



5 July 2019

Mental Health Inquiry
Productivity Commission
GPO Box 1428
CANBERRA ACT 2601
www.pc.gov.au/mental-health

Submission to the Productivity Commissions' Mental Health Inquiry

Thank you for the opportunity to make a submission.

Our team has published several papers on the social and economic impacts of mental health in the labour workforce. Our economic modelling was able to identify a range of costs due to this condition and its co-morbidities. We have undertaken detailed analysis demonstrating the high costs of lost income and savings, and high poverty rates for patients; lost income taxation revenue and increased support payments for government along with the effects of interventions to prevent depression.

For your reference, we have listed relevant papers on the following page and have attached them to this letter. If you would like to discuss any of these findings then you are welcome to contact me.

Yours sincerely

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1. **Deborah Schofield**, Rupendra Shrestha, Michelle Cunich, Robert Tanton, Lennert Veerman, Simon Kelly, Megan Passey (2019) The Indirect Costs of Depression and Other Mental and Behavioural Disorders for Australia from 2015 to 2030. *BJPsych Open*, 5 (3).
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7. **Schofield D**, Shrestha, R, Percival R, Passey M Callander E, Kelly S (2011) The personal and national costs of mental health problems: impacts on income, taxes and government support payments due to lost labour force participation. *BMC Psychiatry* 11:72.

Indirect costs of depression and other mental and behavioural disorders for Australia from 2015 to 2030

Deborah Schofield, Michelle Cunich, Rupendra Shrestha, Robert Tanton, Lennert Veerman, Simon Kelly and Megan Passey

Background

The impact of mental disorders has been assessed in relation to longevity and quality of life; however, mental disorders also have an impact on productive life-years (PLYs).

Aims

To quantify the long-term costs of Australians aged 45–64 having lost PLYs because of mental disorders.

Method

The Survey of Disability, Ageing and Carers 2003, 2009 formed the base population of Health&WealthMOD2030 – a microsimulation model integrating output from the Static Incomes Model, the Australian Population and Policy Simulation Model, the Treasury and the Australian Burden of Disease Study.

Results

For depression, individuals incurred a loss of AU\$1062 million in income in 2015, projected to increase to AU\$1539 million in 2030 (45% increase). The government is projected to incur costs comprising a 22% increase in social security payments and a 45% increase in lost taxes as a result of depression through its impact on PLYs.

Conclusions

Effectiveness of mental health programmes should be judged not only in terms of healthcare use but also quality of life and economic well-being.

Declaration of interest

None.

Keywords

Mental and behavioural disorders; productive life-years (PLYs); microsimulation model.

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Background

Mental and substance-use disorders accounted for 183.9 million disability-adjusted life-years (DALYs) or 7% of DALYs worldwide in 2010.¹ Of this burden, depressive disorders accounted for the largest proportion (41%), followed by anxiety disorders (15%), illicit drug use (10.9%) and alcohol use disorders (10%).¹ The global burden of mental and substance-use disorders (measured as DALYs) increased by 38% between 1990 and 2010 as a result of population growth and ageing.¹

Although burden of disease studies quantify the years and quality of life lost because of mental illness, many governments and supranational organisations (such as the Organisation for Economic Co-operation and Development (OECD)) also require, for policy development, estimates of the significant indirect costs of mental illness through non-participation in the labour market.² The costs of mental illness through lost labour force participation and lost productivity are commonly measured as lost personal earnings. Levinson *et al*, using the World Health Organization's (WHO's) World Mental Health Surveys in ten high-income and nine low- and middle-income countries, found that respondents who have a serious mental illness earned, on average, a third less than the median earnings of the whole population in each country, and there were no significant between-country differences.³ These losses equated to 0.3–0.8% of national earnings. It was also found that reduced earnings among those with any earnings and the higher likelihood of not earning were both significant mechanisms for these associations. These may also result in further costs to individuals (such as falling into income poverty) and to the

government (such as extra social security payments and lost tax revenue) in addition to direct (healthcare) costs.²

The direct costs are substantial as a result of the high prevalence of mental illness.⁴ In the USA in 2013, mental disorders surpassed all other conditions in terms of cost, with spending at \$201 billion.⁵ Government spending on mental health services in Australia have increased from AU\$5.3 billion in 2004–2005 to AU\$8.5 billion in 2014–15.⁴ People with mental illness are also at higher risk of social and economic disadvantage.^{2,6}

Mental health impact on the labour force

Although mental illness is more prevalent in younger age groups, older workers with a mental illness may be more likely to leave the workforce as a result of the combined effects of ageing and the disabling effects of the illness. Of the 347 000 Australians aged 45–64 years out of the labour force because of ill health in 2010, 7.1% were out of the labour force as a result of depression (24 000 individuals) and another 9.6% as a result of other mental and behavioural disorders (32 000 individuals).⁶ Consequently, depression and other mental and behavioural disorders are ranked as the top fifth and third most common chronic health condition causing older workers to leave the labour force, respectively.⁶ International studies that examine the indirect costs of mental illness in adults normally focus on lost earnings for individuals⁷ and thus exclude other important costs such as reduced income from other sources (such as superannuation and financial assets) and retirement savings for individuals.

Study aims

In Australia, there are two notable studies that address both the direct (medical) and indirect costs of high prevalence mental disorders (depression, anxiety-related and substance use)⁸ and the low prevalent condition of psychosis⁹ using cross-sectional survey data. Lee *et al* estimated the total annual productivity losses of depression, anxiety-related and substance use to be AU\$11.8 billion, together with annual income tax losses of AU\$1.2 billion and welfare payments of AU\$12.9 billion in 2007.⁸ And for psychosis, Neil *et al* estimated the productivity costs to be AU\$40 941 and other indirect costs (for example non-government organisation assistance, supported employment and accommodation) to be AU\$14 642 per affected individual.⁹ However, there has been little research undertaken on quantifying the longer-term indirect costs of mental illness in Australia and internationally. This study projects the income received by people aged 45–64 who have lost productive life-years (PLYs) as a result of depression and other mental and behavioural disorders (defined as the number of people who are not in the labour force because of mental illness per year⁶), the amount of tax paid and social security payments received from 2015 to 2030. This study quantifies the difference in these costs between those who have lost PLYs as a result of depression and other mental and behavioural disorders and those in the labour force without these disorders in order to provide a more comprehensive picture of the indirect costs of mental illness than is currently available. Furthermore, these comparisons enable computation of potential savings if the illness could be prevented or treated in a way that enabled labour force participation.

Method

The model

Outputs from Health&WealthMOD2030 – Australia’s first microsimulation model of the long-term economic impact of chronic disease in people aged 45–64 – were used to quantify the impact of depression and other mental and behavioural disorders on PLYs, income, government revenue, social security payments and gross domestic product (GDP) in Australia. Information about the development of Health&WealthMOD2030 is provided in Schofield *et al*.¹⁰

The base population of Health&WealthMOD2030 was micro-level data from the Australian Bureau of Statistics’ (ABS) Survey of Disability, Ageing and Carers (SDAC) in 2003 and 2009.¹¹ Individual records were extracted for people aged 45–64 and, for each person, relevant demographic, socioeconomic and health information.

Although the SDACs 2003 and 2009 provide comprehensive data on the health and health services used by people with chronic conditions, they have only limited economic information. From another microsimulation model, Static Incomes Model (STINMOD),¹² additional economic information was imputed onto the base data. STINMOD is Australia’s leading model of income tax and government support payments developed by the National Centre for Social and Economic Modelling at the University of Canberra. Income, tax, social security payments and wealth data were imputed onto the base population by ascertaining individuals with similar characteristics on STINMOD and ‘donating’ their economic information onto Health&WealthMOD2030 using synthetic matching. The ten variables used to perform the matching were: age group, gender, type of income unit, receipt of the Aged Pension, receipt of the Disability Support Pension (DSP), the individual’s income quintile, labour force status, hours

worked per week, highest educational qualification and home ownership.

Output from STINMOD was for the Australian population in 2013 and thus we indexed these data to reflect economic growth from 2013 to the projection years (2015–30). Total income and taxes paid were assumed to grow at a rate of 1% per year in real terms (i.e. 1% above the Consumer Price Index) based on information in Treasury.¹³ The DSP that people with mental illness may receive was benchmarked to growth in average weekly earnings. Other social security payments (including unemployment benefits or Newstart) were assumed to grow in line with the Consumer Price Index (i.e. zero real growth).

Treasury projections of population and labour force growth were used to take account of trends in these variables over the period 2015–2030. We extracted the population projections and projected full- and part-time employment rates for men and women aged 45–64 by 5-year age groups over 2015–30. Since Treasury’s population projections were separable only by age group and gender, we applied the projected age and gender specific distributions for the remaining sociodemographic variables (education, home ownership and family structure) from a second microsimulation model, Australian Population and Policy Simulation Model,¹⁴ to project more complete profiles of the population in 2015, 2020, 2025 and 2030.

Trends in the incidence of chronic health conditions reported in Begg *et al*¹⁵ were applied to the base population. The chronic conditions trends from that study were applied from 2003 to 2023 to the base population; after this time, prevalence rates were assumed to stabilise as in Begg *et al*.¹⁵ The use of these data was approved by the ABS Microdata Review Panel.

Lost PLYs as a result of depression and other mental health disorders

SDAC respondents with chronic health conditions were classified by the ABS using ICD-10 codes.¹⁶ Individuals who reported their main long-term health condition as depression/mood affective disorders (excluding postpartum depression) (ICD code F30–39) were considered to have the specific condition of ‘depression’ in this study. Those who reported their main long-term health condition as any of the other mental and behavioural disorders i.e. dementia, schizophrenia, phobic and anxiety disorders, nervous tension/stress, intellectual and developmental disorders, intellectual disability, autism and related disorders (including Rett’s syndrome and Asperger’s syndrome), attention-deficit hyperactivity disorder, speech impediment, Alzheimer’s disease, or other mental and behavioural disorders (not fully defined) (ICD codes F00–29 and F40–99) were considered to have ‘other mental and behavioural disorders’.

In this study, those who reported they were out of the labour force because of illness and listed depression as their main long-term health condition were considered to have lost PLYs as a result of depression. Those who reported they were out of the labour force because of illness and listed another mental or behavioural disorder as their main long-term health condition were considered to have lost PLYs as a result of mental and behavioural disorders.

Indirect costs

The costs of mental illness projected over 2015–2030 were: lost income, extra social security payments and lost taxes. Personal income consisted of labour market earnings, income from other sources with a financial return and social security payments. The social security payments in STINMOD relevant for people aged 45–64 were the Aged Pension, DSP, Newstart Allowance, Carer

Payment, and Family Tax Benefit (<http://www.humanservices.gov.au/customer/services>). The taxes paid by individuals were their personal income tax (includes Medicare levy) for the financial year. All costs were expressed in real terms in 2013 Australian dollars.

Statistical analysis

Descriptive analysis consisted of reporting the mean (s.d.) and median weekly income, social security payments and taxes paid, for individuals employed full time with no mental health condition, employed part time with no mental health condition, not in the labour force because of depression and not in the labour force because of other mental and behavioural disorders.

Differences in the costs incurred by those not in the labour force (or with lost PLY) because of depression and other mental and behavioural disorders (separately) compared with those in full- or part-time employment without these disorders were estimated using counterfactual simulation with Monte Carlo methods. For each record of those not in the labour force because of depression or other mental and behavioural disorders, a counterfactual record was selected at random with replacement from the pool of those in full-time employment without these disorders; records were matched for age group, gender and highest level of education. The mean of the difference in the costs between the records of those not in the labour force because of depression or other mental and behavioural disorders and their counterfactuals was then estimated. A total of 1000 simulations were run, generating 1000 counterfactual data-sets for records of those not in the labour force because of depression or other mental and behavioural disorders. The average of the 1000 simulations and the 95% confidence interval, estimated using the percentile method, were reported in this study.

The simulation method was repeated with the selection of counterfactual records from the pool of those in part-time employment without depression or other mental and behavioural disorders to estimate the differences in the indirect costs of those not in the labour force because of depression or other mental and behavioural disorders and those in part-time employment who do not have these disorders.

