The evolution of out-of-hospital medical costs to and through retirement

Abstract

This paper shows how cost of out-of-hospital medical services and prescription drugs change as Australians enter and live through retirement. We use a sample of over 65,000 retired individuals aged 45 and over and extract their Medicare claims for period 2005–2014. Analysing the expenditure distribution for up to eight years after retirement, the result shows that expenditure on medical services continues to increase whilst pharmaceutical expenditure declines for most retirees. Partially retired individuals have higher medical service cost but lower pharmaceutical cost, while those retiring prior to Age Pension age have slower growth in medical service and pharmaceutical costs.

Keywords: medical expenditure, outpatient, pharmaceutical cost, retirement

JEL code: I10

Introduction

Australia's population is ageing and living longer than ever before. With improvements in the average life expectancy, a larger proportion of individuals can expect to live into their 80s and 90s. Fewer workers and a growing pool of retirees mean that governments need sound policies in order to accommodate the cost to public finances of supporting older Australians. Health is in the forefront of a comfortable old age. In this paper, we show how medical expenditures change as Australians move into and live through retirement, focusing on out-of-hospital expenditures. This information will help guide policymakers towards better decisions about health subsidies and retirement income policy and give individuals a clearer picture of what their financial needs might be in the years following their retirement, so they can plan to meet these expenditures accordingly.

As the average life expectancy continues to improve, an Australian male aged 65 now can expect to live until 84, while an Australian female can expect to live to 87, 4-5 years longer than expectation in the 1980s (Australian Bureau Statistics, 2014a). In addition, 26% of males and 40% of females are projected to live until the age of 90. Over the past two decades, the number of Australians aged 85 and over has increased by 153%, while the general population growth over the same period is only 32% (ABS, 2014b). In the next 40 years, this population group is projected to quadruple to about 1.8 million by 2050 (Treasury, 2010).

Older individuals tend to have more medical procedures and ongoing pharmaceutical expenses than younger individuals. Johar et al. (2012) show that hospital and other medical costs, excluding residential care, increase quite steeply from about $5,000 per year (in 2009AUD$) at the age of 45 to over $25,000 at the age of 80 for both males and females. Hospital costs are the major component of these expenses, especially for the very old. This, in itself, has budgetary implications, given our universal insurance on inpatient treatments at public hospitals. However, in any year, the vast majority of individuals have no hospital event, and

their health costs are mainly due to outpatient medical services and prescription drugs. It is projected that these two costs will increase by 3–5% per year for the next two decades (Begg et al., 2008). With wage inflation lower than that rate, and a private health insurance market that is focused on hospital treatments, it is inevitable that out-of-hospital out-of-pocket (OOP) health expenses from outpatient treatment and drugs will significantly increase as a share of income. The latest report by the Association of Superannuation Funds Australia (ASFA), for instance, estimates that a single 70-year-old who leads a 'modest' lifestyle would pay an average weekly OOP cost of $40.64 (in 2009AUD$) for health services, while a single 70-year-old who leads a 'comfortable' lifestyle would need double that amount, $80.63, to cover the weekly OOP health cost (ASFA, 2014).

Much of the literature on health expenditure growth analyses the relationship between health expenditure and national accounts, population growth, and changes in demographic structure (see, for example, Treasury, 2015; Hosoya, 2014; Chen et al., 2015; Samadi and Rad, 2013; Di Matteo, 20005; Hansen and King, 1996). Meanwhile, the bulk of micro papers come from the US and developing countries where most health care is paid privately (Xu et al, 2003; Martin et al., 2011; Ekman, 2007). They focus on the link between health expenditure and private health insurance and the threat of a household facing catastrophic health expenditure. These studies tend to be disease specific (Eckardt et al., 2016; Van Baal et al., 2008; Gandjour and Lauterbach, 2005) or focus on individuals at the end of their life (Hadley et al., 2012). When the health care market is predominantly private, medical expenses are apparent to consumers as they pay their medical bills, but when health care is largely subsidised, as in Australia, the full costs of care are often unknown to consumers. A change in the public subsidy level impacts OOP cost. Ellis et al. (2013) is the first micro-level study for a large sample of individuals using Australian data. With access to several administrative databases, they compute the total health expenditure for each individual and analyse it as a two-component series: one

component that responds to transitory health shocks and another component that is persistent. The latter component is driven by fundamentals such as age, sex, chronic conditions, and lifestyle habits that set a 'fixed' level of health care worth for each individual. This component explains most of the variation in individual health care expenditure. In contrast, health shocks are 'time-varying'.

