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## Health problems and retirement due to ill-health among Australian retirees aged 45–64 years

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### ABSTRACT

**Objective:** To examine which health problems are associated with retirement due to ill-health among Australians aged 45–64 years.

**Methods:** Cross-sectional analysis of self-reported data of 1933 retired men and 3160 retired women aged 45 and over, living in NSW in 2008, who took part in the 45 and Up Study. Main outcome measure: retirement due to ill-health versus retirement for other reasons.

**Results:** Among retired women, those who reported ever having been told by a doctor that they had thrombosis, depression, osteoarthritis or cancer (except melanoma and skin and breast cancer), were twice as likely to have retired early due to ill-health as those without these health problems. The number of health problems associated with early retirement due to ill-health appeared to be slightly greater for men than for women. From most to least significant stroke, cancer (except melanoma and skin and prostate cancer), osteoarthritis, depression, anxiety and heart disease had significant associations with early retirement. In men and women, the strongest association with retirement due to ill-health was in self-reported health status.

**Conclusion:** Legislators, decision-makers, and health policymakers should be aware that several health problems are associated with early retirement due to ill-health among men and women aged 45–64 years. Interventions to prevent or treat these health problems would not only bring immediate health gains to the individuals themselves but would increase their ability to participate in the workforce and/or be otherwise productive in society. Interventions would need to be tailored for men and women separately, given the gender differences in disease profiles and social roles.

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### 1. Introduction

An ageing population that is healthy benefits society in two ways. It increases productivity, because people are able to remain in the workforce for longer and/or participate in voluntary work; and it reduces the demands on a health system facing rising costs—not least because

of the population's increasing longevity. In recognition of this, the Australian Government nominated "Ageing well, ageing productively" as a national research priority and established a *National Strategy for an Ageing Australia*. This National Strategy identifies that there is a need to develop "better social, medical and population health strategies to improve the mental and physical capacities of ageing people" [1].

One group in our ageing population worthy of particular attention is the people who have retired early for health reasons. This is because there is scope to improve their mental and physical capacities, which can in turn benefit society as a whole by reducing demands on the health system. Poor health has been shown theoretically and

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empirically to be a reasonably strong predictor of retirement [2], and early retirees often report their own health as poor. Shultz and colleagues [3] examined push and pull factors that predict retirement and identified self-reported poor health as a factor pushing people into retirement. A Dutch study of 778 retirees found that self-perceived health was poorer among those who retired involuntarily for health reasons than among those who retired voluntarily [4]. Similarly, a US Health and Retirement Study of 992 early retirees found that the strongest reason for involuntary retirement appeared to be poor health (after taking into account a multitude of factors such as income and employers' policies towards older workers) [5]. This supports the logical assumption that people who have retired early for health reasons have more health problems than people who retired for other reasons. There is thus a need to determine which health problems are contributing to this premature retirement so that they can be addressed. This study investigates in more detail the health problems that are associated with retirement due to ill-health among retirees of working age. This will identify the health problems that legislators, decision-makers, and health policymakers need to focus on in order to develop interventions that will improve people's chances of ageing well and productively into retirement. This may lead to cost savings in the health care system.

Separate health policies are required to address the specific needs of men and women, given the differences in their biology and social roles [6]. Hence, in this study the relationship between retirement due to ill-health and health problems is differentiated by gender, which can further assist the Australian Federal Government in determining health policy content. Currently the Australian Federal Government is developing both a Men's and Women's Health Policy that will be based on the principle of gender equity. Part of the purpose of these policies is to raise awareness of preventable health problems that disproportionately affect men and women [6] and often lead to poorer health outcomes.

In summary, this study aims to examine which health problems are associated with retirement due to ill-health among Australians aged 45–64 years.

## 2. Materials and methods

### 2.1. Sample and participants

The 45 and Up Study is a cohort study of people aged 45 years and over in New South Wales, Australia [7]. The study was set up as a long-term collaborative resource to examine healthy ageing, including in retirement. Participants were randomly selected from the national Medicare Australia health insurance database. This database includes all Australian citizens, permanent residents and some temporary residents and refugees [7]. All residents of remote areas were sampled. People living in rural areas and aged 80 years and over were oversampled by a factor of two. Further details of study design and recruitment have been described elsewhere [7].