To estimate the national costs of lost labour force participation because of depression or other mental and behavioural disorders, the counterfactuals were drawn from the pool of people in the labour force (i.e. employed full time or employed part time or unemployed) without these disorders. Lost GDP per year as a result of missing workers with depression and other mental and behavioural disorders was calculated using the projected number of people out of the labour force because of these disorders from Health&WealthMOD2030 and the projected working-age population and GDP from Treasury. All analyses were undertaken using SAS V9.4 (SAS Institute Inc., Cary, NC, USA). All statistical tests were two-sided with a 5% level of significance.

Results

Among the 5 945 000 people surveyed in the SDACs 2003 and 2009 who were aged 45–64 years, 27 100 (1%) were not in the labour force because of depression and a further 29 900 (1%) were not in the labour force because of other mental and behavioural disorders (supplementary Table 1; available at <https://doi.org/10.1192/bjo.2019.26>). Those who were out of the labour force because of either depression or other mental and behavioural disorders had a median weekly income of AU\$421.27 in 2015. This amount of income was only 30% of the median weekly income of those employed full time without depression or other mental and behavioural disorders (AU\$1306) (supplementary Table 1). Of their total

weekly income, those not in the labour force because of either depression or other mental and behavioural disorders received median social security payments of AU\$421.27 in 2015.

By 2030, the Australian population aged 45–64 years old was estimated to reach 7 130 200. Of this population, there were 31 200 (1%) individuals not in the labour force because of depression and 39 400 (1%) not in the labour force because of other mental and behavioural disorders. Those with lost PLYs because of either depression or other mental and behavioural disorders were estimated to receive AU\$484.73 in median weekly income in 2030 (supplementary Table 1, final column). Those not in the labour force because of depression were estimated to receive median social security payments of AU\$484.73 and those not in the labour force because of other mental and behavioural disorders were estimated to receive slightly less at AU\$423.38. Being not in employment and typically with little or no other source of income, those out of the labour force because of mental illness paid a median of AU\$0 in taxes per week.

The mean differences in weekly income, social security payments and taxes between those with lost PLYs because of either depression or other mental and behavioural disorders and employed full time without these disorders (adjusted for age, gender and education) were estimated from 2015 to 2030 (Table 1). People out of the labour force because of depression received an income that was AU\$963.71 (95% CI 876.69–1094.37) less per week than the income of those employed full time without mental disorders in 2015. Those out of the labour force because of other mental and behavioural disorders received an income that was AU\$924.81 (95% CI 850.61–1052.28) under the weekly income of those employed full time without mental disorders in 2015.

The difference in weekly incomes between people not in the labour force because of mental illness compared with those employed full time without mental illness increased to AU\$1215.28 (95% CI 1115.51–1372.27) for those with depression, and AU\$1171.69 (95% CI 1083.47–1309.85) for those with other mental illnesses in 2030. People with lost labour force participation because of depression were estimated to pay AU\$336.89 (95% CI 330.47–342.50) less in taxes per week than those employed full time without mental illness in 2015, with the difference increasing to AU\$359.13 per week (95% CI 353.83–364.26) in 2030. Similarly, those out of the labour force because of other mental and behavioural disorders paid significantly less in taxes compared with people employed full time without these disorders.

The national impact of depression when it leads to exits from the labour force was projected to be AU\$1062 million (95% CI 953–1244 million) in lost income in 2015, increasing to AU\$1539 million (95% CI 1387–1786 million) in 2030 (i.e. 45% increase) (Table 2). Additional social security payments because of lost PLYs because of depression was estimated to increase from AU\$437 million (95% CI 424–448 million) in 2015 to AU\$532 million (95% CI 519–545 million) in 2030 – a 22% increase. Lost government tax revenue was projected to increase from AU\$305 million (95% CI 270–345 million) in 2015 to 441 million (95% CI 393–504 million) in 2030 – a 45% in real terms (Table 2). Lost national income and tax revenue, and additional social security payments because of people with other mental and behavioural disorders exiting the labour force were of comparable magnitude with those for depression alone (Table 3).

As a result of the 27 100 workers missing from the labour force because of depression in 2015, there was an estimated loss of AU\$3.2 billion in GDP. The number of missing workers because of depression was estimated to increase to 31 200 in 2030, with the loss in GDP projected to be AU\$4.3 billion (Table 3). And as a result of the 29 900 workers missing from the labour force

Table 1 Mean differences in weekly income, social security payments and income taxes between people with lost productive life-years because of depression and other mental and behavioural disorders and those employed full time or part time without depression or other mental and behavioural disorders (adjusted for age, gender and education), Australian population aged 45–64 years (in 2013 real AU\$) [Typesetter: Please set landscape and on one pdf page if possible.]

Labour force status	2015		2020		2025		2030	
	\$ difference	95% CI	\$ difference	95% CI	\$ difference	95% CI	\$ difference	95% CI
Weekly total income (AU\$) received by individuals								
Not in labour force because of depression versus employed full time without depression or other MBDs	-963.71	(-1094.37 to -876.69)	-1045.11	(-1173.54 to -959.10)	-1141.37	(-1280.07 to -1056.98)	-1215.28	(-1372.27 to -1115.51)
Not in labour force because of depression versus employed part time without depression or other MBDs	-363.63	(-445.42 to -296.03)	-408.69	(-490.35 to -335.32)	-440.86	(-518.07 to -365.68)	-460.15	(-542.76 to -391.89)
Not in labour force because of other mental and behavioural disorders versus employed full time without depression or other MBDs	-924.81	(-1052.28 to -850.61)	-1000.08	(-1119.85 to -922.09)	-1091.67	(-1212.25 to -1009.06)	-1171.69	(-1309.85 to -1083.47)
Not in labour force because of other mental and behavioural disorders versus employed part time without depression or other MBDs	-332.68	(-400.29 to -277.32)	-360.52	(-432.20 to -297.25)	-380.65	(-450.51 to -321.19)	-402.96	(-469.18 to -342.79)
Weekly social security payments (AU\$) received by individuals								
Not in labour force because of depression versus employed full time without depression or other MBDs	336.89	(330.47 to 342.50)	344.59	(338.88 to 349.70)	349.30	(343.65 to 354.19)	359.13	(353.83 to 364.26)
Not in labour force because of depression versus employed part time without depression or other MBDs	283.93	(272.58 to 295.47)	291.94	(281.06 to 303.33)	297.52	(286.39 to 308.48)	309.41	(297.60 to 320.18)
Not in labour force because of other mental and behavioural disorders versus employed full time without depression or other MBDs	308.89	(302.82 to 314.52)	317.15	(310.99 to 322.61)	326.29	(330.63 to 321.33)	341.48	(336.83 to 345.75)
Not in labour force because of other mental and behavioural disorders versus employed part time without depression or other MBDs	258.08	(246.16 to 268.90)	266.06	(255.68 to 277.09)	275.45	(264.24 to 285.37)	291.50	(282.26 to 300.75)
Weekly taxes paid (includes Medicare levy) (AU\$) by individuals								
Not in labour force because of depression versus employed full time without depression or other MBDs	-274.12	(-305.14 to -246.51)	-300.82	(-332.18 to -273.02)	-327.71	(-362.59 to -298.27)	-348.83	(-387.98 to -316.22)
Not in labour force because of depression versus employed part time without depression or other MBDs	-101.77	(-124.85 to -81.54)	-115.92	(-139.66 to -93.77)	-120.85	(-143.12 to -99.41)	-119.98	(-141.40 to -100.92)
Not in labour force because of other mental and behavioural disorders versus employed full time without depression or other MBDs	-256.11	(-287.92 to -232.24)	-278.79	(-308.19 to -252.67)	-305.23	(-336.44 to -277.32)	-331.02	(-366.33 to -303.16)
Not in labour force because of other mental and behavioural disorders versus employed part time without depression or other MBDs	-87.76	(-107.10 to 70.12)	-95.34	(-117.71 to -76.91)	-98.45	(-117.91 to -80.87)	104.28	(86.54 to 123.02)

MBDs, mental and behavioural disorders.

Table 2 National costs of lost productive life-years because of depression and other mental and behavioural disorders per year, Australian population aged 45–64 years (in real terms, 2013 AU\$ millions)

Cost	2015		2020		2025		2030	
	Impact	95% CI	Impact	95% CI	Impact	95% CI	Impact	95% CI
Depression								
Lost income	1062	(953 to 1244)	1243	(1114 to 1424)	1391	(1254 to 1579)	1539	(1387 to 1786)
Extra social security payments	437	(424 to 448)	479	(467 to 491)	499	(487 to 511)	532	(519 to 545)
Lost income tax revenue	305	(270 to 345)	361	(321 to 406)	402	(358 to 454)	441	(393 to 504)
Other mental and behavioural disorders								
Lost income	1109	(997 to 1282)	1273	(1149 to 1470)	1518	(1377 to 1750)	1876	(1698 to 2126)
Extra social security payments	432	(418 to 445)	472	(460 to 472)	528	(515 to 542)	630	(617 to 630)
Lost income tax revenue	308	(276 to 351)	357	(357 to 405)	426	(382 to 481)	532	(473 to 594)

because of other mental and behavioural disorders, there was an estimated loss of AU\$3.5 billion in GDP in 2015. The number of missing workers because of other mental and behavioural disorders increased to 39 400 in 2030 and the associated loss in GDP was projected to be AU\$5.5 billion.

Discussion

Main findings

This study projected the national costs of depression and other mental and behavioural disorders through lost PLYs among people aged 45–64 years to increase over the next 15 years. For depression, these costs consisted of a 45% increase in lost income (which grew faster than the 22% growth in social security payments as a result of the indexation of these payments being less than expected wages growth), a 45% increase in lost income tax revenue, and a 34% increase in lost GDP from 2015 to 2030.

These indirect costs are in addition to the direct costs of mental illness. The direct (healthcare) cost of mental illness was estimated to be AU\$8.5 billion for all age groups in 2014–15, which covered mental health spending in hospitals, out-of-hospital, pharmaceuticals and community services.⁴ However, it should be noted that only 62% of people with mental illness actually seek help from healthcare professionals/medical facilities in Australia¹⁷ and thus the direct costs would be greater if there were sufficient services available to meet that higher demand. Significant other spending also occurs for housing and accommodation, employment and disability services for those with mental illness.^{8,9}

Limitations

This study does have some limitations. First, the findings are derived from respondents' self-reported labour market behaviour and whether they have mental illness or not. Despite self-reported employment status and health in general being considered as valid measures for these types of studies,¹⁸ there is the potential for bias in results. Second, the findings on the indirect costs of mental illness presented in this paper are for a single country (Australia). However, we also make the point that these findings demonstrate how microsimulation modelling can be used to obtain estimates of the number of people in a population effected by mental illness and their (and the government's) costs and that

concerns about the direct and indirect costs of mental illness are relevant to OECD countries.²

Comparison with findings from other studies

Other studies have estimated the costs of lost labour force participation as a result of mental illness as the number of lost work days, lost earnings or the amount of disability support payments.^{7–9,19} However, these studies are limited in scope compared with the current study; for example, they did not include all (and count specific) social security payments and lost GDP. They have a number of other limitations, including only using average earnings to estimate the cost to individuals or average of total support payments to estimate the cost to government. Such average measures may not be representative of the actual economic circumstances of the population with mental illness. Our study used individual-level income, taxes paid and social security payments to estimate the costs to individuals from exiting the labour market as a result of either depression or other mental and behavioural disorders. The study by Lee *et al.*⁸ reports similar estimates of the costs of lost productivity and lost taxes for mental illness when considering the entire group (i.e. those with depression and other behavioural disorders). However, there is a notable difference in the estimates of the cost of welfare payments between these studies, which is likely to stem from the lack of detailed information about the type of pensions and allowances received by individuals that comprises the income of this group (and hence the use of an average value of welfare benefits) in Lee *et al.*⁸ Finally, the previous studies (with the exception of McCrone *et al.*⁷) did not use a study design (such as microsimulation) enabling estimation of the long-term costs of mental illness.