The aim of this paper is to present a clearer picture of the evolution of out-of-hospital medical costs of older Australians as they enter and go through retirement. We focus on individuals aged 45 and over, who are partially or fully retired, and their medical claims and prescription drug fills outside the hospital setting during 2005 to 2014. We compute the individual total annual out-of-hospital medical and pharmaceutical costs and plot the distribution of these costs from two years prior to retirement to eight years after retirement. To account for the increase in costs anyway due to age-related frailty, we also plot the de-trended cost series separately for males and females, subtracting the age-sex-year average from the individual total costs. The age-sex-year average is obtained from the entire sample of 45 and over population. In addition, as health providers in Australia are free to set their fees independently for outpatient services, we investigate whether they charge older patients less, which in turn may slow down medical service cost growth. Moreover, using data on pharmaceuticals, we examine the evolution of expenditures on cardiovascular, musculoskeletal, and nervous system drugs to shed some light on the link between retirement and mortality, physical, and mental health. These results are the first for Australia, and an important contribution to the literature on medical costs in the setting of a heavily subsidised health system elsewhere.

Numerous papers have found that retirement is good for health (Behncke, 2012; Mazzonna and Peracchi, 2012; Brockmann et al., 2009). In a more recent study using data from Germany, Eibich (2015) finds that retirement improves mental health and reduces outpatient health care utilisation. He attributes these health improvements to relief from work-related stress and

strain, longer nights' sleep, and more time to do regular physical exercise. In the US, Kampfen and Maurer (2016) also find that retirement increases the physical activity of American retirees, especially those with higher education and wealth. In Australia, Mavromaras et al. (2013) find that retirement has positive effects on self-reported health measures, especially for female and long-term retirees. They use the variation in the Age Pension eligibility age as an instrument for retirement. Other results, however, are not as optimistic. Exploiting several natural experiments arising from a series of policy changes in retirement age in Norway, Hernaes et al. (2013) find that retirement age has no effect on mortality. Neuman (2007) finds that the result varies when using subjective and objective measures of health. While subjective health seems to respond positively to retirement, he finds no similar improvement in objective health measures, suggesting that the health effect of retirement may be more 'perceived than real'. There is also evidence that retirement is bad for health: for example, Godard (2016) finds that it increases the probability of being obese and Bonsang et al. (2012) find that retirement significantly reduces cognitive functioning.

While the literature remains mixed about the effect of retirement on health, the goal of this paper is not to challenge or replicate these studies in finding the causal effect of retirement. Rather, its intention is to exploit the unique observability of the *true* individual health expenditure risk to study how this risk evolves through the retirement period. For once, we depart from the standard, survey-based, self-reported health measures that are subject to endogenous reporting errors. For example, retirees may deliberately report less optimistic health than they truly have to signal that they are no longer fit to go to work. In addition, presenting the evolution of health risk as a whole (i.e., health level that is innate to an individual and health transition due to health shocks) may be more informative to policymakers than just focusing on the retirement effect on transient health, as in the case of fixed-effect type analyses. The information from this study has policy implications for age pension settings and for public

health financing as well as safety net policies to safeguard against catastrophic private health expenditures.

Data

The sample is derived from participants of the 45 and Up Study (2006-2010) involving 267,188 residents aged 45 and over in New South Wales randomly selected from the 45+ population in the Medicare Australia enrolment database. The representativeness of the sample to the general 45+ population has been documented in Johar et al. (2012). It is currently the largest ongoing study of healthy ageing in the Southern Hemisphere (45 and Up Study Collaborators, 2007). While the survey is collected once, it is linked to Medicare central databases for out-of-hospital medical services (Medical Benefits Schedule, MBS, claims) and prescription pharmaceuticals (Pharmaceutical Benefits Schedule, PBS, claims) from the Department of Human Services for the financial year 2005/6 to 2013/4. The MBS data contains the costs of doctor consultations, imaging, pathology, and other medical services performed in out-of-hospital settings, such as repairs, reconstructions, implants, pain management, etc. These are the providers' charges, which include patients' out-of-pocket costs (OOP) and any concession items they claim from the government, such as incentive payments to charge low-income and rural patients zero OOP (bulk-bill). The OOP is the gap between the provider's fee and the government rebate; the rebate for out-of-hospital services is 85% of the MBS base fee for most items and 100% for general practitioner (GP) attendances, group therapy, acupuncture, health assessments and care plans (group A) and services provided by a practice nurse or registered Aboriginal Health Worker on behalf of a medical practitioner. The PBS data contains prices paid to suppliers for out-of-hospital prescription drugs.

The 45 and Up Study is ideal for this study, since it has a relatively high proportion of retired respondents compared to a general population survey. We identify 65,976 respondents who are alive at the end of the study period and have indicated in the survey that they are partially or fully retired since 1997 (60% of all retirees). For each individual, we compute their annual MBS and PBS expenditures during 2005–2014 in constant 2014 Australian dollars to fit in a retirement time line of 2 years prior to retirement up to 8 years after retirement. These expenditures reflect the individual true out-of-hospital health risk, given the comprehensive coverage of the Medicare data, as well as its high accuracy (i.e., minimum measurement error due to subjective or recall bias). Almost everyone in the sample claim MBS and PBS items every single year; just 5–6% of the sample have zero MBS or PBS expenditures during the study period. We analyse the distribution (50^{th}, 75^{th}, 90^{th} percentiles) of these expenditures[1], in total and de-trended for age, sex, and year. Four groups of interest are: (1) fully retired individuals who retire before the Age Pension age[2] (early retiree); (2) fully retired individuals who retire after the Pension age; (3) partially retired individuals who retire before the Pension age; and (4) partially retired individuals who retire after the Pension age.

