
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.

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,1 and consequently, they have lower incomes and fewer wealth assets than those with good health.2–11 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),12–14 people who have stated they consider themselves to have poor health generally15 or aggregating people who have stated they have any chronic health condition or disability.16,17 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.18,19 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.20–22 However, while multiple health conditions have been highlighted as an important research topic within the health domain,23 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. 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 babooning health budgets are common issues facing governments internationally.\textsuperscript{1,8,25–27}

**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\textsuperscript{28–31}; 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,\textsuperscript{32} and STINMOD, a microsimulation model of income tax and government support payments,\textsuperscript{33,34} 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.\textsuperscript{6}

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 ($\chi^2 = 5.4$, $P = 0.0645$).

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 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.

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

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

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

<table>
<thead>
<tr>
<th>Number of conditions</th>
<th>Proportion with any wealth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Actuala</td>
<td>99</td>
</tr>
<tr>
<td>Counterfactualb</td>
<td>100</td>
</tr>
<tr>
<td>2 Actuala</td>
<td>98</td>
</tr>
<tr>
<td>Counterfactualb</td>
<td>100</td>
</tr>
<tr>
<td>3 Actuala</td>
<td>95</td>
</tr>
<tr>
<td>Counterfactualb</td>
<td>100</td>
</tr>
<tr>
<td>4+ Actuala</td>
<td>94</td>
</tr>
<tr>
<td>Counterfactualb</td>
<td>100</td>
</tr>
</tbody>
</table>

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 accumulated wealth assets aged 45 to 64 years, 2009

<table>
<thead>
<tr>
<th>Number of conditions</th>
<th>Total wealth</th>
<th>Income-producing assets</th>
<th>Non-income-producing assets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Median</td>
</tr>
<tr>
<td>1 Actuala</td>
<td>376 900</td>
<td>426 500</td>
<td>253 700</td>
</tr>
<tr>
<td>Counterfactualb</td>
<td>386 000</td>
<td>143 300</td>
<td>227 300</td>
</tr>
<tr>
<td>2 Actuala</td>
<td>390 900</td>
<td>140 900</td>
<td>227 300</td>
</tr>
<tr>
<td>Counterfactualb</td>
<td>392 900</td>
<td>410 400</td>
<td>170 800</td>
</tr>
<tr>
<td>3 Actuala</td>
<td>378 100</td>
<td>125 000</td>
<td>238 600</td>
</tr>
<tr>
<td>Counterfactualb</td>
<td>376 800</td>
<td>123 000</td>
<td>224 200</td>
</tr>
</tbody>
</table>

a: Actual values in Health&WealthMOD.
b: Counterfactual values if people who had varying numbers of conditions had no chronic condition.

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.28–30,36 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,22,37 poorer physical functioning38,39 and the loss of productivity,40 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.41–43 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.44 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.\textsuperscript{15–27} 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,\textsuperscript{3,4,8,49} and the high occurrence of early retirement due to ill health,\textsuperscript{5} 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.\textsuperscript{30} 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.\textsuperscript{51–53} and others have found no significant difference for females.\textsuperscript{54–57} 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\%).\textsuperscript{55,56,58–62}

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.

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**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**