Implications

Despite the significant increase in government spending on mental health services over the past 25 years,^{4,8,9} the costs are continuing to surge. This circumstance adds credence to the government expanding its investment in prevention as well as maintaining support strategies for mental illness. The government is likely to further benefit from these strategies through the reduction in adverse health, family, and work consequences (such as preventing the loss of income tax and payroll tax); reduced social security payments; and reduced spending on other services (such as healthcare, education, housing and the justice system).

Table 3 Lost gross domestic product (GDP) as a result of Australians aged 45–64 years exiting the labour force because of depression and other mental and behavioural disorders, 2015–2030 (\$AU billions, 2013 real dollars)

Mental illness	2015		2020		2025		2030	
	Lost GDP, \$AU billions	% of total GDP	Lost GDP, \$AU billions	% of total GDP	Lost GDP, \$AU billions	% of total GDP	Lost GDP, \$AU billions	% of total GDP
Depression	3.17	0.21	3.55	0.21	3.88	0.20	4.33	0.20
Other mental and behavioural disorders	3.50	0.24	3.90	0.23	4.50	0.24	5.47	0.25

Despite strong economic growth and a low national unemployment rate, Australia has some of the lowest employment rates for people with mental illness among the OECD. For example, the employment gap between people who have mental health problems and those who do not in Australia is about 20 percentage points – a gap wider than in any of the other eight OECD countries involved in the OECD's ninth and last review of what these countries are doing to tackle the broader health, education, social and labour market policy challenges in relation to mental illness among the working-age population.²⁰ Australians affected by mental illness are also three times more likely to be unemployed than those who have no mental health problems and are overrepresented in all benefit schemes. Even when they do have jobs, people with mental illness often struggle with more and longer periods of sickness absence and underperformance at work.²⁰ Thus Australia's labour market and related structures may not be adequately supporting the employment of people with mental illness.

For these reasons, the Australian Federal Government has put forward a multifaceted strategy with the main goals being: the prevention and early detection of mental illness; greater assistance for individuals to better understand and manage their mental illness; the elimination of discrimination, and assistance for employers and work colleagues in becoming more aware of the value of workers with mental illness; the government helping where necessary with the costs of modifying workplaces and enhancing access to education and training; and helping individuals with mental illness to remain connected with society.²¹ Since the strategy involves the government working with a range of stakeholders and institutions, a cross-portfolio approach is necessary in order to achieve improvements in mental health outcomes and generate the kind of opportunities needed for people to experience 'a contributing life' that includes employment, housing and social connectedness.²¹ A similar approach has been adopted in other OECD countries; for example, the UK has been operating a 'cross-government' mental health outcomes plan called 'No health without mental health' since 2011.²²

Interventions

A recent systematic meta-review assessing the effectiveness of workplace interventions for the prevention, treatment or rehabilitation of workers diagnosed with depression, anxiety or both mental illnesses²³ found that the quality of evidence was moderate for two primary prevention interventions: enhancing the worker's control, and encouraging physical activity. Higher-quality evidence was found for cognitive-behavioural therapy (CBT)-based stress management; however, poorer-quality evidence was found for other secondary prevention interventions (such as counselling). Tertiary interventions with a particular focus on improving labour force participation or the nature of the individual's employment status (such as exposure therapy and CBT-based and problem-focused return to work interventions) generated high-quality evidence for improving the symptoms of depression, anxiety or both illnesses and moderate evidence for improving occupational outcomes. In short, this review demonstrated that there is reliable empirical evidence for the effectiveness of interventions implemented in the workplace that could be used more widely to help in the prevention of depression, anxiety or both illnesses, as well as assisting with the recovery of workers diagnosed with these illnesses.

The costs of mental illness to individuals are not only sizeable but potentially perpetuating. The lower labour force participation rate for people with mental illness means that they are also more susceptible to falling into poverty not only in their prime working-age years but also in retirement as a result of lack of accumulated savings. Consequently, mental illness can generate a

lifetime of social and economic marginalisation.²² Thus assisting people with mental illness to participate in the labour force through effective workplace interventions (such as those detailed in Joyce *et al*²³), along with the government taking a cross-portfolio approach to assist people with mental illness across various aspects of their lives (such as housing, education and work), will not only help them to achieve greater economic well-being, but also enable them to experience greater social connectedness with additional positive mental health outcomes.

Scaling-up government initiatives to tackle mental illness

It is important to note that the significant costs of depression and other mental and behavioural disorders are incurred in low-, medium- and high-income countries. A recent study has quantified not only the direct (medical treatment) costs and health outcomes but also some of the indirect costs attributable to depression and anxiety disorders in 36 low-, middle- and high-income countries from 2016 to 2030.²⁴ The estimated costs of scaling-up effective medical treatment coverage for depression and anxiety disorders (mainly counselling and antidepressant medication) totalled US \$147 billion. However, the benefits of this investment were shown to significantly outweigh these treatment costs. For instance, a 5% improvement in labour force participation and productivity was estimated to be worth US\$399 billion, and improvements in health (measured as healthy life-years) contributed a further US \$310 billion in benefits.²⁴ However, these type of large-scale benefits will only be possible if the level of national investment in mental health services is increased to match the level of national need. The WHO's Mental Health Atlas Survey for 2014 suggests that governments are currently spending, on average, 3% of their total health budgets on mental health, with allocations ranging from less than 1% in low-income countries to 5% in high-income countries.²⁵ In order to reduce the significant societal costs of depression and other mental and behavioural disorders projected for low, medium- and high-income countries if current investment levels remain, both the WHO and the World Bank have commenced initiatives to assist countries with scaling-up their investments – placing investment in effective treatment for mental disorders at the centre of the global development agenda.²⁶

From a global perspective, it would also be informative to know if similar results occurred in other OECD nations or developing nations. With growth in the development and use of microsimulation models across the world, these issues may be the focus of future research that may support and generalise the results of the current study even further.

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Depression prevention, labour force participation and income of older working aged Australians: A microsimulation economic analysis

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Abstract

Objective: Depression has economic consequences not only for the health system, but also for individuals and society. This study aims to quantify the potential economic impact of five-yearly screening for sub-syndromal depression in general practice among Australians aged 45–64 years, followed by a group-based psychological intervention to prevent progression to depression.

Method: We used an epidemiological simulation model to estimate reductions in prevalence of depression, and a microsimulation model, Health&WealthMOD2030, to estimate the impact on labour force participation, personal income, savings, taxation revenue and welfare expenditure.

Results: Group therapy is estimated to prevent around 5,200 prevalent cases of depression (2.2%) and add about 520 people to the labour force. Private incomes are projected to increase by \$19 million per year, tax revenues by \$2.4 million, and transfer payments are reduced by \$2.6 million.

Conclusion: Group-based psychological intervention to prevent depression could result in considerable economic benefits in addition to its clinical effects.

Keywords

Depressive disorders, economics, income, labour force participation, welfare, cost-effectiveness

Background

Major depression is a common mental disorder. Taken together with anxiety, it is the largest single cause of disability among both men and women in Australia, and is responsible for 10% and 18% of years lived with disability in men and women, respectively (Begg et al., 2007). Anxiety and depression were second only to ischemic heart disease in terms of the number of disability-adjusted life years (DALYs) lost in the 2003 Australian Burden of Disease and Injury study (Begg et al., 2008). Results from the 2010 Global Burden of Disease study suggest that around 70% of this joint burden of anxiety and depression is attributable to depressive disorders (Whiteford et al., 2013). Other countries have similarly high burdens, with the 2010 Global Burden of Disease study reporting that unipolar depression

is the 11th leading cause of disease burden worldwide, up from 15th in 1990 (Murray et al., 2012).

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Depression also comes with economic costs. The allocated health care expenditure for depression and anxiety in Australia is substantial, with the most recent estimates totalling \$1.4 billion per annum (Australian Institute of Health and Welfare, 2010). Depression reduces productivity and workforce participation (Lerner and Henke, 2008; Beck et al., 2011; Schofield et al., 2008). This may have significant economic consequences for the individuals concerned (Schofield et al., 2011a). People with depression who leave the workforce early have substantially lower incomes and savings compared to their full time employed counterparts (Schofield et al., 2011b; Schofield et al., 2011c).

There is increasing evidence that part of this burden of depression can be prevented, and that at least some interventions are cost-effective (Mihalopoulos et al., 2011a). Recently, Mihalopoulos et al. investigated the health impacts and health costs of interventions to prevent depression and found that a comprehensive group-based psychological intervention following opportunistic screening for sub-syndromal depression in general practice offered good value for money from a health sector perspective, compared to no intervention (Mihalopoulos et al., 2011b).

Preventing depression is likely to result in wider economic benefits. This study will build upon the findings of Mihalopoulos et al. and estimate the impact on labour force participation and personal income of depression prevention using screening and treatment with a group-based psychological intervention in Australians aged 45-64. Recent evidence suggests that group therapy is no less effective than individual therapy (Cuijpers et al., 2008), and on a per patient basis it is cheaper, and therefore more cost-effective, than individual therapy. This age group is considered particularly important as it has a high rate of early retirement associated with depression (Schofield et al., 2008) and will make up an increasing proportion of the working population as Australia's population ages (Commonwealth of Australia, 2007).

Method

We estimated the extra number of years in the labour force of people aged 45-65 years in 2010 had they not developed depression if a screening and intervention program to prevent the onset of depression were in place. We further estimated the potential increase in the personal incomes of the individuals concerned as a result of staying in the workforce, and the consequences for government revenue.

Depression and labour force participation

The prevalence of depression was estimated from a microsimulation model, Health&WealthMOD2030, which was based on the Australian Bureau of Statistics (ABS) Surveys of Disability, Ageing and Carers (SDAC).

Health&WealthMOD2030 models health, labour force participation, personal incomes and savings, and was specifically designed to measure the economic impacts of ill health leading to early retirement of Australians aged 45-64 years.

The base population of Health&WealthMOD2030 was unit record data for those aged 45-64 years extracted from the two Surveys of Disability, Ageing and Carers (SDACs) conducted by the Australian Bureau of Statistics (ABS) in 2003 and 2009 (Australian Bureau of Statistics, 2005; Australian Institute of Health and Welfare, 2010). These nationally representative (Australian) household survey data consist of information on demographic variables (such as age, sex, family type, and state of residence), socioeconomic variables (such as level of education, income, type of home ownership, and benefits received), labour force variables (such as labour force participation, employment restrictions, and retirement), and health and disability variables (such as chronic conditions, health status, type and extent of disability, support and care required) for each individual in the household. The 2003 and 2009 SDAC data were reweighted to reflect the profile of the 2010 Australian population aged 45-64 years by using a reweighting algorithm *GREGWT* developed and commonly used by the ABS to reweight their survey data (Bell, 2000). The mathematical technique is described in Singh and Mohl (1996) and an implementation of the same algorithm for small area estimation is described in Tanton et al. (2011). The reweighting was done to account for changes in disability and illness, demographics, labour force participation and other features of the population that had occurred between the years for which we have data (2003 and 2009) and 2010.

The SDACs included limited economic data which were presented in ranges. More detailed information on income, government benefit, individual income tax paid and wealth were derived from a separate microsimulation model called the Australian Population and Policy Simulation Model (APPSIM), which is a dynamic population microsimulation model that was developed to provide a snapshot output of the socio-demographic and economic characteristics (such as income and government support payments) of the population in each year (Keegan and Kelly, 2009). It is maintained and developed by the National Centre for Social and Economic Modelling (NATSEM). Detailed economic information such as income and wealth from the APPSIM snapshot output for year 2010 were imputed onto the base population of Health&WealthMOD2030 by identifying persons with similar characteristics on APPSIM and using a process commonly used in microsimulation models called synthetic matching (Rässler, 2002). Ten variables that were common to both datasets and strongly related to income were chosen as matching variables for synthetic matching: labour force status (4 groups), income unit type (4 groups), income quintile (5 groups), receiving/not receiving age

pension (2 groups), receiving/not receiving disability support pension (2 groups), sex (2 groups), age (4 groups), hours worked per week (5 groups), highest educational qualification (2 groups) and home ownership (2 groups).