For a number of MBS items, we further analyse whether they are charged differently to different patient groups. Aside from the general inflation and the change in the Medicare base price, doctors and other health providers are free to set prices, and there is evidence that they charge different fees to different patients, especially higher fees for richer patients (Johar, 2012, Johar et al., 2016). It may be the case that providers charge older patients less than younger patients, and this would slow down the growth in expenditure by age, compensating for some

[1] Following the feature of health expenditure series that has long right tail, we focus on the top half of the distribution.

[2] This is the age a person qualifies to receive the government's Age Pension benefits. The Age Pension is a program that supports the livelihood of older Australians who meet an income and asset test. During the study period, the age eligibility varies slightly between age 64.5 and 67 years old depending on the person's date of birth. More review of the program and its impact can be found in Atalay and Barrett (2015) and Barrett and Tseng (2008).

of the increase in the intensity of use. On the other hand, it is also possible that providers charge older patients more because these patients are typically covered by various safety net programs that shift the cost burden away from the patient themselves.[3] We therefore compute the average charge, average OOP (net of any concessions), and frequency of use of several popular services by age bands: (i) normal and long consultation (over 20 minutes) with a GP; (ii) initial and subsequent consultation with a specialist; and (iii) anaesthetics during the operation on small tumours, cysts, ulcers or scars, and eye operation.[4] Other high volume services include pathology, such as blood tests and tests in serum, urine, or other body fluid, and diagnostics. These items, however, rarely charged above the MBS rebate and have zero OOP.

Lastly, we use PBS data to further investigate mixed findings about the link between retirement and health. One of the sources of mixed finding is that different studies use different outcome variables. Thus for each individual, we calculate the expenditure on drugs for the nervous system which are used to treat depression and other mood disorders, drugs for the musculoskeletal system which are used to promote bone health, and drugs for the cardiovascular system to treat cardiovascular diseases, which are closely linked to mortality.[5] We then plot these expenditures across the retirement horizon.

[3] An example of such behaviour has been famously documented in relation to the Extended Medicare Safety Net Program http://www.health.gov.au/internet/main/publishing.nsf/Content/2011_Review_Extended_Medicare_Safety_Net

[4] Items 23 and 36 for GP, items 104 and 105 for specialists, and items 31205, and 42734-42741 (same base fee) for anaesthetics. The base MBS fee for these items as at December 2015 in order are: $37.05, $71.70, $85.55, $43.00, $95.45, and $300.75.

[5] Cardiovascular system drugs: ATC code C01-C10 (cardiac therapy, antihypertensives, diuretics, peripheral vasodilator, beta blocking agents, calcium channel clickers, agents acting on renin-angiotensin system, lipid modifying agents). Nervous system drugs: ATC code N03-N06 (antiepileptics, anti-parkinson drugs, psycholeptics, and psychoanaleptics). Musculo-skeletal system drugs: ATC code M01-M05 (antiinflammatory and antirheumatic products, topical products for joint and muscular pain, muscle relaxants, antigout preparations, drugs for treatment of bone diseases).

Result

Table 1 presents economic and health profiles of sub-groups defined by sex, age at retirement relative to Age Pension age eligibility and retirement status (partially or fully retired). Most individuals move to full retirement before the Age Pension eligibility age. This trend is consistent with the Australian Bureau of Statistics' report from the 2012/13 Multipurpose Household Survey which finds that only 25% of male and 9% of female retire at age 65 years and over.[6] The average male who retires early retires seven years before the Pension age. There is a marked difference between full and partial retirement. Early retiring males who are fully retired tend to be older, have lower household income, lower rate of private health insurance holding but higher rate of health concession card holding. They have higher rates of chronic conditions, and are in poorer general health and have a poorer quality of life, and poorer memory, vision, and teeth. The only health dimension that is slightly better for early retiring males is mental health. Early retiring females show a similar pattern, but the differences in subjective health and quality of life are smaller than for males. Generally, all female retirees have lower rates of chronic conditions than male retirees but higher rates of depression. On average, male and female retirees who retire after the Pension age retire at age 69. As older sub-groups, it can be expected that they are in the poorest health and have the lowest income. Almost half of them suffer from hypertension, but they are less depressed than the early retirees. All in all, the descriptive statistics suggest that the bulk of variations across sub-groups may be driven by age and sex.

