

- 4 Burford O, Jiwa M, Carter O, et al. Internet-based photoaging within Australian pharmacies to promote smoking cessation: randomized controlled trial. *J Med Internet Res* 2013;15:e64.
- 5 Ingre M. Then and Now: A Look at How Australia's Connected Consumers Have Changed. Nielsen Newswire, 2013. [online]. Available at: <http://www.nielsen.com/us/en/newswire/2013/then-and-now-a-look-at-how-australias-connected-consumers-have-changed-.html> (5 November 2013, date last accessed).
- 6 Frankenfield D, Roth-Yousey L, Compher C. Comparison of predictive equations for resting metabolic rate in healthy nonobese and obese adults: a systematic review. *J Am Diet Assoc* 2005;105:775–89.
- 7 Jakicic JM, Winters C, Lang W, Wing RR. Effects of intermittent exercise and use of home exercise equipment on adherence, weight loss, and fitness in overweight women. *JAMA: J Am Med Assoc* 1999;282:1554–60.
- 8 Hertzog MA. Considerations in determining sample size for pilot studies. *Res Nurs Health* 2008;31:180–91.
- 9 Weight Watchers Federation WA. [online], 2014. Weight watchers Federation WA. Available at: <http://www.weightwatchersfederationwa.org.au/> (17 February 2014, date last accessed).
- 10 Polivy J. The false hope syndrome: unrealistic expectations of self-change. *Int J Obes Relat Metab Disord* 2001;25:S80–4. doi:10.1038/sj.ijo.0801705.

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## Multiple chronic health conditions and their link with wealth assets

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**Background:** There has been little research on the economic status of those with multiple health conditions, particularly on the relationship between multiple health conditions and wealth. This paper will assess the difference in the value and type of wealth assets held by Australians who have multiple chronic health conditions. **Methods:** Using Health&WealthMOD, a microsimulation model of the 45–64-year-old Australian population in 2009, a counterfactual analysis was undertaken. The actual proportion of people with different numbers of chronic health conditions with any wealth, and the value of this wealth was estimated. This was compared with the counterfactual values had the individuals had no chronic health conditions. **Results:** There was no change in the proportion of people with one health condition who actually had any wealth, compared to the counterfactual proportion had they had no chronic health conditions. Ninety-four percent of those with four or more health conditions had some accumulated wealth; however, under the counterfactual, 100% would have had some accumulated wealth. There was little change in the value of non-income-producing assets under the counterfactual, regardless of number of health conditions. Those with four or more chronic health conditions had a mean value of \$17 000 in income-producing assets; under the counterfactual, the average would have been \$78 000. **Conclusion:** This study has highlighted the variation in the value of wealth according to number of chronic health conditions, and hence the importance of considering multiple morbidities when discussing the relationship between health and wealth.

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## Introduction

It is known that internationally, an individual's economic status is closely linked to his/her health: those with ill health have lower rates of labour force participation in virtually all Organisation for Economic Co-operation and Development countries,<sup>1</sup> and consequently, they have lower incomes and fewer wealth assets than those with good health.<sup>2–11</sup> However, to date, most studies that have assessed the economic burden of ill health have taken a limited view of health—focusing on people who have specific conditions (e.g. a focus on people with diabetes),<sup>12–14</sup> people who have stated they consider themselves to have poor health generally<sup>15</sup> or aggregating people who have stated they have any chronic health condition or disability.<sup>16,17</sup> Such assessments of health status do not take into consideration the complexity of a person's health circumstances.

Many people with a health condition suffer from multiple health conditions simultaneously. This is especially the case amongst older

age groups, who are of increasing importance as they make up a large and increasing proportion of the population in most countries.<sup>18,19</sup> Using the traditional aggregate assessments of poor health outlined above may mask inequalities in the economic circumstances of people with chronic health conditions. For example, it is recognized that those with multiple health conditions have poorer functional outcomes and a poorer quality of life than those with single chronic health conditions.<sup>20–22</sup> However, while multiple health conditions have been highlighted as an important research topic within the health domain,<sup>23</sup> there has been limited research on the economic status of those with multiple health conditions, and a review of the literature found none on the relationship between multiple health conditions and wealth.