The dataset used in this paper was released in August 2008. For the analysis of this paper, we included 3160

females and 1933 males of the 45 and Up Study, who were recruited between 2006 and 2008, reported to be fully retired and completed version 2 and version 3 of the questionnaire. We did not include respondents completing version 1 of the 45 and Up survey due to changes in important questions. In versions 2 and 3 of the survey, the question "Has a doctor EVER told you that you have..." included separate listings for hay fever, asthma, depression and anxiety, whereas in version 1 hay fever was combined with asthma, and depression and anxiety were not included in this question [8]. Hay fever and asthma are very different health problems, and mental health has been found to have a large impact on people's retirement decisions [9].

### 2.2. Measures

Data were collected by self-report questionnaire [8].

#### 2.2.1. Retirement due to ill-health

Participants who reported being retired were asked why they had retired, and were allowed multiple responses including: 'reached usual retirement age', 'to care for family member/friend', 'made redundant', 'lifestyle reasons', 'ill-health', 'could not find a job', or 'other'. The reason for retirement was coded as '1' for anyone who recorded they had retired due to ill-health even if they had also listed other reasons for retirement. Participants were classified as '0' if they had retired for only other reasons.

#### 2.2.2. Health problems

Participants were asked about a range of health problems (see Table 1). Urinary incontinence was assessed by asking participants: 'About how many times a week are you usually troubled by leaking urine?' Hearing loss was assessed by the question: 'Do you feel you have hearing loss?' Thyroid problems, osteoarthritis, and osteoporosis or low bone density were assessed by the question: 'In the last month have you been treated for: . . .'. All health problems were categorised as either 'present' or 'absent'.

#### 2.2.3. Health status

Self-reported health status was categorised into three groups: '1' which included the categories 'excellent' and 'very good'; '2' which represented 'good'; and '3' which included the categories 'fair' and 'poor'.

#### 2.2.4. Sociodemographic variables

Location was classified into five groups – major cities, inner regional, outer regional, remote, and very remote – according to the Accessibility/Remoteness Index of Australia (ARIA-mean) which measures geographical accessibility to essential services and is based on participants' postcodes [10]. Outer regional, remote and very remote were combined for our analysis due to the very small numbers of records. Age was grouped in 5-year intervals. Marital status was defined as either 'married/defacto' or 'other'. Education was classified according to the highest qualification completed: 'Higher school or leaving certificate or lower', 'Trade or apprenticeship', 'Certificate or diploma', and 'University degree or higher'.

**Table 1**

Crude and adjusted odds of retiring due to ill-health versus other reasons and its association with health problems and health status among retired women (N = 3160) and men (N = 1933) aged 45–64 years.