The 2010 prevalence of self-reported depression and the labour force participation rates of those without depression and of those with depression were estimated for each 5 year age group and gender from Health&WealthMOD2030. Labour force participation was defined as being either employed or looking for work. People who were neither employed nor looking for work were categorised as “out of the labour force”. Differences in the labour force participation rates of those with no depression and with depression, adjusted for highest level of education attained and number of co-morbid conditions (Gunn et al., 2012) were estimated by gender and 5 year age group using a binomial regression model with identity link. The age-sex specific differences in median incomes between those who were in the labour force without depression and those who were not in the labour force and who had depression, adjusted for highest level of education attained, were estimated using quantile regression models. This difference in income was considered as the additional income an individual would have if they did not develop depression because of the intervention and remained in the labour force, assuming the rate of employment distribution between full time and part time was the same as for those without depression. Analyses were repeated for total amount of tax paid and government transfer payment received by the individuals to estimate the impacts on income tax collection and government benefit payments, of interventions to prevent depression.

Reduction in the prevalence of depression due to interventions

An epidemiological Markov model was used to predict the percentage reduction in the prevalence of psychiatrically confirmed depression that would have been achieved if a screening program for sub-syndromal depression and group therapy intervention for those identified with sub-syndromal depression had been in place. Full details of the model are available elsewhere (Mihalopoulos et al., 2011a). Briefly, intervention consisted of screening of people who attend general practice for symptoms of depression (by a practice nurse). People who screened positive were then referred to a psychologist for further assessment. If found to be eligible they were offered the intervention consisted of eight group based psychological therapy sessions with a psychologist. The effectiveness of this intervention was based on a meta-analysis of 19 randomised controlled trials (Cuijpers et al., 2008). All studies in this meta-analysis examined the effects of preventive interventions on the incidence depressive disorders and used a standardized diagnostic interview to exclude the presence of a fullblown depressive disorder at baseline and to examine the incidence of depressive disorders at follow-up. The analysis suggested

that interpersonal therapy was more effective than cognitive behavioural therapy.

The current model used the same probabilities as used by Mihalopoulos et al. Briefly: 50% of GPs participate in the screening program; the proportions of men and women seeing a GP in any one year were 76% and 86% respectively (Australian Bureau of Statistics, 2009). The proportions who met the criteria for the intervention, agreed to further screening and agreed to undertake the intervention were all sourced from the 2007 National Survey of Mental Health and Wellbeing (NSMHWB) and the trials upon which the analyses were based (Cuijpers et al., 2008).

Assumptions

In modelling the effects of both interventions, we made the following assumptions.

First, we assumed that the percentage reduction in the prevalence of self-reported depression in the SDAC surveys with the screening and intervention program would be the same as the percentage reduction in the prevalence of psychiatrically confirmed depression that was the outcome of the trials reporting on the screening and intervention programs. Second, we assumed that screening would, on average, take place every 5 years, and that this would result in an averaging out of the effects over these years. The original depression model assumed that the effects diminish exponentially over time until less than 7% of the initial effect is left at year 5 (Mihalopoulos et al., 2011a).

Simulation

We estimated the number of additional persons in the labour force for each age-sex group as a result of reduction in psychiatrically confirmed depression prevalence because of the screening and intervention as

$$AddLF_i = AddDepFree_i * \Delta P(LF)_i$$

Where $\Delta P(LF)_i$ is the difference in the labour force participation rates between those without depression and those with depression for each age-sex group and $AddDepFree_i$ is the reduction in the number of self-reported depression cases (i.e. additional number of depression free persons) in each age-sex group because of interventions, which is estimated as

$$AddDepFree_i = Dep_i * DepRed_i / 100$$

Where Dep_i is the estimated number of self-reported depression cases in 2010 and $DepRed_i$ is the percentage reduction in psychiatrically confirmed depression prevalence for each age sex group due to interventions.

Table 1. Self-reported depression by age group and sex, Australia 2010.

Sex	Age group	Number of records	People with self-reported depression		Depression population prevalence % (95% CI)
			Number of records	Estimated population# (95% CI)	
Male	45-54	6910	220	40,000 (33,800; 46,900)	2.7 (2.3; 3.1)
Male	55-64	5417	178	41,800 (35,600; 48,600)	3.4 (2.9; 3.9)
Female	45-54	7066	372	80,300 (73,200; 87,700)	5.3 (4.8; 5.7)
Female	55-64	5711	317	65,800 (60,300; 71,900)	5.1 (4.7; 5.6)

#Rounded to the nearest hundred.

Table 2. Association of depression with labour force participation and per capita economic outcomes, Australia 2010.

Sex	Age group	Differences in the labour force participation rates# (95% CI)	Differences between annual private incomes\$ (95% CI)	Differences between annual tax paid\$ (95% CI)	Differences between annual transfer incomes\$ (95% CI)
Male	45-54	0.14 (0.05; 0.22)	48,000 (44,500; 50,000)	8,000 (6,800; 8,800)	-1,500 (-12,100; 0)
Male	55-64	0.17 (0.08; 0.25)	40,700 (39,100; 41,700)	5,000 (4,000; 5,700)	0 (0; 0)
Female	45-54	0.09 (0.04; 0.14)	28,200 (26,900; 29,000)	2,500 (2,100; 2,700)	-12,400 (-16,000; -7,600)
Female	55-64	0.05 (0.01; 0.1)	28,300 (26,800; 29,800)	2,500 (2,200; 2,900)	-4,600 (-12,300; 0)

#Adjusted for highest level of education and number of co-morbid conditions, of people with no depression and with depression. \$Adjusted for highest level of education and number of co-morbid conditions, of those in labour force without depression and of those not in labour force with depression, in 2010.

A\$ rounded to the nearest hundred.

The expected number of additional persons in the labour force in 2010 was then multiplied by the adjusted difference in median incomes between those who were in the labour force and had no depression, and those who were not in the labour force and who had depression, to estimate the total additional income they would have collectively earned if they did not have depression and stayed in the labour force. In order to simulate the results for the entire Australian population of age group 45 to 64 years, we performed a weighted analysis using the weights that represented the number of similar individuals in the 2010 Australian population. All modelling was done separately for males and females. To derive uncertainties around the estimates, 1000 bootstrap replicate datasets were created and 95% uncertainty intervals were derived using non-parametric bootstrapping methods.

Ethical approval was not required, but the research conformed to the Helsinki Declaration and to local Australian legislation.

Results

Out of 25,104 records in Health&WealthMOD2030 base population of 45-64 years old, 1087 reported having depression. Once

weighted, this represented about 227,900 Australians aged 45-64 years old who had self-reported depression (3% of men and 5% of women) in 2010 (Table 1). Opportunistic screening for sub-syndromal depression in general practice and treatment followed by group therapy every 5 years was estimated to prevent around 2.3% of these cases. As labour force participation would have been higher with intervention, there would be commensurate increases in income.

Men in this age group, who have depression, had a 14-17 percentage-point lower probability of being in the labour force than those who do not have depression. For women, that probability is lower by 9 percentage-points at age 45-54 years and 5 percentage-points at age 55-64 years (Table 2).

The income difference between those in the labour force without depression and those not in the labour force with depression was about \$48,000 per year for men aged 45-54 years and \$28,200 for women of the same age group. While the income difference was higher for men aged 45-54 years compared to the older age group of 55-64 years, they were similar for both age groups among women.

Men aged 45-54 years who were not in the labour force with depression paid around \$8,000 less in taxes and received \$1,500 more in transfer incomes every year compared to

Table 3. Effects of group-based psychological intervention on depression prevalence and national impacts on labour force participation and economic outcomes, Australia 2010.

Sex	Age group	Change in depression prevalence (95% CI)	Additional individuals free of depression [#] (95% CI)	Increase in labour force [§] (95% CI)	Increase in total private income per year [†] ('000s) (95% CI)	Increase in total tax paid per year [†] ('000s) (95% CI)	Reduction in total transfer income payout per year [†] ('000s) (95% CI)
Male	45-54	-2.4% (-4.1; -0.7)	1000 (300; 1,600)	130 (30; 280)	6,304 (1,386; 13,161)	1,052 (241; 2,236)	197 (0; 1,556)
Male	55-64	-2.2% (-3.8; -0.7)	900 (300; 1,600)	150 (40; 310)	6,257 (1,720; 12,711)	775 (208; 1,599)	0 (0; 0)
Female	45-54	-2.3% (-4.0; -0.7)	1,800 (600; 3,200)	160 (40; 320)	4,532 (1,101; 8,990)	407 (101; 804)	1,997 (422; 4,068)
Female	55-64	-2.2% (-3.7; -0.7)	1,400 (500; 2,400)	80 (8; 180)	2,194 (223; 5,151)	198 (20; 453)	358 (0; 1,274)
			5,200 (1,700; 8,800)	500 (160; 980)	19,288 (5,784; 35,909)	2,432 (729; 4,656)	2,552 (635; 5,607)

[#]Rounded to the nearest hundred. [§]Rounded to the nearest ten. [†]In 2010 A\$, in '000s.

those who were in the labour force and who did not have depression, so the net increase in government revenue was \$9,500 per year per person for this age group. For women of this age group, the net increase was about \$14,900 (Table 2). The annual increase in government revenue from the older age group of 55-64 years was slightly lower compared to the younger age group, with \$5,000 per person for men and \$7,100 for women.

Table 3 shows that screening plus group therapy could prevent about 5,200 prevalent cases of depression among of 45-64 year old Australians, and add 280 men and 240 women to the labour force. Private incomes are estimated to increase by a total of \$19.3 million per year, tax revenues by \$2.4 million, and transfer payments would be reduced by \$2.5 million.

Discussion

Summary of findings

In this paper we have estimated the potential impact of a depression prevention program on labour force participation and income generation among people at high risk of developing depression. The results suggest that considerable benefits, in terms of both additional working years and increased personal income, could be made by introducing either a group therapy intervention to prevent depression. On average, those who were able to remain in the workforce as a result of the prevention of depression would earn between \$28,000 and \$48,000 more per year, and net government revenues would increase by around \$5 million.

Limitations

Some caution needs to be taken in interpreting these findings. We have assumed that the reduction in self-reported prevalence of depression from a depression intervention would be similar to the reduction in depression diagnosed with validated diagnostic instruments. Although this seems plausible, it has not been assessed. It is reassuring, however, that the 2007 National Survey on Mental Health and Wellbeing found 12-month prevalences for medically diagnosed depression that are very close to the self-reported prevalences we used in this study (3.1% among men and 5.1% among women aged 16-85 years, compared to 3% and 5%, respectively, in our study) (Australian Bureau of Statistics, 2009). Secondly, we assumed that the interventions would result in uniform reductions in depression prevalence across all levels of severity. It is possible that the effect would be smaller for more severe forms of depression than for less severe cases, in which case our approach may have led to overestimation of the effect on early retirement due to depression. Evidence on this point is lacking. To the extent that persons who retired with depression no longer had the disorder when they were interviewed, this could have led us to underestimate the workforce benefits of depression prevention.

Interpretation

Our results should be considered to be a conservative estimate of the impact of depression prevention interventions due to the approach taken. Firstly, we have only captured the lost working years and income among those who retire. Among those

who continue in the workforce, depression is likely to reduce productivity through absenteeism and reduced productivity at work. The size of these effects is incompletely known (Donohue and Pincus, 2007). Secondly, the assumptions used for estimating reductions in prevalence were based on conservative levels of participation in the screening program by both GPs and patients. If participation rates could be increased, there would be greater reductions in the incidence of depression with consequent increases in workforce participation.

On the other hand, in a situation of high unemployment, a larger number of people in the labour force may manifest itself as an increase in the number of unemployed, rather than in the number of working persons. In that case, the economic results suggested by our analysis may not fully materialise.

This study shows that increased labour force participation as a result of preventing depression is likely to benefit not only the individuals concerned, but also has impacts on taxes and government support payments due to lost labour force participation. Previous studies have shown that in the 45 to 64 year age group persons who are out of the labour force due to depression pay virtually no tax and receive \$228 per week in transfer income whereas those in employment pay \$344 in tax and receive only \$9 in benefits, on average (Schofield et al., 2011c). This is in addition to expenditure for depression-related health care.