This paper will assess the difference in the value and type of wealth assets held by Australians who have multiple chronic health conditions, a single chronic health condition and no chronic health conditions to estimate the impact of multiple health

conditions on wealth. It will focus on people within the 45–64-year age group, as it is during this stage of the life cycle that most of an individual's lifetime wealth accumulation occurs.<sup>24</sup> While this paper does focus on Australia, the results are generalizable to other developed countries, as population ageing, low labour force participation of older workers and increasing focus on ballooning health budgets are common issues facing governments internationally.<sup>1,18,25–27</sup>

## Methods

This study has been conducted using Health&WealthMOD, a microsimulation model of the 45–64-year-old Australian population in 2009. The model contains detailed information, at the individual level, of health, labour force participation and economic status. It has been successfully used in the past to estimate the economic impacts of various individual health conditions and the economic benefits of prevention<sup>28–31</sup>; however, these past applications have not taken into consideration any multimorbidities experienced by individuals. Health&WealthMOD was built on individual record data from the *2003 Survey of Disability, Ageing and Carers* (SDAC), a nationally representative survey of health and disability conducted by the Australian Bureau of Statistics,<sup>32</sup> and STINMOD, a microsimulation model of income tax and government support payments,<sup>33,34</sup> which is maintained and developed for the Australian Government by the National Centre for Social and Economic Modelling at the University of Canberra.

The base population of Health&WealthMOD was unit record data extracted from the SDAC. From this data set, individual records were extracted for those aged 45–64 years. The details extracted for each individual in the base population included demographic variables (e.g. age, sex, family type, and state of residence), socioeconomic variables (level and field of education, income, benefits received), labour force variables (labour force participation, employment restrictions, retirement) and health and disability variables (main chronic conditions, number of chronic health conditions, general health status, type and extent of disability, support and care required).

Using STINMOD, additional economic information was imputed onto the base data of Health&WealthMOD by the synthetic matching of persons with similar characteristics on STINMOD, a process commonly used in microsimulation models [35]. Nine variables, sex (two groups: males, females), income unit type (four groups: single only, single with dependants, couple only, couple with dependants), type of government pension/support (three groups: disability support pension, other pension/government support payments, no pension/government support payments), income quintile (five groups: quintile 1, quintile 2, quintile 3, quintile 4, quintile 5), age group (four groups: 45–49, 50–54, 55–59, 60–64), labour force status (four groups: employed full-time, employed part-time, unemployed, not in the labour force), hours worked per week (five groups: 1–15 hours, 16–24 hours, 25–34 hours, 35–40 hours, 41+ hours), highest educational qualification (two groups: university, no university) and home ownership (two groups: owner occupied, renting), that were common to both data sets and strongly related to income were chosen as matching variables for synthetic matching.<sup>6</sup>

The data were then aged to reflect the 2009 Australian 45–64-year-old population. The ageing was used to account for the demographic, labour force, earnings growth and other changes that had occurred between 2003 and 2009.

The variables used in this study regarding health conditions came from the 2003 SDAC. The SDAC identified individuals as having no chronic health condition, a single chronic health condition only and up to nine or more chronic health conditions based on self-report. For ease of interpretation, this paper grouped those with four or more health conditions together.

The variables used in this paper regarding wealth came from STINMOD. Wealth was defined as the value of accumulated assets (such as property and shares) and does not include income derived from sources such as employment wages or social security payments. Two different classes of wealth were analysed—income-producing assets (cash, superannuation, shares and property investment other than the respondents' owner-occupied home) and non-income-producing assets (value of owner-occupied home)—as well as the total value of an individual's wealth, which was calculated as the sum of the above two wealth classes.

## Statistical analysis

Initial descriptive analyses were carried out to estimate the number and proportion of individuals with no chronic health condition, one chronic health condition, two chronic health conditions, three chronic health conditions and four or more chronic health conditions.