Our sample claims benefits for close to 1.9 million out-of-hospital MBS items every year, with GP attendances and pathology items being the two biggest items (28% and 37%, respectively). The upper panel of Figure 1 shows the evolution of annual MBS expenditures at the median,

[6] ABS catalogue 6238.0.

75th and 90th percentiles for the sub-groups defined by sex and age at retirement relative to Age Pension age eligibility. The horizontal axis represents the retirement line. The solid (dashed) lines are for the fully (partially) retired. In all cases, MBS expenditures are trending upwards, more steeply at the 90th percentiles. Not surprisingly, those who retire after the Age Pension eligibility age are more costly, in each year after retirement, than those who retire before. This may be explained by age: those who retire after the Pension age tend to be older. At retirement (period=0), for male retirees, the differences in the MBS expenditure due to the timing of the retirement are $200 at the median, $375 at the 75th percentile and $580 at the 90th percentile. For females, the differences are more modest at around $200 at the median and 75th percentile and $400 at the 90th percentile. As the MBS expenditure grows faster for those who retire after the Pension age, the gaps widen. Eight years after retirement (period=8), half of the retirees who retire after the Pension age consume at least $1,200 worth of MBS services, while 10% consume over $3,500. The corresponding figures for early retirees are $850 and $2,700, respectively. We observe no significant jump in MBS expenditure straight after retirement, suggesting that new retirees do not suddenly increase their use of health care services. With regards to full versus partial retirement, expenditures tend to be slightly higher for those who are partially retired, especially for those at the 90th percentile more than 3 years after retirement. This may be explained by treatments for work-related injuries or work-related medical examinations.

In the lower panel of Figure 1, we plot the detrended expenditures. They show that, for most retirees (i.e., at least at the median and below), MBS expenditures are about $400–$550 lower than their age-sex average, and decline slowly throughout retirement. At the 75th percentile, retirees who retire before the Pension eligibility age have a modest increase in MBS expenditures by just $150 over eight years. In contrast, at other points of the expenditure

distribution, there are rising MBS expenditures throughout retirement, with a larger increase for those who retire after the Pension eligibility age at the 90th percentile.

Figure 2 shows the evolution of annual PBS expenditures, total in the upper panel and de-trended in the lower panel. As with the MBS expenditures, those who retire after the Pension age (who tend to be older) generally have higher PBS expenditures. However, unlike MBS expenditures, we observe different expenditure patterns for full and partial retirement. While the MBS expenditure of the partially retired is similar to that of the fully retired, the cost of their prescription drugs is lower at every point of the expenditure distribution and at all time periods from retirement. PBS expenditures continue to rise after retirement for those who are fully retired. Up to retirement, half of people who retire before (after) the Pension age have PBS expenditure less than $200 ($700), 25% of them cost at least $700 ($1,200), and at the top 10%, PBS expenditure is over $1,500 ($2,100) for males and $1,400 ($1,900) for females. Eight years later, PBS costs increase by about $200–$400 at the median, $500–$600 at the 75th percentile, and $700–$850 at the top. In contrast, PBS expenditures of retirees who are only partially retired prior to the Pension age decline three to four years after retirement, especially for those in the 90th percentile. PBS expenditures of males who retire after the Pension age increase but at a slower rate, or even flatten, whilst female's PBS expenditures continue to increase steadily.

The lower panel of Figure 2 shows the de-trended PBS expenditure series. The de-trended series reveals that for most individuals, the upward trend in the PBS expenditures over time can be explained by the general age trend and inflation. Most retirees have $500–$700 lower PBS expenditures than their age-sex means. At the median, PBS costs are falling in almost every case, but more dramatically for the partially retired. At the 75th percentile, PBS expenditures of those fully retired slowly increase moving in to and through retirement, while the expenditures of those who are partially retired are stable or declining if they retire before

the Pension age. For the fully retired at the 90th percentile, PBS expenditures continue to rise, especially for females. In contrast, PBS expenditure tapers off 1–2 years after retirement for those who are partially retired, except for female retirees at the 90th percentile who retire after the Pension age.

Tables 2 to 4 report variations in medical fees, OOP, and quantity by age-sex groups for several common health services. In Table 2, we find that GP consultations are charged fairly closely to the rebate level for everyone, with about $2–$3 OOP for those over 65. OOP is slightly lower for the very old, which may be explained by health concession card, incentive payments and eligibility for other safety net payments. Frequency of visits increases quite significantly with age from about five normal consultations (MBS item 23) per year to ten visits per year, especially by males aged 75 and over. For longer consultations (MBS item 36), those aged 80 and over have about three long visits per year. So at least for GP consultations, the growth in medical costs with age is driven by more frequent visits.