	Women					Men						
	Retired due to ill-health (n = 572)		Crude OR <sup>a</sup> (99% CI)	P	Adjusted OR (99% CI)	P	Retired due to ill-health (n = 599)		Crude OR <sup>b</sup> (99% CI)	P	Adjusted OR (99% CI)	P
	n	%					n	%				
Ever told by a doctor s/he had:												
Skin cancer (non-melanoma)	130	17	0.89 (0.67 to 1.19)	0.3	0.99 (0.70 to 1.38)	0.9	172	29	0.87 (0.66 to 1.15)	0.21	1.13 (0.79 to 1.61)	0.39
Melanoma	28	23	1.37 (0.77 to 2.41)	0.16	0.85 (0.41 to 1.74)	0.5	49	35	1.22 (0.76 to 1.96)	0.29	1.02 (0.55 to 1.87)	0.94
Prostate cancer	–	–	–	–	–	–	38	41	1.58 (0.90 to 2.76)	0.036	1.58 (0.74 to 3.38)	0.12
Breast cancer	49	28	1.82 (1.16 to 2.85)	<b>0.0007</b>	1.65 (0.96 to 2.84)	0.017	–	–	–	–	–	–
Other cancer	70	35	2.59 (1.74 to 3.88)	<b>&lt;0.0001</b>	2.23 (1.40 to 3.55)	<b>&lt;0.0001</b>	63	52	2.54 (1.56 to 4.13)	<b>&lt;0.0001</b>	2.39 (1.31 to 4.35)	<b>0.0002</b>
Heart disease	74	34	2.58 (1.75 to 3.81)	<b>&lt;0.0001</b>	1.21 (0.74 to 1.98)	0.32	163	53	3.11 (2.24 to 4.32)	<b>&lt;0.0001</b>	2.03 (1.33 to 3.10)	<b>&lt;0.0001</b>
High blood pressure	248	23	1.56 (1.22 to 1.99)	<b>&lt;0.0001</b>	1.10 (0.82 to 1.49)	0.40	289	36	1.44 (1.12 to 1.86)	<b>0.0002</b>	0.94 (0.67 to 1.31)	0.6
Stroke	21	32	2.15 (1.08 to 4.30)	<b>0.0043</b>	0.99 (0.42 to 2.34)	0.97	41	71	5.69 (2.68 to 12.10)	<b>&lt;0.0001</b>	3.60 (1.35 to 9.55)	<b>0.0007</b>
Diabetes	74	33	2.38 (1.62 to 3.51)	<b>&lt;0.0001</b>	1.21 (0.74 to 1.97)	0.30	117	47	2.23 (1.56 to 3.18)	<b>&lt;0.0001</b>	1.20 (0.76 to 1.89)	0.31
Blood clot (thrombosis)	60	34	2.48 (1.61 to 3.80)	<b>&lt;0.0001</b>	1.99 (1.18 to 3.36)	<b>0.0007</b>	34	43	1.72 (0.95 to 3.14)	0.019	1.05 (0.49 to 2.26)	0.9
Enlarged prostate	–	–	–	–	–	–	90	32	1.07 (0.75 to 1.53)	0.62	1.01 (0.63 to 1.63)	0.9
Hayfever	129	22	1.30 (0.97 to 1.73)	0.021	1.07 (0.75 to 1.53)	0.6	72	33	1.13 (0.76 to 1.67)	0.4	0.95 (0.56 to 1.61)	0.80
Asthma	116	26	1.71 (1.26 to 2.33)	<b>&lt;0.0001</b>	0.91 (0.61 to 1.36)	0.5	72	38	1.38 (0.92 to 2.08)	0.040	1.20 (0.70 to 2.05)	0.4
Anxiety	143	32	2.44 (1.82 to 3.27)	<b>&lt;0.0001</b>	1.31 (0.89 to 1.93)	0.07	155	59	3.92 (2.76 to 5.58)	<b>&lt;0.0001</b>	2.07 (1.25 to 3.41)	<b>0.0002</b>
Depression	225	35	3.38 (2.60 to 4.38)	<b>&lt;0.0001</b>	1.96 (1.38 to 2.78)	<b>&lt;0.0001</b>	213	58	4.26 (3.12 to 5.82)	<b>&lt;0.0001</b>	2.12 (1.35 to 3.32)	<b>&lt;0.0001</b>
Parkinson's disease	7	41	3.19 (0.89 to 11.43)	0.019	1.59 (0.32 to 7.91)	0.5	11	79	8.30 (1.54 to 44.65)	<b>0.0012</b>	6.57 (0.97 to 44.39)	<b>0.011</b>
Hearing loss	205	22	1.37 (1.07 to 1.76)	<b>0.0013</b>	1.17 (0.87 to 1.58)	0.2	350	35	1.45 (1.12 to 1.87)	<b>0.0002</b>	1.21 (0.87 to 1.68)	0.1