The proportion of individuals who had any accumulated wealth for each of these groups was then assessed and compared with the counterfactual proportion, had they had no chronic health condition. Chi-square tests were undertaken to assess the difference in the proportions. The analysis was then limited to people who had accumulated some wealth. The estimated value of total wealth, income-producing assets and non-income-producing assets for those individuals with varying numbers of chronic health conditions was then compared with the counterfactual value if they had no chronic health conditions. The counterfactual estimates were derived from data on individuals who had no chronic health conditions, and who were of the same age group, sex, had the same highest education qualification (university or non-university) and were in the same income unit type. Multiple linear regression models were used to estimate counterfactual means. All analyses were undertaken using SAS V9.2 (SAS Institute Inc., Cary, NC, USA).

## Results

In Health&WealthMOD, there were 8,864 individuals aged 45–64 years representing 5 423 900 individuals in the 2009 Australian population. Within this population, 58% had one or more long-term health conditions. Table 1 shows the proportion of individuals with multiple long-term health conditions for males and females in different age groups. There was a similar distribution of multiple health conditions across the age groups for males and females. The proportion of individuals with multiple long-term health conditions increased with age for both males and females.

The most common health conditions reported were hypertension (17%) and arthritis (17%), followed by back problems (16%). These proportions differed by gender. Among males, 17% reported having back problems, 17% hypertension and 13% arthritis. Among women, 20% reported arthritis, 17% reported hypertension and 15% reported back problems.

Table 2 shows the actual proportion of people with any wealth by varying numbers of health conditions, compared to their counterfactual likelihood of having any wealth, had they had no health conditions. There was no change in the proportion of people with one health condition who actually had any wealth, compared to the counterfactual proportion ( $\chi^2 = 16.0$ ,  $P < 0.0001$ ). Of those who had two health conditions, 98% had some accumulated wealth. If they had had no health conditions, a slightly higher proportion, 100%, would have had some accumulated wealth ( $\chi^2 = 7.4$ ,  $P = 0.0064$ ).

Ninety-five per cent of those with three health conditions had some accumulated wealth. Had they had no health conditions, 100% would have had some accumulated wealth ( $\chi^2 = 53.8$ ,  $P < 0.0001$ ). Similarly, 94% of those with four or more health conditions had some accumulated wealth; however, under the

counterfactual, 100% would have had some accumulated wealth ( $\chi^2 = 4004.3$ ,  $P < 0.0001$ ).

Table 3 shows the *actual* value of total wealth, income-producing assets and non-income-producing assets of those with varying

**Table 1** Multiple long-term health conditions among males and females of different age groups—Australian population aged 45–64 years, 2009

Gender and Age Group	Number of conditions	N	Number in population	Percentage of population
<b>Females</b>				
45–54 years	0	1307	771 500	52
	1	606	248 200	23
	2	314	177 400	12
	3	151	87 700	6
	4+	220	107 900	7
55–64 years	0	564	359 000	30
	1	446	285 400	24
	2	363	212 800	18
	3	220	153 800	13
	4+	314	190 600	16
<b>Males</b>				
45–54 years	0	1316	767 900	51
	1	586	344 700	23
	2	289	183 400	12
	3	168	100 500	7
	4+	176	110 600	7
55–64 years	0	593	391 500	32
	1	460	310 500	25
	2	299	214 100	18
	3	216	138 700	11
	4+	256	167 900	14

**Table 2** Counterfactual analysis: comparison of actual proportion of people with any wealth by different numbers of chronic health conditions—Australian population aged 45–64 years, 2009

Number of conditions		Proportion with any wealth (%)
1	Actual <sup>a</sup>	99
	Counterfactual <sup>b</sup>	100
2	Actual <sup>a</sup>	98
	Counterfactual <sup>b</sup>	100
3	Actual <sup>a</sup>	95
	Counterfactual <sup>b</sup>	100
4+	Actual <sup>a</sup>	94
	Counterfactual <sup>b</sup>	100

a: Actual values in *Health&WealthMOD*.

b: Counterfactual values if people who had varying numbers of conditions had no chronic condition.