In contrast to GPs, specialists charge considerably above the rebate level, which is 85% of the MBS schedule fee, resulting in substantial OOP costs. Table 3 shows that OOP is around $40 for an initial consultation (MBS item 104) and $20 for a subsequent consultation (MBS item 105). OOP seems to decline with age (30–40% OOP rate), especially for initial consultations. In a typical year, if older retirees are referred to specialists by their GP for two different health problems with two follow-ups for each problem, OOP reaches $160 (plus additional $5 for two GP referrals). Such private costs are a big burden for retirees relying solely on Age Pension income.[7]

[7] For instance, the basic payment rate for Age Pension for a single pensioner is currently $794.80 per fortnight at most, totalling to no more than $20,700 in annual income. With the ASFA's estimate of at least $330 per week for housing, food, and basic necessities, the specialists' consultations alone will absorb almost 5% of the remaining income (ASFA, 2014).

The last group of services we investigate is anaesthetic items, which are relatively expensive and mandatory. In an inpatient setting, patients generally do not choose the attending anaesthetist. In an outpatient setting, anaesthetics can be administered by the specialist. Table 4 shows the price and use of two common anaesthetic items during a tumour/cyst/scar operation (MBS item 31205) and an eye operation (MBS item 427). The first item is charged relatively close to the rebate, with less than $10 in OOP for most retirees. In contrast, for eye operations, which the elderly undergo about 4–6 times a year on average, OOP is at least $60 each time. Those aged 59–62 years face an OOP of over $100 for each service. In contrast to GP consultations, there is no incentive to charge lower fees to the elderly for these items.

Figure 3 depicts the de-trended PBS expenditures for cardio, musculoskeletal, and nervous systems drugs. For cardiovascular drugs, for everyone, the median is below the age-sex-year trends. Throughout retirement, expenditure remains largely constant (less than $100 increase in 8 years) for 75% of retirees with the lowest cost. Even at the top of the cost distribution, expenditure only rises slowly, by at most $200 in eight years. Partial retirement has a slower cost growth. Given the strong link between cardio health and mortality, this picture may lend support to those past studies which find that retirement has no impact on mortality.

For musculoskeletal drugs, the expenditure of male and female retirees exhibits quite a distinct pattern. For male, the 75th percentile is about the same level as the age-sex-year trend, and cost stays stable or slightly declines throughout retirement. For the high-cost male retirees, expenditure is about $100–$200 above the age-sex-year trend at retirement and stays stable if they retire before the Pension age. Cost keeps on rising if they retire after the Pension age; bone health may be worsened as these males waited too long for retirement. For females, the median is below the age-sex-year trend but the 75th percentile is $100–$250 above it. Females who are fully retired seem to maintain their bone health, whilst those who are partially retired find their bones weaken. Job type may explain some of this pattern. High-cost male retirees may have

worked in a physically demanding job, and postponing retirement aggravates their bone problems. Meanwhile, female retirees may develop bone problems as they engage in jobs that involve more moving activities, compared to clerical/administrative jobs, such as being a carer or operating a self-employed business. All in all, since bone density determines physical health, it appears that retirement has heterogenous effects on physical health, and failing to recognise this heterogeneity may lead to a wrong conclusion that retirement has no effect on physical health.

Lastly, for nervous system drugs, except for high-cost retirees, cost remains constant throughout retirement, suggesting maintenance of mental health. There are more fluctuations at the top, but economically they are not substantial. There is a popular belief that retirement can cause anxiety or deep depression, but at least from data on nervous system drugs, there does not seem to be such an effect.

Conclusion

Health is a major component of a comfortable retirement. In this paper, we have revealed the growth in out-of-hospital medical costs by retirees. On top of the general increase in medical costs due to age-related frailty and price inflation, we find that out-of-hospital medical service costs grow as individuals enter and live through retirement, especially for high-cost individuals. Retirees make much more frequent visits to the doctor and require more tests and operations. At the same time, health providers do not appear to make meaningful concessions to older patients. The cost burden, though, may not always fall on the patients but on the government. In contrast, pharmaceutical costs for most retirees remain mostly stable throughout retirement, and even decline in later years, especially for those who are still partially working. This picture is consistent with that part of the literature which finds that retirement has some health benefits

as it gives individuals more opportunities to invest in their health. As with the mixed finding about whether retirement is conducive to health, data on common drugs suggest that retirement impacts neither mortality nor mental health. It has a different effect on physical health for different people depending on their bone strength, sex, and timing of retirement.

Timing of retirement matters to medical cost behaviour: those who retire after the Age Pension eligibility age tend to have higher medical costs. This pattern suggests that the recent government's move to slow down the retirement rate by increasing the eligibility age (from 65 to 67 by 1/17/2023) may also decelerate out-of-hospital medical cost growth.

References

45 and Up Study collaborators (2008), Cohort profile: The 45 and Up Study. International Journal of Epidemiology, 37, 941-947.

Association of Superannuation Funds Australia (2014), *Spending Patterns of Older Retirees: New ASFA Retirement Standard.* ASFA Limited, Sydney.