Urinary incontinence	276	22	1.57 (1.23 to 2.01)	<b>&lt;0.0001</b>	1.05 (0.79 to 1.40)	0.7	149	43	1.97 (1.44 to 2.70)	<b>&lt;0.0001</b>	1.25 (0.83 to 1.90)	0.2
In the last month have you been treated for:												
Thyroid problems	74	27	1.73 (1.19 to 2.51)	<b>0.0002</b>	1.21 (0.77 to 1.91)	0.27	20	50	2.27 (1.00 to 5.18)	<b>0.011</b>	2.25 (0.78 to 6.48)	0.048
Osteoarthritis	124	40	3.40 (2.46 to 4.70)	<b>&lt;0.0001</b>	1.77 (1.18 to 2.65)	<b>0.0003</b>	66	57	3.25 (1.96 to 5.37)	<b>&lt;0.0001</b>	2.15 (1.15 to 4.03)	<b>0.0016</b>
Osteoporosis/low bone density	75	30	2.06 (1.41 to 3.00)	<b>&lt;0.0001</b>	1.45 (0.91 to 2.31)	0.04	30	63	3.86 (1.77 to 8.40)	<b>&lt;0.0001</b>	1.45 (0.53 to 4.00)	0.3415
Health status												
Excellent/very good	127	7	1	–	1	–	108	12	1	–	1	–
Good	212	23	3.72 (2.72 to 5.08)	<b>&lt;0.0001</b>	2.85 (2.03 to 4.01)	<b>&lt;0.0001</b>	203	32	3.35 (2.38 to 4.72)	<b>&lt;0.0001</b>	2.47 (1.68 to 3.64)	<b>&lt;0.0001</b>
Fair/poor	206	51	12.85 (9.07 to 18.21)	<b>&lt;0.0001</b>	7.67 (5.06 to 11.62)	<b>&lt;0.0001</b>	260	70	16.59 (11.19 to 24.59)	<b>&lt;0.0001</b>	8.87 (5.60 to 14.05)	<b>&lt;0.0001</b>
Geographical location												
Major city	200	17	1	–	1	–	205	27	1	–	1	–
Inner regional	237	18	1.04 (0.79 to 1.37)	0.7	1.16 (0.84 to 1.61)	0.2	244	31	1.21 (0.90 to 1.61)	0.096	1.03 (0.71 to 1.49)	0.22
Outer regional/remote/very remote	133	19	1.14 (0.83 to 1.57)	0.3	1.13 (0.77 to 1.66)	0.4	149	39	1.73 (1.23 to 2.43)	<b>&lt;0.0001</b>	1.21 (0.78 to 1.88)	0.41
Age												
45–49	11	28	1.98 (0.78 to 5.00)	0.059	1.08 (0.36 to 3.24)	0.86	17	65	5.24 (1.79 to 15.33)	<b>&lt;0.0001</b>	3.61 (0.92 to 14.10)	0.015
50–54	58	34	2.63 (1.68 to 4.09)	<b>&lt;0.0001</b>	2.42 (1.40 to 4.20)	<b>0.0001</b>	45	55	3.37 (1.87 to 6.10)	<b>&lt;0.0001</b>	2.20 (1.01 to 4.76)	<b>0.0088</b>
55–59	149	18	1.12 (0.85 to 1.48)	0.29	1.23 (0.88 to 1.71)	0.11	170	39	1.75 (1.30 to 2.35)	<b>&lt;0.0001</b>	1.66 (1.14 to 2.43)	<b>0.0005</b>
60–64	354	17	1	–	1	–	367	26	1	–	1	–
Married/de facto												
Yes	178	29	1	–	1	–	453	28	1	–	1	–
No	393	16	2.19 (1.67 to 2.86)	<b>&lt;0.0001</b>	1.58 (1.14 to 2.19)	<b>0.0003</b>	144	45	2.07 (1.50 to 2.86)	<b>&lt;0.0001</b>	1.22 (0.80 to 1.86)	0.23
Education												
Higher school or leaving certificate or lower	299	17	0.95 (0.68 to 1.32)	0.70	0.71 (0.48 to 1.06)	0.028	255	38	2.35 (1.65 to 3.35)	<b>&lt;0.0001</b>	1.65 (1.06 to 2.58)	<b>&lt;0.0001</b>
Trade or apprenticeship	33	25	1.53 (0.85 to 2.76)	0.06	1.80 (0.91 to 3.59)	0.027	136	43	2.99 (1.98 to 4.51)	<b>&lt;0.0001</b>	2.54 (1.52 to 4.26)	<b>0.0038</b>
Certificate or diploma	131	20	1.16 (0.79 to 1.70)	0.31	1.08 (0.69 to 1.70)	0.64	99	24	1.20 (0.79 to 1.82)	0.25	0.91 (0.55 to 1.52)	0.6
University degree or higher	98	18	1	–	1	–	99	20	1	–	1	–