**Table 3** Counterfactual analysis: comparisons of actual value of total wealth, income-producing assets and non-income-producing assets held by individuals with different numbers of chronic health conditions—Australian population with accumulated wealth assets aged 45 to 64 years, 2009

Number of conditions		Total wealth			Income-producing assets			Non-income-producing assets		
		Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
1	Actual <sup>a</sup>	376 900	426 500	253 700	191 500	301 700	83 600	185 400	203 200	140 800
	Counterfactual <sup>b</sup>	386 000	143 300	227 300	195 600	95 200	77 600	187 400	53 500	137 600
2	Actual <sup>a</sup>	389 200	525 000	246 200	208 200	413 800	66 400	181 000	188 600	134 600
	Counterfactual <sup>b</sup>	390 900	140 900	227 300	198 600	92 300	77 600	189 300	54 100	139 800
3	Actual <sup>a</sup>	292 900	410 400	170 800	144 400	308 300	36 500	148 500	189 700	115 400
	Counterfactual <sup>b</sup>	378 100	125 000	238 600	190 500	80 600	77 600	184 600	51 200	138 700
4+	Actual <sup>a</sup>	218 600	264 700	150 200	87 500	182 700	17 100	131 100	143 700	107 700
	Counterfactual <sup>b</sup>	367 800	123 000	224 200	185 700	78 300	77 600	179 000	51 000	130 500

a: Actual values in *Health&WealthMOD*.

b: Counterfactual values if people who had varying numbers of conditions had no chronic condition.

numbers of chronic health conditions, and their estimated counterfactual values had they had no chronic health conditions, with the analysis limited to those who had accumulated any wealth.

There was a clear decrease in the *actual* value of income-producing assets with increasing numbers of health conditions. However, the *actual* value of non-income-producing assets (the family home) was similar across all four groups (Table 3). The average *actual* total value of wealth and the *actual* value of income-producing assets held by those who had three or four or more chronic health conditions were far lower than the average *counterfactual* values, if they had no chronic condition. However, for those with one or two chronic health conditions, the results show little change under the counterfactual scenario of not having any chronic health conditions. Similarly, there was little change in the value of non-income-producing assets under the counterfactual, regardless of number of health conditions (Table 3).

## Discussion

In the past, other studies have documented the lower value of wealth held by those with specific health conditions—diabetes, cardiovascular disease, back problems, depression and mental health—who had retired from the labour force early.<sup>28–30,36</sup> However, to date, no studies have assessed the influence that varying numbers of chronic health conditions have on wealth. This study has highlighted the variation in the value of wealth according to number of chronic health conditions, and hence the importance of considering multiple morbidities when discussing the relationship between health and wealth.

Individuals with three, four or more chronic health conditions had far less income-producing assets than those with one or two chronic health conditions, and a far lower value of income-producing assets than the estimated value had they had no chronic health condition. Thus, the individuals with more health conditions may be more reliant on income from employment earnings than from their wealth assets. However, other studies have found that multiple morbidities are associated with increased rates of disability,<sup>22,37</sup> poorer physical functioning<sup>38,39</sup> and the loss of productivity,<sup>40</sup> indicating that employment may be harder to maintain for those with more health conditions. The Australian universal health care system and social security system may to some extent help to provide an income stream. Internationally, schemes such as the Employment and Support Allowance in the United Kingdom and the Supplemental Security Income scheme in the USA offer similar arrangements.<sup>41–45</sup> However, these safety nets may not always accommodate a decent standard of living, with some noting that recipients in Australia who are dependent on these payments may be below the poverty line, particularly single pensioners.<sup>44</sup> Thus, to ensure a reasonable standard of living,

individuals must have accumulated wealth to supplement this welfare income. Some savings are also needed to protect against unexpected events such as deterioration in health.<sup>45–47</sup> However, those with more chronic health conditions had a lower value of total wealth to draw on, which suggests a possible increase in future financial vulnerability.

Traditionally, the provision of health care services, both treating and preventing illness, has seen the improvement of health for its own sake as its main outcome, with health policy and economic and welfare policy operating in independent policy silos. With the documentation of the poorer economic outcomes that are associated with ill health, as was demonstrated in this study, it is apparent that the treatment or prevention of poor health may be of use to policymakers seeking to also improve the living standards of citizens. This paper has demonstrated the economic benefit that could have been produced if those with multiple health conditions had had their conditions prevented.

