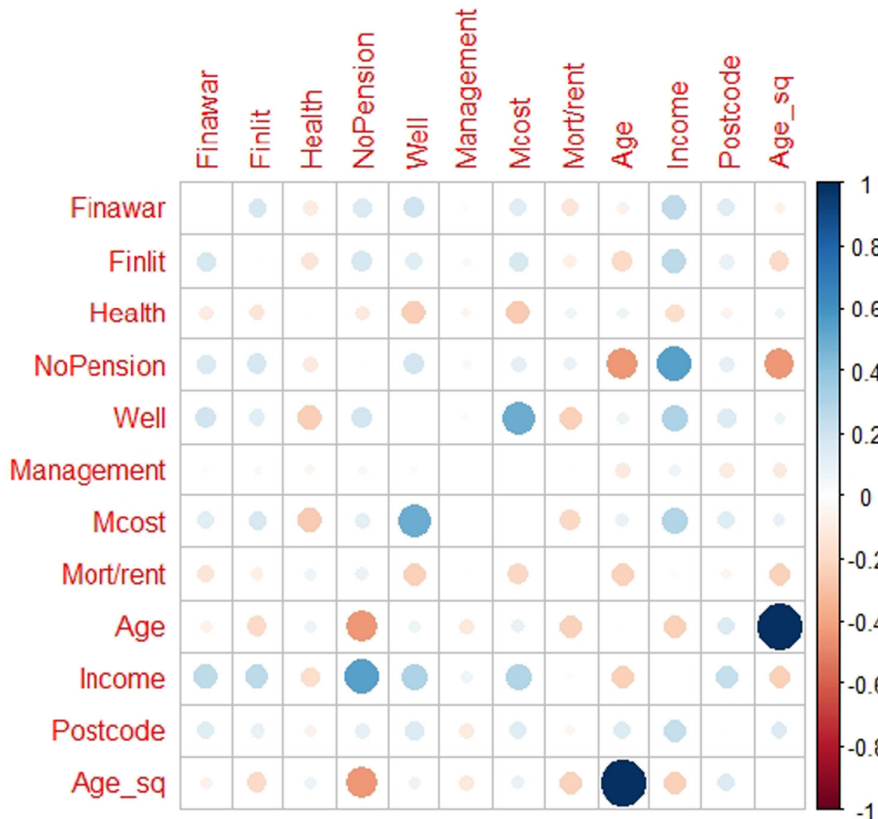


FIGURE D1 Cross-correlations of explanatory variables for the whole sample. The size of the circles represents the strength of correlation as does the scale on the right.

There are some weaker, but expected, correlations. The income row and column show positive correlations between income and financial awareness and literacy, socio-economic postcode, subjective wellbeing and the ability to manage costs. The small negative correlations with poor health and age are also expected. Subjective wellbeing and the ability to manage costs are quite strongly correlated and are clearly overlapping constructs.

These strong correlations may create near-collinearity, which means that the regression coefficients need to be interpreted with caution. However, robustness analysis indicates that the results are robust when individual variables are deleted from the model (see Appendix S1).

Figures D2 and D3 provide the cross-correlation plots for the explanatory variables for those who suffered a financial loss and health shock, respectively.