Bold represents  $P < 0.01$ .

<sup>a</sup> Number missing for women—urinary incontinence:  $n = 120$ ; health status:  $n = 7$ ; geographical location:  $n = 4$ ; married/defacto  $n = 5$ ; education:  $n = 44$ .

<sup>b</sup> Number missing for men—urinary incontinence:  $n = 45$ ; health status:  $n = 45$ ; geographical location:  $n = 1$ ; married/defacto  $n = 5$  education:  $n = 33$ .

### 2.3. Statistical analysis

Logistic regressions were used to estimate odds ratios of retiring due to ill-health versus other retirement reasons and its associations with health problems and self-reported health status while adjusting for geographical location, age, marital status and education. The adjusted model included all health conditions, self-reported health and sociodemographic variables simultaneously. A *P*-value of <0.01 was chosen for statistical significance because there is a potential for a greater risk of type I error because of the multiple comparisons. Records with missing values were excluded from the adjusted models. Statistical analyses were conducted using SAS version 9.1 (SAS Institute, Cary, NC, USA).

### 3. Results

Of the 21,719 females and 16,393 males aged between 45 and 64 years who completed the 2nd or 3rd version of the survey, 3160 women (15%) and 1933 men (12%) were fully retired. The probability of retiring due to ill-health was 18% (572/3160) for women and 31% (599/1933) for men.

#### 3.1. Health problems

After adjusting for all socio-economic variables and other health problems, women who reported ever having been told by a doctor that they had thrombosis, depression, osteoarthritis, or cancer (except melanoma and skin and breast cancer), were twice as likely to have retired early due to ill-health than women without these health problems (see Table 1). The number of health problems associated with retirement due to ill-health appeared to be greater for men than for women. From most to least significant, stroke, cancer (except melanoma and skin and prostate cancer), osteoarthritis, depression, anxiety and heart disease had a significant association with retirement due to ill-health among male retirees.

#### 3.2. Health status

The strongest association with retirement due to ill-health was in self-reported health status. Compared to female retirees who reported excellent to very good health, women who rated their health as fair or poor were 7.67 times as likely (95% CI: 5.06–11.62) to have retired early due to ill-health. Also, women who rated their health as good were 2.85 times as likely (95% CI: 2.03–4.01) to have retired early due to ill-health. The same pattern emerged for male retirees, but the associations were slightly stronger for males who rated their health as fair or poor (OR: 8.87 (95% CI: 5.60–14.05)).

#### 3.3. Socio-economic variables

The adjusted odds of retiring due to ill-health declined with increase in age for men but not for women. Only women aged between 50 and 54 had higher odds of being retired due to ill-health than women aged between 60 and 64 years. Single women had higher odds of being retired due to ill-health than their married counterparts, but no

association was found for men after adjusting for other covariates. In comparison to men with a university degree, men with a trade or apprenticeship had the highest odds of being retired due to ill-health followed by men with an education equivalent to or lower than high school.

### 4. Discussion

This study demonstrated that there are several health problems associated with early retirement among men and women aged 45–64 years, and that they differ between men and women. Women would benefit from interventions targeting cancers, thrombosis, depression and osteoarthritis. Men would mostly benefit from interventions that focus on stroke, cancers, osteoarthritis, depression, anxiety and heart disease.

#### 4.1. Health problems

Our findings are partly consistent with previous Australian research that used a different dataset—the survey of Disability, Ageing and Carers [11]. This survey differed from the 45 and Up survey in that it allowed for participants to report only one main health condition, and the model was not adjusted for other diseases, whereas in our study the model allowed for participants to have multiple conditions. Similar to the results of our crude analysis, Schofield and colleagues also found that arthritis, mental health problems, diseases of the nervous system, heart disease, diabetes, hypertension, cancer, respiratory diseases, other circulatory diseases, asthma and diseases of the digestive system were associated with being out of the labour force. Contrary to the results of our crude analysis, they found that hearing loss was *not* related to being out of the labour force. They also found that back injuries, which were not measured in our dataset, had the largest impact on people being out of the workforce.