A limitation of this paper is that it was conducted using cross-sectional data, and thus causality cannot be established. It is the authors' view that due to the known impact of ill health on labour force participation,<sup>3,48,49</sup> and the high occurrence of early retirement due to illness,<sup>5</sup> people with multiple health conditions have lower wealth due to their ill health. It is possible the people may have poorer health due to their lower wealth. There is longitudinal evidence about unemployment and subsequent ill health.<sup>50</sup> However, there is less evidence of the influence of income on health: longitudinal studies have found no significant relationship between income and self-reported health status,<sup>51–53</sup> and others have found no significant difference for females.<sup>54–57</sup> Some longitudinal studies have found that when income does have a significant influence on health, the magnitude of the change reported is very small (an increased probability of reporting ill health of as little as 1%<sup>55,56,58–62</sup>).

Given the ageing of most populations internationally and the high rate of multiple morbidities amongst people of older working age, it is important to understand the impact that multiple health conditions can have on economic circumstances, as more people are likely to suffer from multiple health conditions in the future. This paper has highlighted the variation in wealth assets held by those with different numbers of health conditions, and the increase in relative disadvantage experienced by those with increasing numbers of morbidities. Although the paper used Australian data, it is likely that these results would be generalizable to most developed countries, given the similar age distributions and the impact ill health has on labour force participation.

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*Conflicts of interest:* None declared.

## Key points

- Assessing co-morbid health conditions is an important emerging area of research, however little is known about the impact having multiple health conditions has upon economic costs.
- Having increasing numbers of health conditions is associated with less chance of having wealth, and for those who do have some assets the value of these is less.
- Taking account of co-morbid health conditions should be an important component of any economic evaluation of the

indirect costs of illness as co-morbidities have a large influence upon the results produced.

- Health care has the potential to also improve living standards by improving economic outcomes.

## References

- 1 Organisation for Economic Co-operation and Development. *Sickness, Disability and Work: Breaking the Barriers*. Paris: OECD Publishing, 2007.
- 2 Nepal B, Payne A, Brown L. Health, wealth and wise? The relationship between health, employment and earnings in Australia. AMPNATSEM Income and Wealth Report, Issue 23, July 2009. Sydney: AMP, 2009.
- 3 Cai L, Cong C. Effects of health and chronic disease on labour force participation of older working Australians. *Aust Econ Pap* 2009;48:166–82.
- 4 Schofield D, Shrestha R, Percival R, et al. Economic impacts of illness in older workers: quantifying the impact of illness on income, tax revenue and government spending. *BMC Public Health* 2011;11:418.