Conclusion

Government reports have highlighted population ageing and labour shortages as potential pressures threatening the Australian economy (Commonwealth of Australia, 2007). Most other developed countries face similar challenges associated with the ageing of their populations, and many newly developed countries like China will soon see their dependency ratios (i.e. the ratio of inactive elderly to the total labour force) deteriorate as well (Organisation for Economic Co-operation and Development, 2008). Keeping a greater proportion of experienced, older workers in the labour force is of increasing concern to governments. This study suggests that prevention of depression with group-based interventions may increase labour force participation as well as incomes for the individuals concerned.

Author contributors

JLV: Concept, design, analysis up to the point of change in depression prevalence, write-up. RNS: Analysis from the point of change in depression prevalence; tables; critical review of manuscript. CM: Input on intervention effectiveness and data sources; critical review of manuscript. MEP and EJC: Discussion of design and analysis; critical review of manuscript. DJS, SJK and RT: Model construction and analysis; discussion of design and analysis; critical review of manuscript. All authors have read and approved the final manuscript.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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The association between labour force participation and being in income poverty amongst those with mental health problems

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Objectives: Mental health conditions are associated with lower standards of living. This study quantifies the relationship between employment, depression and other mental health conditions and being in income poverty. **Methods:** Cross-sectional analysis was undertaken using the 2003 *Survey of Disability, Ageing and Carers* data for Australians aged 45–64 years.

Results: Those not in the labour force due to depression and other mental health conditions are significantly more likely (odds ratio (OR) 12.53, 95% CI: 12.20–12.86, $p < 0.0001$; OR 20.10, 95% CI: 19.67–20.54, $p < 0.0001$) to be in income poverty than those not in the labour force with no chronic health condition. Amongst those with depression and other mental health conditions, those who were in employment were significantly less likely to be in income poverty than those who have had to retire because of the condition.

Conclusion: Due to the association between leaving the workforce due to mental health problems and poverty status, efforts to increase the employment of individuals with mental health conditions, or prevent the onset of the conditions, will likely improve living standards.

Keywords: poverty; labour force participation; retirement; living standards

Introduction

Mental health conditions place a massive burden upon the health of individuals internationally (Patel & Knapp, 1998). In addition to being the leading cause of burden of disease (Lopez, Mathers, Ezzati, Jamison, & Murray, 2006), these conditions also impact an individual's ability to function normally in everyday activities: people with mental health conditions are recognised as being some of the most socially marginalised and economically disadvantaged members of the community (Council of Australian Governments, 2006). The labour force participation rates of people with a mental health condition are also poor – people with a mental health condition have unemployment levels of 75–90% in the US; and 61–73% in the UK; and only one quarter that of healthy individuals in Australia (Waghorn & Lloyd, 2005).

Suffering from a mental health condition may increase the likelihood of an individual retiring from the workforce early, due to the limitations caused by the condition (Waghorn & Lloyd, 2005). Within Australia, half the older workers – aged 45–64 years – who have a mental health condition are not in the labour force (Schofield, Shrestha, Passey, Earnest, & Fletcher, 2008). This has significant costs for the individuals who have to bear the health burden of the disease, as well as the economic burden of health care, and lost labour force participation (Schofield, Kelly, et al., 2011).

It has been recognised that those with mental health conditions have lower incomes (Brazenor, 2002; Schofield, Shrestha, et al., 2011) and this is likely to markedly reduce the living standards of these individuals. One way of comparing the living standards of individuals is assessing their poverty status. Poverty is used as an indicator of living standards within modern society (Hagenaars & de Vos, 1988). Having a mental health condition in the older working years may increase the chance of living in poverty due to lower labour force participation rates and subsequent poorer financial status.

This article will examine the relationship between labour force participation, mental health conditions and being in income poverty amongst 45–64-year old Australians. It aims to quantify the difference in the likelihood of being in income poverty between those who are not in the labour force due to depression and other mental health conditions, and those with no chronic health condition in varying states of employment. It will estimate the number of Australians who are not in the labour force due to depression and other mental health conditions who were in income poverty in 2003 and will look at how being out of the labour force due to depression and other mental health conditions increases the chances of being in income poverty compared to those in employment and those out of the labour force for other reasons.

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Methods

The 2003 *Survey of Disability, Ageing and Carers* (SDAC) data were used to assess the poverty status of those aged between 45 and 64 years. The SDAC is a nationally representative survey of the Australian population conducted by the Australian Bureau of Statistics (ABS) in 2003 (ABS, 2005). The survey contains detailed information on the self-reported disability and health status of individuals, as well as demographic and economic information.

The SDAC covered individuals in all states and territories, excluding those in very remote areas (which made up less than 1% of the population). The 2003 SDAC covered both private and non-private dwellings, with the exception of jails and correctional institutions. Households were selected at random by the ABS using multistage sampling techniques and every individual within the household was surveyed. There were 36,241 respondents in 14,019 households, and 5145 individuals from 303 non-private dwellings and 564 care-accommodation establishments. The response rate for those in private and non-private dwellings was 89%, and for those in care-accommodation 90% (ABS, 2005). The original 2003 SDAC data were weighted by the ABS to represent the whole Australian population in 2003 by age, sex, state/territory and section of state characteristics. These weights were utilised in all of the data analyses.

Respondent's health conditions were classified by the ABS using ICD10 codes (World Health Organisation, 2010). People who reported their main long-term health condition as depression/mood affective disorders (excluding postnatal depression) (ICD code F30-39) were considered to have 'depression'. Those who reported their main long-term health condition as mental and behavioural disorders, dementia, schizophrenia, phobic and anxiety disorders, nervous tension/stress attention deficit disorder/hyperactivity and other mental and behavioural disorders (ICD codes F00-29, F40-99) were categorised as having 'other mental health conditions' for this study.

The 2003 SDAC questioned respondents about their labour force status, and recorded respondents' 'main reason for not looking for work' if they were not working and not looking for work (ABS, 2005). One response option was 'due to own ill health or disability'. In this article, respondents who selected that they were out of the labour force due to their own ill health, and identified depression or other mental health conditions as their main long-term health condition, were considered to be 'out of the labour force due to depression' or 'out of the labour force due to other mental health conditions'. It was assumed that where the respondent identified depression or other mental health conditions as their main health condition, that it was the health condition responsible for their being out of the labour force.

Poverty lines

An 'income poverty line' is defined as the level of income below which a unit (a person or family) is in income poverty. Poverty lines are usually adjusted to take into account the composition of the unit using equivalence scales and expressed in terms of a percentage of the equivalised average or median income.

Only taking into consideration an individual's personal income is not seen as a true reflection of an individual's economic situation. Within a family, it can be assumed that members pool their economic resources to the benefit of all members – thus looking at the wider income of the whole family will be more accurate (Greenwell, Lloyd, & Harding, 2001). The income unit is defined by the ABS as 'a group of two or more related persons in the same household assumed to pool their income and savings and share the benefits deriving from them equitably; or one person assumed to have sole command over his or her income, consumption and savings' (ABS, 2005, p. 6). Due to this recognition and assumption of the sharing of economic resources within an income unit, the equivalised family income will be used rather than the individual's personal income in this analysis.

To identify the individuals in the 45–64-year old Australian population who were in income poverty in 2003, an income poverty line based on 50% of the median income was used. The median income was estimated using 'income unit' or family income in conjunction with OECD-modified equivalence scales (De Vos & Zaidi, 1997; Saunders, 1996) (the terms 'income unit' and 'family' are interchangeable in the remainder of this article as they both refer to an income unit as defined above). The 50% of median income poverty line expresses the economic situation of those in income poverty relative to those in the middle of the income distribution. Those who are in poverty will have at most half the income of those in the middle of the income distribution of the population. The 50% of the median income has been widely used as a poverty line both in Australia and internationally (Mejer & Siermann, 2000; Saunders & Bradbury, 2006; Saunders, Hill, & Bradbury, 2007).

Differences in numbers and composition of families are accommodated for using equivalence scales (Trigger, 2003). The OECD-modified equivalence scale (Hagenaars, de Vos, & Zaidi, 1994) is utilised, whereby a value of 1.0 is given to the first adult member (person aged 15 years and over), a value of 0.5 to each subsequent adult family member and a value of 0.3 given to each child (person aged under 15 years). This means that a family of two adults and four children will have an equivalence score of 2.7 ($1.0 + 0.5 + 0.3 + 0.3 + 0.3 + 0.3$); similarly, a family made up of a single adult has a value of 1. The family's income is divided by their equivalence score, thereby equivalising the income and allowing comparisons between families of different sizes.

In order to identify if an individual was in poverty or not, the following steps were undertaken:

- (1) Total family income was calculated by tallying the individual incomes of all members in the family, this was done for all records on the 2003 SDAC.¹
- (2) Equivalised income was then estimated for each individual by dividing their total family income by the equivalence score for their family.
- (3) The median equivalised income was then obtained for the whole Australian population. The poverty line was estimated by dividing the median by two. In 2003, the 'poverty line' (50% of the median equivalised income) was \$232.50 per week.²
- (4) Any individual whose equivalised family income was below the poverty line was deemed to be in poverty.

Statistical analysis

Members of the 45–64-year old Australian population were grouped into one of nine groups based on their labour force status: employed full-time with no chronic health condition, employed full-time with depression, employed full-time with other mental health conditions, employed part-time with no chronic health condition, employed part-time with depression, employed part-time with other mental health conditions, not in the labour force due to depression, not in the labour force due to other mental health conditions and not in the labour force for reasons other than ill health. The proportion of the 45–64-year old Australian population who were in poverty in each group was estimated.

Logistic regression models were used to compare the odds of being in poverty for those with and without depression and other mental health conditions who were aged 45–64 years – in any labour force participation group. Those with no chronic health condition were used as the reference group and the odds were adjusted for age, sex and education. Age and sex are standard covariates to include, and education was also included for its ability to predict social status and earning capacity at the individual level (Laplagne, Glover, & Shomos, 2007).

Logistic regression models were used to compare the odds of being in poverty for those out of the labour force due to depression and other mental health conditions and those employed full-time, employed part-time and not in the labour force with no health condition. A logistic regression model was constructed to look at the difference in the odds ratio (OR) of being in poverty for those employed full-time with depression and other mental health conditions and employed part-time with depression and other mental health conditions compared to those out of the labour force due to depression and other mental health conditions. The model was adjusted for age, sex and education.

The difference in odds of being in poverty for those employed part-time with no chronic health condition, those out of the labour force due to other reasons, those out of the labour force due to depression and those out of the labour force due to other mental health conditions compared to those employed full-time with no chronic health condition was assessed. The regression models were adjusted for age, sex and education.

Distribution analysis was undertaken for those not in the labour force due to depression and other mental health conditions, not in the labour force due to other reasons, employed part-time with no chronic health condition and those employed full-time with no chronic health condition. This distribution analysis was undertaken on the equivalised income unit income for these individuals, by looking at the proportion of individuals in different quartiles, and graphically using box and whisker plots.

The analyses were undertaken using SAS V9.2 (SAS Institute Inc., Cary, NC, USA). All of the results presented were obtained from weighted data and represent the entire Australian population, and all statistical tests were two sided with the significance level set at 5%. Logistic regression analysis was undertaken using the 'survey logistic' function in the SAS software.

Results

In the 2003 SDAC, there were 8793 records representing individuals in the 45–64-year old population. Of these, 2265 were employed full-time with no chronic health condition; 783 were employed part-time with no chronic health condition; 625 were not in the labour force for reasons other than their ill health and had no chronic health conditions; 32 were employed full-time with depression as their main health condition; 74 were employed full-time with other mental health conditions as their main health condition; 16 were employed part-time with depression as their main health condition; 43 were employed part-time with other mental health conditions as their main health condition; 41 were out of the labour force due to depression and 54 were out of the labour force due to other mental health conditions. There were 1840 records for individuals in income poverty who were aged 45–64 years; once weighted there were 984,200 individuals aged 45–64 years in income poverty in 2003 – or 20% of the Australian population aged 45–64 years.

Table 1 shows the weighted number of individuals in income poverty in the Australian population by labour force status. Those who are out of the labour force due to other mental health conditions had the largest proportion of individuals in income poverty, with over half – 57% of individuals being in income poverty; followed by those out of the labour force due to depression, with almost half (43%) being in income poverty. Those employed full-time had the lowest

Table 1. Proportion of individuals in income poverty with varying labour force and health status – amongst the 45–64-year old Australian population.