Our finding that diseases associated with early retirement due to ill-health include osteoarthritis and depression for both genders, and anxiety for men, is reflected in the Australian Government's social security spending: 30% of people who receive the Disability Support pension give as their main reason musculoskeletal and psychological problems [12].

The odds ratios of retiring for health reasons associated with health conditions were fairly similar amongst the disease groups that were statistically significant for women, ranging between 1.77 for osteoarthritis to 2.23 for cancers. For men, more variation was found. In particular, men reporting having had a stroke or Parkinson's disease had respectively 3.6 times and 6.57 times the odds of retiring for health reasons. Both diseases can lead to poorer functioning. Men reporting ever having had cancers, osteoarthritis, depression, anxiety and heart disease were twice as likely to have retired early due to ill-health.

A study in the US calculated adjusted odds ratios for work disability for cancer survivors and compared these ratios with heart disease, stroke, diabetes, lung disease and arthritis/rheumatism. Although this study used an outcome measure different from ours, it still found that, cancer-free survivors of both genders had twice the odds

of having a work disability compared to people without chronic conditions [13], and that there were hardly any significant differences between work disability rates for cancer and the other conditions. Another recent study of 11,462 retirees aged 50–64 years from the Survey on Health and Ageing in Europe [14] found that self-reported major depression and stroke were the most important health problems, followed by arthritis/osteoporosis and diabetes. Hypertension, asthma and heart attack were not found to be associated with retirement in the European study. These results are reasonably similar to our own, except that in our study diabetes was *not* found to be associated with retirement due to ill-health for either gender, and heart disease was for men. The studies in Europe [14] adjusted for gender as a confounder only whereas the US [13] and our study estimated the effects separately for men and women.

#### 4.2. Health status

As expected, and in line with previous European [14,15] and Australian research [16], self-reported health was significantly associated with retirement due to ill-health, although Kalwij and Vermeulen [15] also found that in some countries the association is not evident. The Australian study by Schofield and colleagues adjusted only for gender and age. Our study adjusted for multiple health problems as well as sociodemographic variables, but despite this, self-reported health status still had the strongest association with retirement due to ill-health. This accords with a systematic review that showed (after adjusting for various chronic conditions and health status indicators and other factors known to impact on mortality) that self-reported health status is an independent predictor of mortality [5]. Although as a health indicator, mortality is obviously very different from 'retirement due to ill-health', the importance of the comparison lies in the fact that people's self-perceptions of their health should not be underestimated when tackling issues that impact negatively on healthy ageing into retirement. Self-reported health captures their complete sense of well-being and allows for the impact of multiple co-morbidities not captured by the analysis of specific diseases. This might partly explain the strong association between self-reported health and retirement due to ill-health: not all health problems were included in the model so self-reported health might have captured those diseases that were missing. Alternatively, due to the cross-sectional design of the survey, current self-reported health status may have shown a stronger association than health problems because the health of respondents might be worse now than when they retired.

#### 4.3. Socio-economic variables

Consistent with previous studies [14], health conditions are not the only factors associated with retirement but form part of a complex interplay of macro- and micro-factors. There is ample evidence that demonstrate gender differences in retirement behaviour [17]. In our study single female retirees were more likely to have retired for health

reasons than married female retirees, whereas for men no association was found. Alavinia and Burdorf [14] have also reported that being without a partner is associated with early retirement, although they did not compare by gender. This can have financial implications for governments from an aged pension point of view: a recent study [18] reported that divorced, separated or widowed female Australian retirees were less likely to be self-funded than were married women. This was not true for men. Thus, the relationship between single women, retirement, health and income needs to be further investigated. Closing the gap between single female and male retirees has the added benefit of reducing health inequality between men and women.

Consistent with the European study [14], Australian men with a higher school certificate or lower, and men with a trade, were more likely to be retired for health reasons compared to men with a university degree. Trades people usually do heavier work and may be more likely to sustain injuries that prevent them from healthy ageing and increase the likelihood of their retiring for health reasons.