- 5 Schofield DJ, Shrestha RN, Passey ME, et al. Chronic disease and labour force participation among older Australians. *Med J Aust* 2008;189:447.
- 6 Schofield D, Shrestha R, Callander E, et al. Modelling the cost of ill health in Health&WealthMOD (Version II): lost labour force participation, income and taxation, and the impact of disease prevention. *Int J Microsimul* 2011;4:32–6.
- 7 Smith JP. Healthy bodies and thick wallets: the dual relationship between health and economic status. *J Econ Perspect* 1999;13:145–66.
- 8 Bellaby P. Can they carry on working? Later retirement, health and social inequality in an ageing population. *Int J Health Serv* 2006;36:1–23.
- 9 Cavapozzi D. Health and labor supply dynamics of older married workers, No 73, “Marco Fanno” Working Papers. Dipartimento di Scienze Economiche “Marco Fanno”, 2008.
- 10 Roberts J, Rice N, Jones AM. Early retirement and inequality in Britain and Germany: how important is health. *Sheffield Economic Research Paper Series*. Sheffield: University of Sheffield, 2008.
- 11 Weehuizen R. *Mental Capital: the Economic Significance of Mental Health*. Melbourne: Universitaire Pers Maastricht, 2008.
- 12 Access Economics. *Bipolar Disorder Costs: An Analysis of the Burden of Bipolar Disorder and Related Suicide in Australia*. Australia: SANE, 2003.
- 13 Dall T, Mann SE, Zhang Y, et al. Economic costs of Diabetes in the US in 2007. *Diabetes Care* 2008;31:1–20.
- 14 Dunlop D, Manheim L, Yelin E, et al. The costs of arthritis. *Arthritis Rheum* 2003;49:101–13.
- 15 Cai L, Kalb G. *Health Status and Labour Force Participation: Evidence from the HILDA Data*. Maastricht, Netherlands: Melbourne Institute of Applied Economic and Social Research, 2004.
- 16 Wightman P, Robertson F. Costs of disability. A survey of the costs of disability for people with disabilities in labour force related activity, Policy Research Paper No.59. Sydney: Social Policy Research Centre (SPRC), 1996.
- 17 Zaidi A, Burchardt T. Comparing incomes when needs differ: equalization for the extra costs of disability in the U.K. *Rev Income Wealth* 2005;51:89–114.
- 18 Organisation for Economic Co-operation and Development. *Ageing Societies. OECD Factbook 2008*. Paris: OECD, 2008.
- 19 Organisation for Economic Co-operation and Development. *Labour Force Stat 1986–2006*. Paris: OECD, 2007.
- 20 Walker AE. Multiple chronic diseases and quality of life: patterns emerging from a large national sample, Australia. *Chronic Illn* 2007;3:202–18.
- 21 Baumeister H, Balke K, Harter M. Psychiatric and somatic comorbidities are negatively associated with quality of life in physically ill patients. *J Clin Epidemiol* 2005;58:1090–100.
- 22 Gijzen R, Hoeymans N, Schellevis FG, et al. Causes and consequences of comorbidity: a review. *J Clin Epidemiol* 2001;54:661–74.
- 23 Fortin M, Hudon C, Bayliss EA, et al. Multimorbidities many challenges: time to focus on the needs of this vulnerable and growing population. *BMJ* 2007;334:1016–7.
- 24 Miles D. Modelling the impact of demographic change upon the economy. *Econ J* 1999;109:1–36.
- 25 Organisation for Economic Co-operation and Development. *Fiscal Implications of Ageing: Projections of Age-Related Spending, ESWP No. 305*. Paris: OECD, 2001.