Labour force status	Number in poverty	Number not in poverty	Percentage in poverty
NILF, due to <i>depression</i>	10,600	13,900	43.1
NILF, due to other <i>mental health problems</i>	21,600	16,500	56.6
NILF for other reasons, no chronic health condition	154,800	240,700	39.1
Employed part-time no chronic health condition	53,900	368,700	12.8
Employed full-time no chronic health condition	78,600	1,332,124	5.6

Note: NILF, not in labour force.

Table 2. OR of being in income poverty for those with and without depression or other mental health problems by labour force status, adjusted for age, sex and education – amongst the 45–64-year old Australian population.

	OR	95% CI	<i>p</i> -Value
Employed full-time with no chronic health condition		Reference	
Employed part-time with no chronic health condition	2.68	2.64–2.71	<0.0001
Not in the labour force due to other reasons ^a	11.64	11.52–11.77	<0.0001
Not in the labour force due to other depression	12.53	12.20–12.86	<0.0001
Not in the labour force due to other mental health problems	20.1	19.67–20.54	<0.0001

Note: ^aFor reasons other than ill health.

Table 3. OR of being in income poverty amongst those with depression and other mental health problems, but different labour force participation status – amongst the 45–64-year old Australian population.

	OR	95% CI	<i>p</i> -Value
Not in the labour force due to depression		Reference	
Employed part-time with depression	0.03	0.03–0.04	<0.0001
Employed full-time with depression	0.09	0.09–0.10	<0.0001
Not in the labour force due to other mental health problems		Reference	
Employed part-time with other mental health problems	0.28	0.27–0.29	<0.0001
Employed full-time with other mental health problems	0.04	0.04–0.04	<0.0001

proportion of individuals in income poverty (6%). Amongst those who were out of the labour force, those who had depression and other mental health conditions had the largest proportion of individuals in income poverty.

Regardless of labour force participation and after adjusting for age, sex and education, the odds of being in income poverty for those with depression were 2.4 times the odds of being in poverty (OR 2.43, 95% CI: 2.39–2.47, $p < 0.0001$) of people with no chronic health conditions. Similarly, the odds of being in income poverty for those with other mental health problems were 2.7 times the odds of being in poverty (OR 2.66, 95% CI: 2.62–2.69, $p < 0.0001$) of people with no chronic health conditions.

Once adjusted for age, sex and education, the odds of being in income poverty were significantly higher for those employed part-time with no chronic health condition, and those not in the labour force for reasons other than ill health, those not in the labour force due to depression and those not in the labour

force due to other mental health conditions – compared to the odds of being in poverty for those employed full-time with no chronic health condition (Table 2). The odds of being in poverty of those not in the labour force due to other mental health conditions were 20 times the odds of being in income poverty of those employed full-time with no chronic health condition (OR 20.1, 95% CI: 19.67–20.54). Similarly, those not in the labour force due to depression had about 13 times the odds of being in income poverty than those employed full-time with no chronic health condition (OR 12.53, 95% CI: 12.20–12.86).

Amongst those with depression, those employed part-time or full-time had significantly lower odds of being in income poverty than those out of the labour force, after controlling for age, sex and education (Table 3). This is also true for those with other mental health problems – those employed full-time or part-time had significantly lower odds of being in income poverty than those out of the labour force.

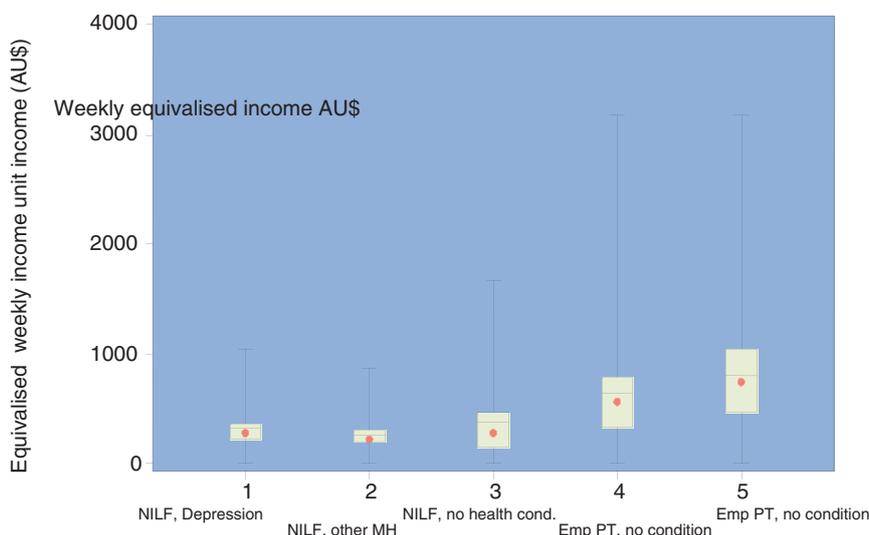


Figure 1. Distribution of weekly equivalised income unit income by employment status – amongst the 45–64-year old Australian population.

Table 4. Proportion of individuals in each income quartile (equivalised weekly income unit income) by employment status – amongst the 45–64-year old Australian population.

Income quartiles	Employment status				
	NILF due to depression (%)	NILF due to other mental health conditions (%)	NILF due to other reasons, no chronic health condition (%)	Employed part-time, no chronic health condition (%)	Employed full-time, no chronic health condition (%)
Q1	58.8	66.5	55.3	21.2	8.7
Q2	26.9	21.1	22.9	25.8	20.2
Q3	12.7	12.5	12.9	29.9	33.9
Q4	1.6	0.0	8.9	23.1	37.2

Those not in the labour force due to depression and other mental health problems had the lowest income dispersion, with these groups clustered in the lowest incomes (Figure 1). Those not in the labour force due to depression had a median income of \$281 (incomes between the 25th and 75th percentiles of \$225–\$364). Those not in the labour force due to other mental health problems had a median income of \$225 and incomes between the 25th and 75th percentile of \$205 and \$308. By contrast, those employed full-time with no chronic health condition had a higher median income of \$745 and incomes dispersed over a wider range (incomes between the 25th and 75th percentiles of \$645–\$1043), followed by those employed part-time with no chronic health condition with a median income of \$565 (incomes between the 25th and 75th percentiles of \$326–\$782).

Figure 1 and Table 4 show that the weekly equivalised income unit income of those not in the labour force due to depression and other mental health problems is grouped around the low end of the income distribution – indeed 59% of those not in the labour force due to depression and 67% of those not in the labour force due to other mental health problems were

in the lowest equivalised income unit income quartile (i.e. the bottom 25% of incomes) with only about 2% in the top income quartile (Table 4). This is in sharp contrast to those employed full-time with no chronic health condition who are mainly situated higher along the income distribution with about 70% in the top half of the income distribution and a much smaller proportion in the lower end of the income distribution with only 9% in the bottom quartile (Figure 1 and Table 4).

Discussion

Persons not in the labour force due to depression and other mental health conditions were more likely to be in income poverty than any other comparator group in this study. Those not in the labour force due to depression and other mental health conditions are significantly more likely to be in income poverty than those not in the labour force due to other reasons, and those without a chronic health condition who remained in the labour force full-time or part-time. Amongst those with both depression and other mental health

conditions, those who have managed to stay in either full-time or part-time employment are significantly less likely to be in income poverty than those who have had to retire because of the condition. It should be noted that the association with labour force participation and economic status was more pronounced for people with other mental health problems than people with depression. This highlights the importance of labour force participation for those with mental health conditions to maintain their living standards.

While other studies have identified the link between mental health conditions and lost labour force participation, and the associated loss of personal income (Access Economics, 2003; Brazenor, 2002; Davies & Drummond, 1994; Department of Health and Ageing, 2007; Economics, 2003; Goetzel, Hawkins, Ozminkowski, & Wang, 2003; Knapp, 1997; Patel & Knapp, 1998; Schofield et al., 2008; Smith, Shah, Wright, & Lewis, 1995; Thomas & Morris, 2003), there have been few studies that identify how susceptible individuals with mental health conditions are to living in income poverty, due to the condition's ability to detrimentally impact labour force participation.

The health–poverty relationship is complex and multidimensional. Poor health can contribute to a low socioeconomic status and poor living standards (Council of Australian Governments National Reform Initiative Working Group, 2006; Saunders, 1996). The Council of Australian Government's identified ill health as detrimentally impacting upon people's living standards through the high direct costs of health care, and reduced labour force productivity and participation (Council of Australian Governments National Reform Initiative Working Group, 2006) the latter of which is seen as the key cost of ill health.

This is the first study to look at the association between lost labour force participation due to mental health problems and an individual being in income poverty. However, due to the cross-sectional dataset that was utilised causation could not be established, and this study was only able to look at the higher likelihood of being in income poverty for those out of the labour force due to depression and other mental health conditions if illness was the stated main reason for not working. The authors have hypothesised that exiting the labour force due to mental health conditions lead to poverty status, however there are a number of other explanations for the associations reported in this study. These are based on the notion that poverty has been linked to the development of mental health conditions, this has mostly been through the negative impact that unemployment can have on mental health conditions, both within Australia and internationally (Banks, 1982; Frese & Mohr, 1987; Iverson, Anderson, Andersen, Christoffersen, & Keiding, 1987; Linn, Sandifer, & Stein, 1985; Moser, Goldblatt, Fox, & Jones, 1987, 1990). It is possible that being in income poverty may lead to the development of mental health problems, which subsequently lead to labour force challenges and labour force exit. This is

unlikely as those in employment have much lower chances of being in income poverty (Australian Council of Social Service, 2010). Alternatively, it is possible that exiting the labour force led to poverty, which subsequently caused mental health problems. However, this is also unlikely as this study focused on individuals who had left the labour force due to ill health.

Those who were out of the labour force due to reasons other than ill health who had no chronic health conditions were less likely to be in income poverty than those who are also out of the labour force, but exited the workforce due to their mental ill health. Those who are out of the labour force for other reasons may have had more choice in when they retired and thus may have had plans in place to ensure adequate financial resources, for example creating an investment portfolio that would provide an income stream during retirement. Those not in the labour force due to mental health conditions may have been forced to leave because of an inability to work any longer due to restrictions imposed by their ill health, and may not have been as prepared for the loss of employment income. This indicates that it is not being out of the labour force in general that is associated with poverty.

There are numerous options that have been shown to be effective in reducing the burden of mental health problems (Barrett, Byford, & Knapp, 2005; Doyle et al., 2001; Jonsson & Bebbington, 1994; Vos et al., 2010). This study has demonstrated the increased poverty rate experienced by those who retire early due to mental health conditions, as such any prevention or intervention that reduces lost workforce participation to individuals is likely to improve individual financial situations and hence keep individuals out of income poverty. In addition, it could help overcome the high health sector burden of the disease, which in 2003–2004 was estimated to be \$4.1 billion (Australian Institute of Health and Welfare, 2010) for all age groups in Australia, and the large costs to government from lost taxation revenue, increased government support payments and lost GDP (Schofield, Shrestha, et al., 2011).

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Notes

1. A small proportion of records (less than 10% of all records in the SDAC) either refused to answer the survey question regarding their personal income, or stated that they did not know what it was. For these individuals with missing information on personal income, their personal income was imputed using regression modelling. A regression model was built which estimated

personal income based upon age (5-year age groups), sex, employment status (employed full-time, employed part-time, unemployed, not in the labour force), health status (has a long-term health condition, does not have a long-term health condition), occupation (nine groups set by the ABS) and education attainment (tertiary or non-tertiary education attainment).

2. This is equivalent to \$275.20 per week in 2009 (in order to account for the inflation from 2003 to 2009, the poverty line was indexed by the Consumer Price Index (ABS 2010).