#### 4.4. Health policy context

A number of the conditions identified in our study (osteoarthritis, cancer, cardiovascular health and mental health) are Australian National Health Priority areas [19]. Osteoarthritis, cancer and cardiovascular disease also form part of the Australian National Chronic Disease Strategy, which is a nationwide approach to chronic disease prevention and management. The strategy aims to promote a coordinated approach to reducing the impact of chronic disease on people's health and on the health care system [20]. Our study provides evidence that it is also important to take specific action among retirees aged 45–64 years. There are several population health interventions (for example national screening programs for cancer [21]), and individual level interventions, such as cognitive behavioural therapy for anxiety and depression [22], that would promote healthy ageing in retirement and hence reduce the burden on the community. Interventions would need to be evaluated for effectiveness and economic benefit. Given the different disease profiles and social roles of men and women, interventions would also need to be gender-specific, both to enhance gender equity in health and to have more likelihood of improving the mental and physical capacities of both male and female retirees. Policymakers need to be aware of the benefits of incorporating gender-specific interventions into health policy.

#### 4.5. Limitations and strengths

Several limitations need to be taken into account when interpreting the study results. First, although several mechanisms *might* explain the associations between retirement due to ill-health and health problems and health status, we could not determine causality because of the cross-sectional nature of the study. Associations between health conditions and ill-health retirement do not necessarily indicate that these conditions per se caused or lead to

retirement. In addition, several questions do not necessarily reflect the situation at the time of retirement. For example, depression or treatment for arthritis may have started after the person retired, or cancers may have been cured prior to retirement. However, a number of longitudinal studies have investigated predictors of early and ill-health retirement [23,24] which can make more confident claims about the causal relationship: A Finnish study found that depressed men retired on average 1.5 years younger than those without depression" [23]. The Whitehall II study found among British civil servants that a higher paid job, lower job satisfaction, and lower self-reported health were independent predictors of early retirement [24]. However, neither of these studies assessed the relative impacts of a range of specific conditions on early retirement by gender.

Second, the 45 and Up Study had a very low response rate (17.9%; 95% CI 17.8–18.1) [7], and thus it is not appropriate to generalise prevalence estimates to the general population. Further, the survey was available only in English, and it excluded people with a mental impairment who could not sign their own consent form. Hence the results are probably not representative of the general population of NSW but may apply more to native English speakers and to healthier people who are more likely to respond [25]. Nevertheless, comparisons within the study group, such as estimating associations between variables, are valid even when the sample is from a select group [7,26]. As Willet [26] demonstrated, using smoking as an example, the impact of smoking was first identified in a group of British doctors—not at all representative of the general population. Thus, the analyses undertaken in our study are appropriate despite the sample being non-representative.

Third, the 45 and Up Study currently lacks clinical data, does not include all chronic conditions and is based on self-report. Although some studies have found that self-reported health can be a valid measure [27,28], and although the 45 and Up Study uses validated questionnaires where appropriate and elicits data that would not otherwise be available, nonetheless the under-reporting of health conditions remains a problem because some conditions are known to be underdetected [29]. In the case of diabetes, for example, respondents may experience poor health but not recognise that it is due to diabetes, so they would not report they had diabetes; as a result, the association between diabetes and retirement due to ill-health would be underestimated. This may partly explain why there is a stronger association with retirement due to ill-health from self-reported health status than from individual health problems.

Fourth, our study did not include severity of disease nor factors that might improve people's levels of functioning, such as medication or other treatment.

A strength of the study is the very large sample size. This allows for putting all health conditions into one model rather than running separate models without losing power. The 45 and Up study also provides unique health information about the age-cohort of Australian men and women that is not available elsewhere in Australia.

## 5. Conclusion

In conclusion, health problems associated with early retirement due to ill-health among men and women aged 45–64 years vary considerably. Interventions to prevent or treat these health problems would not only bring immediate health gains to the individuals themselves but would increase their ability to age productively and therefore contribute to society. Interventions would need to be tailored for men and women separately, given the gender differences in disease profiles and social roles. Women would benefit most from interventions targeting cancers, thrombosis, depression and osteoarthritis. Men would benefit most from interventions that focus on stroke, cancers, osteoarthritis, depression, anxiety and heart disease.

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