- 26 Organisation for Economic Co-operation and Development (OECD). *Live Longer, Work Longer: A Synthesis Report*. Paris: OECD.
- 27 Organisation for Economic Co-operation and Development (OECD). *Ageing OECD Societies. Trends Shaping Education*. Paris: OECD, 2008.
- 28 Schofield D, Percival R, Passey M, et al. The financial vulnerability of individuals with diabetes. *Br J Diabetes Vasc Dis* 2010;10:300–4.
- 29 Schofield D, Shrestha R, Percival R, et al. Quantifying the effect of early retirement on the wealth of individuals with depression or other mental illness. *Br J Psychiatry* 2011;198:123–8.
- 30 Schofield D, Passey M, Percival R, et al. Retiring early with cardiovascular disease—impact on individual's financial assets. *Int J Cardiol* 2010;146:125–6.
- 31 Passey M, Shrestha R, Bertram M, et al. The impact of diabetes prevention on labour force participation and income of older Australians: an economic study. *BMC Public Health* 2012;12:16.
- 32 Australian Bureau of Statistics. *Survey of Disability, Ageing and Carers, 2003*. Canberra: ABS, 2004.
- 33 Lambert S, Percival R, Schofield D, et al. *An Introduction to STINMOD: A Static Microsimulation Model*. Canberra: NATSEM, 1994.
- 34 Percival R, Abello A, Vu QN. STINMOD (Static Income Model) 2007. In: Gupta A, Harding A, editors. *Modelling Our Future: Population Ageing, Health and Aged Care*. Amsterdam: Elsevier B.V., 2007.
- 35 Rässler S. *Statistical Matching: A Frequentist Theory, Practical Applications, and Alternative Bayesian Approaches*. New York: Springer-Verlag New York, Inc, 2002.
- 36 Schofield D, Shrestha R, Percival R, et al. Early retirement and the financial assets of individuals with back problems. *Eur Spine J* 2011;20:731–6.
- 37 Rijken M, van Kerkhof M, Dekker J, et al. Comorbidity of chronic diseases. *Qual Life Res* 2005;14:45–55.
- 38 Kriegsman DMW, Deeg DJH, Stalman WAB. Comorbidity of somatic chronic diseases and decline in physical functioning: the Longitudinal Aging Study Amsterdam. *J Clin Epidemiol* 2004;57:55–65.
- 39 Bayliss EA, Bayliss MS, Ware JE Jr, et al. Predicting declines in physical function in persons with multiple chronic medical conditions: what we can learn from the medical problems list. *Health Qual Life Outcomes* 2004;2:47.
- 40 Iverson L, Lewis KL, Caputi P, et al. The cumulative impact and associated costs of multiple health conditions on employee productivity. *J Occup Environ Med* 2010;52:1206–11.
- 41 Centrelink. *Disability Support Pension*. Canberra: Australian Government, 2011.
- 42 Department for Work and Pensions. *Employment and Support Allowance*. London: Department for Work and Pensions, 2011.
- 43 Social Security Online. *Supplemental Security Income Home Page*. Washington: USA.gov, 2011.
- 44 Australian Council of Social Service. *ACOSS 7 Point Plan for Maximum Employment*. Sydney: ACOSS, 2000.
- 45 Cagetti M. Wealth accumulation over the life cycle and precautionary savings. *J Bus Econ Stat* 2003;21:339–53.
- 46 Caner A, Wolff EN. Asset poverty in the United States 1984–99: evidence from the panel study of income dynamics. *Rev Income Wealth* 2004;50:493–518.
- 47 Dvornak N, Kohler M. Housing wealth, stockmarket wealth and consumption: a panel analysis for Australia. *Econ Rec* 2007;83:117–30.
- 48 Cai L. The relationship between health and labour force participation: evidence from a panel data simultaneous equation model. *Lab Econ* 2010;17:77–90.
- 49 Cai L, Kalb G. Health status and labour force participation: evidence from Australia. *Health Econ* 2006;15:241–61.
- 50 Mathers C, Schofield D. The health consequences of unemployment: the evidence. *Med J Aust* 1998;168:178–82.
- 51 Fischer JAV, Sousa-Poza A. Does job satisfaction improve the health of workers? New evidence using panel data and objective measures of health. *Health Econ* 2009;18:71–89.
- 52 Apouey B, Clark AE. *Winning Big but Feeling no Better? The Effect of Lottery Prizes on Physical and Mental Health*. Paris: Paris School of Economics (Ecole normale supérieure), 2009.
- 53 Frijters P, Ulker A. Robustness in health research: do differences in health measures, techniques, and time frame matter? *J Health Econ* 2008;27:1626–44.
- 54 Halliday TJ. Income volatility and health. IZA discussion paper no. 3234. Bonn: Institute of the Study of Labor, 2007.
- 55 Contoyannis P, Jones AM, Rice N. The dynamics of health in the British Household Panel Survey. *J Appl Econom* 2004;19:473–503.
- 56 Frijters P, Haisken-DeNew JP, Shields MA. The causal effect of income on health: evidence from German reunification. *J Health Econ* 2005;24:997–1017.
- 57 Halliday TJ. *Earnings Growth and Movements in Self-Reported Health*. Bonn: Institute for the Study of Labor, 2012.
- 58 Jones AM, Wildman J. Health, income and relative deprivation: evidence from the BHPS. *Journal of Health Economics* 2008;27:308–24.
- 59 Gunasekara FI, Carter KN, Liu I, et al. The relationship between income and health using longitudinal data from New Zealand. *J Epidemiol Community Health* 2012;66:1–8.
- 60 Buddelmeyer H, Cai L. *Interrelated Dynamics of Health and Poverty in Australia*. Bonn: Germany: Institute for the Study of Labour, 2009.
- 61 Lorgelly PK, Lindley J. What is the relationship between income inequality and health? Evidence from the BHPS. *Health Econ* 2008;17:249–65.
- 62 McDonough P, Berglund P. Histories of poverty and self-rated health trajectories. *J Health Social Behav* 2003;44:198–214.