Australia Bureau of Statistics (2014a), *Australian Historical Population Statistics, 2014*. ABS cat. no. 3105.0. Canberra.

Australia Bureau of Statistics (2014b), *Australian Demographic Statistics, Jun 2014*. ABS cat. no. 3101.0. Canberra.

Atalay, K. & Barrett, G. (2015). The impact of age pension eligibility age on retirement and program dependence: evidence from Australian experiment. Review of Economics and Statistics 97, 71-87.

Barrett, G. & Tseng, Y.P. (2008). Retirement savings in Australia. Canadian Public Policy 34, 177-193.

Begg, S., Vos, T., Goss, J., & Mann, N. (2008). An alternative approach to projecting health expenditure in Australia. Australian Health Review, 32(1), 148-155.

Behncke, S. (2012). Does retirement trigger ill health? Health economics, 21(3), 282-300.

Bonsang, E., Adam, S., & Perelman, S. (2012). Does retirement affect cognitive functioning? Journal of Health Economics, 31(3), 490-501.

Brockmann, H., Müller, R., & Helmert, U. (2009). Time to retire–Time to die? A prospective cohort study of the effects of early retirement on long-term survival. Social Science & Medicine, 69(2), 160-164.

Chen, W.Y., Wen, M.J., Lin, Y.H., & Liang, Y.W. (2015). On the relationship between healthcare expenditure and longevity: Evidence from the continuous wavelet analyses. Quality & Quantity, 1-17.

Di Matteo, L. (2005). The macro determinants of health expenditure in the United States and Canada: assessing the impact of income, age distribution and time. Health policy, 71, 23-42.

Eckardt, M., Brettschneider, C., van den Bussche, H., König, H.H. & MultiCare Study Group (2016). Analysis of health care costs in elderly patients with multiple chronic conditions using a finite mixture of generalized linear model. Health Economics doi: 10.1002/gec.3334.

Eibich, P. (2015). Understanding the effect of retirement on health: Mechanisms and heterogeneity. Journal of Health Economics, 43, 1-12.

Ekman, B. (2007). Catastrophic health payments and health insurance: Some counterintuitive evidence from one low-income country. Health Policy, 83(2), 304-313.

Ellis R.P., Fiebig D., Johar, M., Jones, G. & Savage, E. (2013), Explaining health care expenditure variation: Large-sample evidence using linked survey and health administrative data. Health Economics 22(9): 1093-1110.

Gandjour, A., & Lauterbach, K. W. (2005). Does prevention save costs? Considering deferral of the expensive last year of life. Journal of Health Economics, 24(4), 715-724.

Godard, M. (2016). Gaining weight through retirement? Results from the SHARE survey. Journal of Health Economics, 45, 27-46.

Hadley, J., & Reschovsky, J. D. (2012). Medicare spending, mortality rates, and quality of care. International Journal of Health Care Finance and Economics, 12(1), 87-105.

Hansen, P., & King, A. (1996). The determinants of health care expenditure: A cointegration approach. Journal of Health Economics, 15(1), 127-137.

Hernaes, E., Markussen, S., Piggott, J., & Vestad, O. L. (2013). Does retirement age impact mortality? Journal of Health Economics, 32(3), 586-598.

Hosoya, K. (2014). Determinants of health expenditures: Stylized facts and a new signal. Modern Economy, 5(13), 1171.

Johar, M., Mu, C., Wong, C. & van Gool, K. (2016), Bleeding hearts, profiteers, or both: Specialist physician fees in an unregulated market. Health Economics forthcoming.

Johar, M., Jones, G. & Savage, E. (2012), Healthcare expenditure profile of older Australians: Evidence from linked survey and health administrative data. Economic Papers 31(4): 451-463.

Johar, M., Jones, G., Savage, E. (2014), What explains the quality and price of GP services? An investigation using linked survey and administrative data. Health Economics 23(9), 1115-1133.

Johar, M. (2012), Do doctors charge high income patients more? Economics Letters 117, 596-599.

Kämpfen, F., & Maurer, J. (2016). Time to burn (calories)? The impact of retirement on physical activity among mature Americans. Journal of Health Economics, 45, 91-102.

Martín, J., Gonzalez, M., & Garcia, M. (2011). Review of the literature on the determinants of healthcare expenditure. Applied Economics, 43(1), 19-46.

Mavromaras, K, Richardon, S & Zhu, R. (2013). Age pension, age eligibility, retirement and health outcomes in Australia. National Institute of Labour Studies WP No 201.

Mazzonna, F., & Peracchi, F. (2012). Ageing, cognitive abilities and retirement. European Economic Review, 56(4), 691-710.

Neuman, K. (2007). Quit Your Job and Get Healthier? The effect of retirement on health. Journal of Labor Research, 29(2), 177-201.