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The indirect economic impacts of co-morbidities on people with depression

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ABSTRACT

It is known that people with depression often have other co-morbid conditions; however this is rarely acknowledged in studies that access the economic impacts of depression. This paper aims to quantify the association between co-morbid health conditions and labour force status and economic circumstances of people with depression. This study undertakes cross-sectional analysis using a dataset that is representative of the 45–64 year old Australian population with depression. The probability of being out of the labour force increases with increasing number of co-morbidities, and the amount of weekly income received by people with depression decreased with increasing numbers of co-morbidities. Those with depression and three or more co-morbidities were 4.31 times more likely to be out of the labour force (95% CI: 1.74–10.68), and received a weekly private income 88% lower (95% CI: –94%, –75%) than people with depression alone. It is important to consider the co-morbid conditions an individual has when assessing the impact of depression on labour force participation and economic circumstances.

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1. Objectives of the study

Depression has been identified as having a detrimental impact on the labour force participation of sufferers (Kessler and Frank, 1997; Kessler et al., 2001). Within the United States, more sick days are attributed to depression than any other health condition (Conti and Burton, 1994; Claxton et al., 1999); and within Australia, 57% of people aged 45–64 years with depression are out of the labour force (Schofield et al., 2008). Suffering from a mental illness may increase the likelihood of an individual retiring early from the workforce due to the limitations caused by the condition (Waghorn and Lloyd, 2005).

The workforce absence that results from having depression has significant economic costs on the individuals who already bear the

considerable health burden of the disease.¹ Within Australia, people who are out of the labour force due to depression have lower income, lower wealth and lower savings than their counterparts, without depression who remained in the workforce (Schofield et al., 2011a,b,c). These studies, and others that have identified the link between depression and the loss of personal income associated with workforce absence (Smith et al., 1995; Patel and Knapp, 1998; Brazenor, 2002; Goetzel et al., 2003; Thomas and Morris, 2003; Department of Health and Ageing, 2007) do not take into consideration the impact of co-morbidities.

Depression often occurs simultaneously with other conditions, and it is recognised that the occurrence of co-morbidities reduces the chances of workforce participation amongst

¹ There is a considerable body of research looking at the costs of depression. Most of these studies look at the direct medical (outpatient, inpatient and pharmaceutical costs), with few studies investigating the indirect costs of depression – costs such as lost workforce participation. In a systematic review of cost of illness studies conducted by Luppa et al. (2007), of the 24 papers included in the study, only four looked at the cost of lost productivity. However, despite the scant literature, it is acknowledged that the indirect costs of depression are likely higher than the direct costs (Luppa et al., 2007). Due to this gap in the literature and the importance of indirect costs, this paper focuses on the indirect costs associated with lost labour force participation and depression.

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individuals with depression (Löwe et al., 2004; Buist-Bouwman et al., 2005; Waghorn and Chant, 2005; Stang et al., 2006; Waghorn et al., 2006, 2008; Merikangas et al., 2007; Braden et al., 2008; Kessler et al., 2008). However, it is not known what the economic implications of having co-morbidities are amongst people with depression. This paper will look at the 45–64 year old Australian population, a group identified as being susceptible to early exit from the labour force due to ill health (Schofield et al., 2008), and will analyse the relationship between co-morbidities and economic circumstances of people with depression.

2. Materials and methods

This study was conducted using Health&WealthMOD, a microsimulation model of the 45–64 year old Australian population. 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 document the economic impacts of various individual health conditions (Schofield et al., 2010a,b, 2012b). Health&WealthMOD was built upon 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 (Australian Bureau of Statistics, 2004), and STINMOD, a microsimulation model of income tax and government support payments (Lambert et al., 1994; Percival et al., 2007) 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 dataset, individual records were extracted for those aged 45–64 years. The details extracted for each individual in the base population included demographic variables (for example, 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 such as individual income, government support payments and tax liability were imputed onto the base data. This imputation was done by identifying persons with similar characteristics on STINMOD and “donating” their income and wealth information onto Health&WealthMOD using a process commonly used in microsimulation models called synthetic matching (Rässler, 2002). Nine variables: sex (2 groups), income unit type (4 groups), type of government pension/support (3 groups), income quintile (5 groups), age group (4 groups), labour force status (4 groups), hours worked per week (5 groups), highest educational qualification (2 groups) and home ownership (2 groups), that were common to both datasets and strongly related to income were chosen as matching variables for synthetic matching.

The data were then aged to reflect the 2009 Australian 45–64 year old population. The ageing was used to account for the disability and illness, demographic, labour force, earnings growth and other changes that had occurred between 2003 and 2009. Full details of Health&WealthMOD are available in Schofield et al. (2011a,b,c,d).

Respondents' self-reported health conditions were classified in the SDAC 2003 by the Australian Bureau of Statistics using ICD10 codes. People who reported their main long term health condition as depression/mood affective disorders (excluding postnatal

depression) (ICD code F30–39) were considered to have ‘depression’.²

The conditions high cholesterol, hypertension, deafness and noise induced hearing loss, and diseases of the ear and mastoid process were excluded from the analysis due to the limited impact they have on the labour force participation of individuals (Schofield et al., 2008).

The variables used for private income, taxation payments, and transfer payments came from STINMOD. Private income is the sum of a person's income derived from employment and any income generated from investments such as cash deposits, shares or property, but excludes any government benefits payments.

2.1. Statistical analysis

Initial descriptive analysis was undertaken to estimate the number and proportion of individuals with no chronic health condition, depression only, depression and one co-morbidity, depression and two co-morbidities, and depression and three or more co-morbidities.

The odds ratio of being ‘not in the labour force’ was then calculated for those with depression and one co-morbidity, depression and two co-morbidities, and depression and three or more co-morbidities. Those with depression only were used as the reference group and the results were adjusted for age, sex and highest level of education.

The conditions that were co-morbid with depression were then examined and the odds ratio of being ‘not in the labour force’ was then calculated for those with depression and various co-morbidities to determine what co-morbid conditions were significantly related to workforce absence. People with depression only were used as the reference group and the results were adjusted for age, sex and highest level of education.

Due to low record numbers in the survey for conditions co-morbid with depression, the following conditions were not analysed separately: certain infectious and parasitic diseases, neoplasms, diseases of the blood and blood forming organs, Alzheimer's disease, diseases of the skin and subcutaneous tissue, diseases of the eye and adnexa, diseases of the respiratory system, certain conditions originating in the perinatal period, diseases of the genitourinary system, congenital malformations, deformations and chromosomal abnormalities, other endocrine/nutritional and metabolic disorders, other injury/poisoning, and a group that the ABS originally called ‘other conditions’.

Descriptive analysis was undertaken to estimate the mean and median weekly private income, taxation payments, and transfer income attributable to individuals with no chronic health condition, depression only, depression and one co-morbidity, depression and two co-morbidities, and depression and three or more co-morbidities.

A multiple linear regression model of the log of weekly income was used to analyse the differences between weekly private incomes of these groups. Analyses were repeated for weekly transfer income and weekly tax liability. Those with depression only were used as the reference group. The co-variables age group, sex and highest level of education were adjusted for in the regression models. Regression analysis was undertaken on log-transformed data in order to satisfy the assumptions of linear regression analysis, and regression diagnostics confirmed that the assumptions

² People who listed depression as their main health condition were the subject of this study, as such those who have depression but listed other conditions, for example cardiovascular disease or diabetes, as their main health condition were not included.

Table 1
Depression and co-morbidities, 45–64 year old Australians, 2009.

Number of conditions	N	Number in population (N)	% of Total population aged 45–64 years	% of Population with depression
No chronic health condition	3780	2 290 000	49%	–
Depression only	46	30 400	1%	13%
Depression and one other health condition	51	45 400	1%	20%
Depression and two other health conditions	86	63 700	1%	28%
Depression and three or more other health conditions	159	86 500	2%	38%

were reasonably satisfied. The analyses were undertaken using SAS V9.1 (SAS Institute Inc., Cary, NC, USA). All statistical tests were two sided with the significance level set at 5%.

3. Results

In the 2003 SDAC there were 8864 individuals aged 45–64 years, these data represented 5 423 900 individuals in the Australia population in 2009. Within this population, 4% reported having depression as their main health condition.³ Table 1 shows the number of individuals with depression only, and depression and various numbers of co-morbidities. Of those with depression, 13% of people only reported having depression, with the majority (87%) having at least one co-morbidity.

Table 2 shows the labour force status of those with no chronic health conditions, those with depression only and those with depression and various numbers of co-morbidities. The majority of people with no health condition, or with depression and no co-morbidities were in the labour force. Only around one-third of people with depression and one or more co-morbidities were in the labour force.

Table 3 shows the likelihood of being out of the labour force for those with varying numbers of co-morbidities compared to those with depression only, adjusting for age, sex and highest level of education. The odds of being out of the labour force for people with depression and co-morbidities were at least three times the odds of people with depression alone. People with depression and one co-morbidity had 3.37 times the odds of being out of the labour force relative to people with depression only (95% CI: 1.12–10.11); and people with depression and three or more co-morbidities had 4.31 times the odds of being out of the labour force (95% CI: 1.74–10.68).

When the odds of being out of the labour force were compared amongst people with depression and co-morbidities, using people with depression and one co-morbidity as a reference group, no significant difference in the likelihood of being out of the labour force between people with depression and two co-morbidities and people with depression and one co-morbidity was found (OR 0.927, 95% CI: 0.325–2.643). Similarly, there was no evidence of a difference in being out of the labour force between people with

³ As this only includes those who listed depression as their main health condition, this figure is slightly lower than the estimated portion of Australians aged 18–85 suffering mood/affective disorders in 2009 (6.2%) (Australian Bureau of Statistics, 2009). By way of international comparison, 9% of adults in the US were reported as having depression between 2006 and 2008 (Centers for Disease Control and Prevention, 2010).

Table 2
Labour force status of those with various numbers of health conditions, 45–64 year old Australians, 2009.

Number of conditions	In the labour force	Not in the labour force
No chronic health condition	82%	18%
Depression only	64%	36%
Depression and one other health condition	35%	65%
Depression and two other health conditions	32%	68%
Depression and three or more other health conditions	29%	71%

depression and three co-morbidities and people with depression and one co-morbidity (OR 1.28, 95% CI: 0.47–3.46).

Table 4 shows the odds ratio of being out of the labour force for those with depression and various co-morbidities compared to those with depression only (adjusting for age, sex and highest level of education), and the frequency of occurrence of various co-morbidities. The results were obtained from separate logistic regression models comparing the likelihood of people with depression and the given health condition to people with depression only. Over 40% of people with depression and co-morbidity had arthritis, and these individuals were almost five times more likely to be out of the labour force than those with only depression (OR 4.52, 95% CI: 1.70–12.00).

People with depression and heart disease, and depression and other diseases of the circulatory system respectively had 25 and 13 times the odds of being out of the labour force than those with depression only (OR 24.85, 95% CI: 1.60–386.98; OR 12.58, 95% CI: 1.81–87.68). Similarly, the odds of being out of the labour force for people with depression and diabetes were 10 times the odds for people with depression only (OR 10.20, 95% CI: 2.07–47.05).

Table 5 shows that the median amount of private income received, taxation paid and transfer income received by people with no health condition and people with depression only are similar. Amongst those with depression, the amount of private income received and the amount of tax paid per week declines with increasing numbers of co-morbidities. The amount of transfer income per week generally increases with increasing numbers of co-morbidities; with the exception of people with depression and two other health conditions who receive slightly less per week in transfer income than people with depression and one co-morbidity.

Once adjusted for age, sex and highest level of education attainment, Table 6 shows that people with depression and co-morbidities receive significantly less per week in private income than people with depression only. People with depression and one co-morbidity received 64% less per week in private income than people with depression only (–64%, 95% CI: –86%, –6%), and people with depression and two co-morbidities received 60% less than people with depression only (–60%, 95% CI: –81%, –14%).

Table 3
Odds ratio of being not in the labour force for those with depression and various numbers of co-morbidities compared to those with depression only, adjusted for age, sex and highest level of education, 2009.

Number of conditions	OR	95% CI	p-Value
Depression only	Reference		
Depression and one other health condition	3.37	1.12–10.11	0.0305
Depression and two other health conditions	3.12	1.19–8.19	0.0209
Depression and three or more other health conditions	4.31	1.74–10.68	0.0016

Table 4

Odds ratio of being not in the labour force for conditions co-morbid with depression compared with those with depression only, 45–64 year olds, 2009 – adjusted for age, sex and highest education.