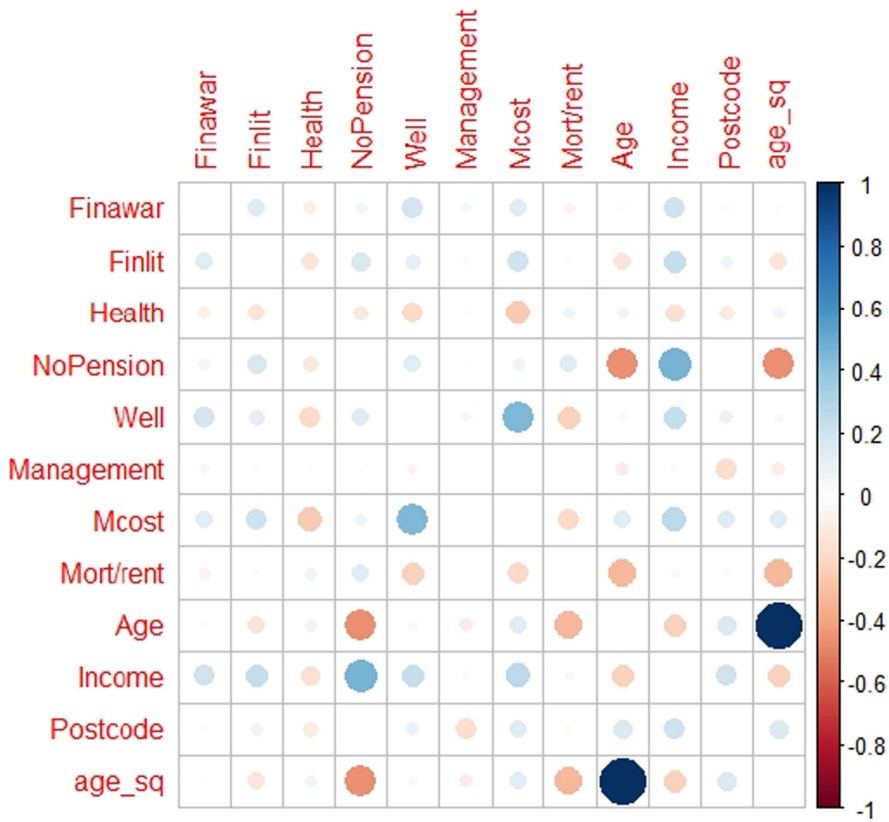


FIGURE D2 Cross-correlations of explanatory variables for those suffering from financial loss. The size of the circles represents the strength of correlation as does the scale on the right.

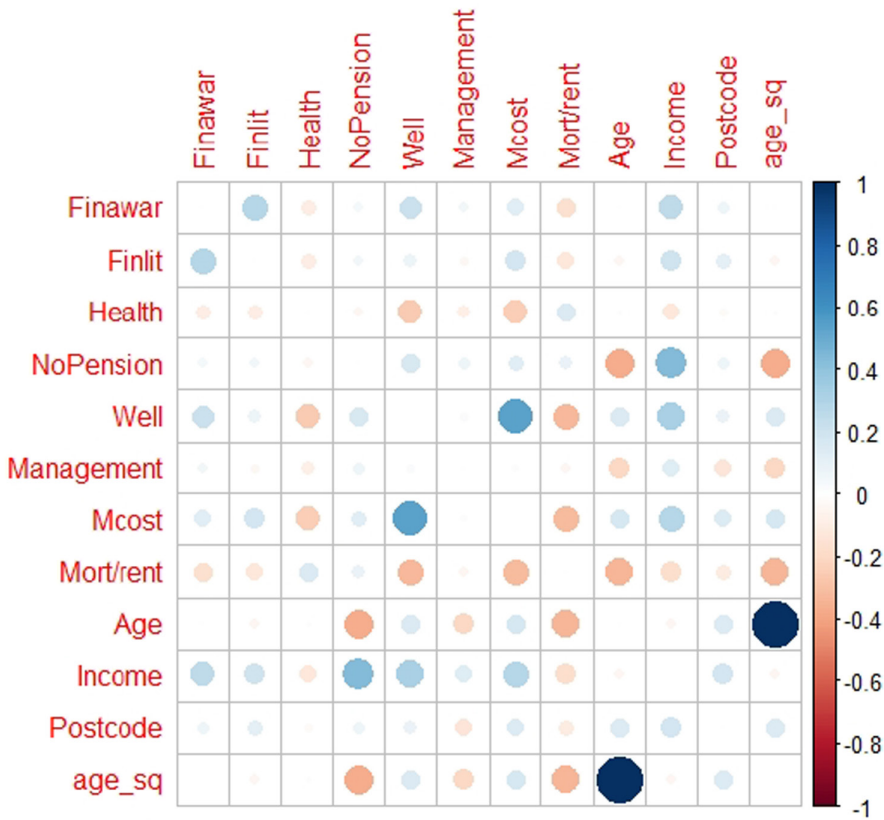


FIGURE D3 Cross-correlations of explanatory variables for those who experienced a health shock. The size of the circles represents the strength of correlation as does the scale on the right.