Treasury (2010). Australia's Ageing Population. Available from http://archive.treasury.gov.au/igr/igr2010/Overview/html/overview_04.htm

Treasury (2015), *2015 Intergenerational Report*. The Treasury Publication, Canberra.

Van Baal, P. H., Polder, J. J., de Wit, G. A., Hoogenveen, R. T., Feenstra, T. L., et al. (2008). Lifetime medical costs of obesity: Prevention no cure for increasing health expenditure. PLoS Med, 5(2), e29.

Xu, K., Evans, D.B., Kawabata, K., Zeramdini, R., Klavus, J., & Murray, C.J. (2003). Household catastrophic health expenditure: A multicountry analysis. Lancet, 362(9378), 111-117.

Figure 1: MBS expenditure throughout retirement

[Insert Figure 1]

Note: the x-axis is the time horizon from two years prior to retirement (-2), at retirement (0), to eight years after retirement (8). The y-axis is MBS expenditures in 2014 Australian dollars. The highest, middle and lowest lines represent the 90th, 75th and 50th expenditures, respectively. The solid line represents the MBS expenditure series of fully retired individuals and the dashed line is the MBS expenditure series of partially retired individuals. De-trended expenditure is adjusted for age, sex and year averages.

Figure 2: PBS expenditure throughout retirement

[Insert Figure 2]

Note: the x-axis is the time horizon from two years prior to retirement (2), at retirement (0), to eight years after retirement (8). The y-axis is PBS expenditures in 2014 Australian dollars. The highest, middle and lowest lines represent the 90th, 75th and 50th expenditures, respectively. The solid line represents the PBS expenditure series of fully retired individuals and the dotted line is the PBS expenditure series of partially retired individuals. De-trended expenditure is adjusted for age, sex and year averages.

Figure 3: De-trended PBS expenditures by drug groups

[Insert Figure 3]

Note: see note for Figure 2.

Table 1: Characteristics of retirees

	Male				Female			
	Retire Before		Retire After		Retire Before		Retire After	
	Partial	Full	Partial	Full	Partial	Full	Partial	Full
Age	60.12	64.32	71.52	72.86	58.56	63.45	70.89	73.16
Income <$30000	0.167	0.252	0.237	0.425	0.252	0.373	0.287	0.492
Income >$70000	0.339	0.156	0.234	0.081	0.251	0.111	0.129	0.059
PHI	0.739	0.675	0.749	0.587	0.729	0.663	0.745	0.647
Health Card	0.188	0.364	0.351	0.461	0.232	0.422	0.377	0.462
Retirement age	57.13	58.70	68.88	68.07	56.04	58.08	68.77	68.54
Hypertension	0.371	0.456	0.438	0.470	0.301	0.400	0.457	0.492
Heart disease	0.133	0.184	0.207	0.252	0.054	0.084	0.116	0.149
Diabetes	0.095	0.136	0.119	0.145	0.051	0.081	0.071	0.091
Depression	0.134	0.120	0.062	0.067	0.179	0.155	0.118	0.109
Fair/poor SAH	0.130	0.149	0.099	0.150	0.106	0.108	0.078	0.125
Fair/poor quality of life	0.084	0.098	0.070	0.106	0.080	0.073	0.060	0.088
Fair/poor memory	0.156	0.188	0.191	0.232	0.128	0.140	0.123	0.168
Fair/poor vision	0.133	0.141	0.139	0.156	0.129	0.129	0.127	0.158
Fair/poor teeth	0.244	0.271	0.276	0.313	0.218	0.244	0.203	0.256
N	6,998	14,753	2,618	9,811	7,060	19,486	945	4,305

Table 2: Fee, OOP and frequency of GP consultations

Item 23	Male			Female			Item 36	Male			Female		
	Fee	OOP	Freq.	Fee	OOP	Freq.		Fee	OOP	Freq.	Fee	OOP	Freq.
Under 59	$34.01	$5.55	5.36	$35.14	$6.42	5.62	Under 59	$58.49	$4.52	2.24	$60.71	$6.21	2.25
59-62	$35.37	$6.16	5.52	$35.82	$6.16	5.84	59-62	$60.65	$5.23	2.17	$62.28	$5.85	2.22
63-66	$34.36	$4.47	6.16	$34.69	$4.15	6.39	63-66	$60.84	$3.84	2.27	$62.23	$3.90	2.34
67-70	$34.05	$3.09	6.94	$34.85	$3.21	7.06	67-70	$62.34	$2.87	2.38	$63.68	$2.85	2.56
71-74	$34.44	$2.62	7.80	$35.54	$2.90	7.83	71-74	$63.60	$2.32	2.56	$65.34	$2.44	2.74
75-78	$34.90	$2.47	8.60	$35.73	$2.79	8.38	75-78	$64.42	$2.07	2.76	$65.61	$2.26	2.93
79-82	$35.14	$2.60	9.19	$34.99	$2.80	9.12	79-82	$64.39	$2.11	2.95	$63.85	$2.32	3.20
83-86	$36.29	$2.88	9.67	$35.28	$2.69	9.29	83-86	$66.05	$2.03	3.22	$66.08	$3.15	3.42
87-90	$36.35	$3.14	9.40	$36.21	$3.28	9.54	87-90	$66.49	$2.05	3.28	$67.13	$3.04	3.50
Over 90	$36.14	$2.45	9.98	$35.08	$2.09	8.30	Over 90	$70.18	$4.30	3.19	$65.09	$2.04	2.89

Note: the government rebate for these items is 100%. Schedule fee for item 23 (36) increased from $25.5 ($45.8) in 2005 to $37.05 ($71.7) in 2014AUD.

Table 3: Fee, OOP and frequency of specialist consultations

Item 104	Male			Female			Item 105	Male			Female		
	Fee	OOP	Freq.	Fee	OOP	Freq.		Fee	OOP	Freq.	Fee	OOP	Freq.
Under 59	$108.74	$50.29	1.35	$111.48	$52.14	1.46	Under 59	$55.06	$25.07	2.35	$57.11	$26.28	2.24
59-62	$112.22	$52.31	1.40	$113.26	$51.86	1.48	59-62	$58.01	$26.90	2.37	$58.90	$26.90	2.29
63-66	$110.36	$47.68	1.45	$109.52	$45.29	1.52	63-66	$58.31	$25.51	2.52	$57.82	$24.14	2.41
67-70	$108.16	$42.87	1.51	$109.51	$42.83	1.56	67-70	$57.86	$23.67	2.67	$58.39	$23.34	2.55
71-74	$108.42	$41.46	1.54	$110.90	$42.18	1.57	71-74	$58.28	$23.00	2.79	$59.90	$23.50	2.72
75-78	$109.21	$40.26	1.60	$110.48	$41.37	1.59	75-78	$59.07	$22.45	3.01	$61.02	$23.75	2.88
79-82	$105.91	$37.41	1.64	$104.49	$37.99	1.62	79-82	$57.71	$21.20	3.23	$58.31	$22.30	3.09
83-86	$109.87	$38.99	1.66	$105.03	$37.29	1.65	83-86	$59.15	$20.46	3.41	$58.25	$21.45	3.24
87-90	$110.54	$39.83	1.66	$107.39	$38.38	1.64	87-90	$59.37	$19.54	3.57	$60.89	$24.62	3.20
Over 90	$114.26	$39.43	1.65	$104.06	$38.31	1.51	Over 90	$64.12	$22.57	3.24	$55.67	$21.75	2.73

Note: the government rebate for these items is 100%. Schedule fee for item 104 (105) increased from $57.9 ($29) in 2005 to $85.5 ($43) in 2014AUD.

Table 4: Fee, OOP and frequency of anaesthetics services

Item 31205	Male			Female			Item 427*	Male			Female		
	Fee	OOP	Freq.	Fee	OOP	Freq.		Fee	OOP	Freq.	Fee	OOP	Freq.
Under 59	$66.48	$9.76	1.27	$72.50	$13.12	1.16	Under 59	$367.99	$114.70	2.60	$243.00	$8.97	4.57
59-62	$70.31	$12.59	1.22	$74.93	$14.01	1.15	59-62	$393.24	$104.68	4.15	$426.48	$118.95	3.12
63-66	$71.51	$10.79	1.18	$72.33	$8.79	1.14	63-66	$360.03	$74.87	4.19	$360.35	$66.67	4.36
67-70	$70.95	$8.80	1.18	$75.91	$9.07	1.14	67-70	$346.73	$63.45	5.00	$378.00	$69.28	4.90
71-74	$70.63	$6.79	1.19	$75.93	$7.73	1.11	71-74	$373.03	$73.66	4.71	$409.38	$82.82	5.82
75-78	$72.28	$7.72	1.15	$77.51	$9.10	1.08	75-78	$383.15	$70.19	5.08	$394.65	$80.03	6.61
79-82	$72.85	$6.38	1.12	$74.15	$4.93	1.15	79-82	$360.15	$59.89	6.07	$376.79	$66.01	6.40
83-86	$68.60	$8.18	1.43	$76.81	$9.65	1.03	83-86	$372.09	$59.58	6.32	$376.09	$70.33	5.40
87-90	$81.70	$19.24	1.32	$70.31	$0.00	1.13	87-90	$419.24	$81.41	5.71	$363.76	$68.32	4.26
Over 90	$75.29	$0.00	1.50	$74.54	$0.00	1.00	Over 90	$410.74	$70.84	5.50	$494.21	$151.88	4.20

Note: the government rebate for these items is 85%. Schedule fee for item 31205 (427*) increased from $64.6 ($203.6) in 2005 to $95.45 ($300.75) in 2014AUD.