Co-morbid conditions	N	Proportion NILF	Or of being NILF	95% CI	p-Value	% of Those with a co-morbidity ^a
Depression only	30 700	36%	Reference			–
Heart diseases	19 800	89%	24.85	1.60–386.96	0.0218	10%
Other diseases of the circulatory system	13 800	74%	12.58	1.81–87.68	0.0106	7%
Diabetes	20 900	88%	10.20	2.40–43.56	0.0017	11%
Diseases of the digestive system	12 800	75%	9.87	2.07–47.05	0.0041	7%
Diseases of the nervous system	33 900	75%	6.84	2.02–23.17	0.0020	17%
Injury/accident	43 000	72%	5.06	1.68–15.21	0.0039	22%
Arthritis and related disorders	85 500	77%	4.52	1.70–12.00	0.0025	44%
Mental and behavioural disorders	54 000	68%	4.34	1.50–12.54	0.0067	28%
Asthma	34 400	57%	3.25	0.97–10.86	0.0556	18%
Back problems (dorsopathies)	71 100	61%	2.66	1.06–6.72	0.0381	36%
Other diseases of the musculoskeletal system and connective tissue	20 000	51%	1.72	0.46–6.52	0.4235	10%

NILF = not in the labour force.

^a This column does not total to 100% as it is possible to have depression and multiple different co-morbid health conditions, i.e. depression and co-morbid condition pairs are not mutually exclusive.

Those with depression and three or more co-morbidities received private income 88% less than people with depression and no co-morbidities (–88%, 95% CI: –94%, –75%).

People with co-morbidities pay significantly less in tax per week. People with depression and one other health condition and people with depression and two other health conditions both pay 91% less in tax per week; those with depression and three or more co-morbidities pay 99% less in tax per week than people with depression only (–99%, 95% CI: –100%, –93%).

Once adjusted for age, sex and level of highest educational attainment, people with depression and one co-morbidity and people with depression and two co-morbidities do not receive a significantly different amount in weekly transfer income than people with depression only. People with depression and three co-morbidities receive over 1000% more in weekly transfer income than people with depression only (1014%, 95% CI: 200%, 4045%).

4. Discussion

The results of this study show that people with co-morbidities have lower rates of labour force participation than people with depression only. These findings flow through to the difference in the economic circumstances of people with depression only and depression and co-morbidities. People who have depression only receive significantly more in weekly private income and pay significantly more per week in tax than people with depression and co-morbidities. However, there was no significant difference in the amount of weekly transfer income received by people with depression only and people with depression and one or two co-morbidities.

People with certain co-morbid health conditions were found to have a higher likelihood of not being in the labour force. For example, people with depression and heart disease had twenty-five times the odds of being out of the labour force relative to people with depression only; similarly, people with depression and diabetes had ten times the odds of being out of the labour force relative to people with depression only. In other studies, it has been shown that people with heart disease, other diseases of the cardiovascular system, and diabetes have particularly poor financial outcomes when they are out of the labour force (Schofield et al., 2010b, 2011d).

Other studies that have looked at the impact of depression and co-morbidities on employment outcomes have found that back problems, arthritis and other physical conditions are associated with workforce absence (Löwe et al., 2004; Waghorn et al., 2006, 2008). However, these studies did not compare the relative impact of a range of co-morbidities as was done in this paper. Furthermore, to date no studies have looked at the economic consequences of co-morbidities upon people with depression.

There is a clear increase in the likelihood of being out of the labour force for those with depression and other co-morbid conditions compared to those who only have depression. Even having one co-morbid condition gives a person with depression a three-fold increase in their likelihood of being out of the labour force. When compared to those with back problems, having co-morbid conditions has a more pronounced impact of people with depression than people with back problems. It has been documented that there was no significant difference in the likelihood of being out of the labour force between those with back problems and one co-morbid health condition and those with back problems alone (Schofield et al., 2012a).

Table 5

Average and median^a weekly private income, transfer payments and tax liability by number of co-morbidities for the Australian population aged 45–64 years, 2009.

	Weekly private income (AU\$) received by individuals			Weekly tax (includes Medicare levy) (AU\$) paid by individuals			Weekly transfer income (AU\$) received by individuals		
	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
No health conditions	1327	35 891	1049	246	10 281	138	32	2142	0
Depression only	1268	21 455	1109	223	7597	147	99	3368	0
Depression and one other health condition	823	18 751	858	86	4948	0	184	5063	206
Depression and two other health conditions	695	16 174	769	55	3789	0	151	4386	149
Depression and three or more other health conditions	500	15 510	149	25	2175	0	212	2923	254

^a All results are in 2009 Australian dollars (AU).

Table 6
Differences in average weekly private income, transfer payments and tax liability amongst people with depression, adjusted for age group, sex and education, for the Australian population aged 45–64 years, 2009.

	Income			Tax liability (includes Medicare levy)			Transfer income		
	% Difference	95% CI	p-Value	% Difference	95% CI	p-Value	% Difference	95% CI	p-Value
Depression only		Reference			Reference			Reference	
Depression and one other health condition	–64%	–86%, –6%	0.0370	–91%	–99%, –30%	0.0212	350%	–11%, 2183%	0.0692
Depression and two other health conditions	–60%	–81%, –14%	0.0196	–91%	–99%, –42%	0.0117	176%	–54%, 1559%	0.2666
Depression and three or more other health conditions	–88%	–94%, –75%	<0.0001	–99%	–100%, –93%	<0.0001	1014%	200%, 4045%	0.0004

Depression has been identified as having a detrimental impact on the labour force participation of sufferers (Kessler and Frank, 1997; Kessler et al., 2001). Within the United States, more sick days are attributed to depression than any other health condition (Conti and Burton, 1994; Claxton et al., 1999); and within Australia, 57% of people aged 45–64 years with depression are out of the labour force (Schofield et al., 2008). Suffering from a mental illness may increase the likelihood of an individual retiring early from the workforce due to the limitations caused by the condition (Waghorn and Lloyd, 2005). The workforce absence that results from having depression has significant economic costs on the individuals who already bear the considerable health burden of the disease. Within Australia, people who are out of the labour force due to depression have lower income, lower wealth and lower savings than their counterparts, without depression who remained in the workforce (Schofield et al., 2011a,b,c). These studies, and others that have identified the link between depression and the loss of personal income associated with workforce absence (Smith et al., 1995; Patel and Knapp, 1998; Brazenor, 2002; Goetzel et al., 2003; Thomas and Morris, 2003; Department of Health and Ageing, 2007), do not take into consideration the impact of co-morbidities.

Having co-morbidities does decrease the likelihood of a person with depression participating in the labour force, and predictably these people do have lower private incomes. While this is likely to reduce personal living standards, it also has significant costs to governments by decreasing the amount of tax revenue being collected, and simultaneously increasing the amount of benefit payments being made. As such, it is important that patients with co-morbidities are identified as being particularly at risk of leaving the workforce and having lower personal incomes.

Conflict of interest

Nil.

Contributors

DS led the study and conceived the original idea; EC undertook the analysis and drafted the original manuscript; RS constructed the model; all authors contributed to the interpretation of the results, and edited the final manuscript.

Role of funding source

The study sponsors played no part in the study design, data analysis and interpretation, report writing, or the decision to publish the study.

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How depression and other mental health problems can affect future living standards of those out of the labour force

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Objectives: To estimate the extent to which those who exit the workforce early due to mental health problems have less savings by the time they reach retirement age.

Methods: Using *Health&WealthMOD* – a microsimulation model of Australians aged 45–64 years that predicts accumulated savings at age 65, regression models were used to analyse the differences between the projected savings and the retirement incomes of people at age 65 for those currently working with no chronic condition, and people not in the labour force due to mental health problems.

Results: Females who retire early due to depression have a median value of total savings by the time they are 65 of \$300. For those with other mental health problems the median figure was \$0. This is far lower than the median value of \$227,900 for females with no chronic condition who remained employed full-time. Males showed similar differences. Both males and females who were out of the labour force due to depression or other mental health problems had at least 97% (95%CI: –99.9% to –68.7%) less savings and retirement income by age 65 than those who remained employed full-time.

Conclusions: People who retire from the labour force early due to mental health problems will face long term financial disadvantage compared to people who are able to remain in employment.

Keywords: aging; early retirement; economic costs; savings

Introduction

It is well documented within numerous countries that people with a depression and other mental health problem are less likely to participate in the labour force (Davies & Drummond, 1994; Goetzel, Hawkins, Ozminkowski, & Wang, 2003; Knapp, 1997; Mental Health Council of Australia, 2007; Patel & Knapp, 1998; Schofield, Shrestha, Passey, Earnest, & Fletcher, 2008). Due to these low labour force participation rates in their working years, people who suffer from mental health problems may be more prone to poverty in retirement due to lack of accumulated savings (Waghorn & Lloyd, 2005). In Australia, people with mental health problems are recognised as being some of the most socially marginalised and economically disadvantaged members of the community (Council of Australian Governments, 2006). The costs to both individuals and to government, in terms of lost income, lost taxation revenue and increased welfare payments are a significant part of the indirect costs of mental health problems (Schofield et al., under review). Thus, mental health problems can lead to a lifetime of social and economic marginalisation (Waghorn & Lloyd, 2005).

Both within Australia and internationally, most studies of the indirect costs of mental health problems have focused on the immediate impact of the illness, that is, how mental health problems reduces labour force participation and the reduction of the individual's income at that time (Boston Consulting Group, 2006; Goetzel et al., 2003; Patel & Knapp, 1998; Thomas & Morris, 2003). Specifically, in Australia it has been shown that older workers who retire early due to depression and other mental health problems have 78% and 93% less wealth, respectively, than people who remain employed (Schofield et al., 2011).

However, reducing labour force participation or retiring early due to depression or other mental health problems has been noted to have the potential to reduce living standards for the rest of these individuals' lives (Waghorn & Lloyd, 2005). Being out of the labour force during the 45–64 age period will impact upon an individual's ability to accumulate savings to finance their standards of living. The 45–64 year age group is the time of the life cycle when most of the 'lifetime savings' occurs (Miles, 1999), which is used to finance future retirement periods. These savings are seen to be increasingly important as life expectancy is

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increasing, and so personal savings are required to support living standards over longer time periods (Bloom & Canning, 2000; Sala-i-Martin, 2005; Zhang & Zhang, 2005).

This article will investigate the impact of early retirement due to depression and other mental health problems on the future retirement savings of Australians aged 45–64 years in 2009, by estimating the amount of savings individuals will have accumulated by the time they reach 65 years. This article will estimate the extent to which those who exit the workforce early due to depression and other mental health problems will have less savings by the time they reach traditional retirement age of 65 and the impact this will have on their retirement finances and potential living standards.

Methods

The results of this study are drawn from *Health&WealthMOD* – Australia's first microsimulation model of health and disability and the associated impacts on labour force participation, personal income, savings and government revenue and expenditure. This model was specifically designed to measure the economic impacts of ill health on Australian workers aged 45 to 64 years; information which was previously unavailable.

Health&WealthMOD was built on the unit record data of the 2003 Survey of Disability, Ageing and Carers, a nationally representative survey conducted by the Australian Bureau of Statistics (Australian Bureau of Statistics, 2005) and the output data of a microsimulation model of income and wealth, STINMOD, developed by the National Centre for Social and Economic Modelling for the Australian Government (Lambert, Percival, Schofield, & Paul, 1994).

The Survey of Disability, Ageing and Carers provides detailed self-reported data on socio-demographic status, labour force participation and health and disability status (such as chronic conditions) for each individual in *Health&WealthMOD*. Respondent's health conditions were classified by the Australian Bureau of Statistics using ICD10 codes. People who reported their main long term health condition as depression/mood affective disorders (excluding post-natal depression) (ICD codes: F30-39) were considered to have 'depression'. Those who reported their main long term health condition as mental and behavioural disorders (ICD code: F00-99), dementia (ICD codes: F01-03), schizophrenia (ICD codes: F20), phobic and anxiety disorders (ICD codes: F40-41), nervous tension/stress (ICD codes: 43), mental retardation/intellectual disability (ICD code: F70-79), attention deficit disorder/hyperactivity (ICD codes: F90) and other mental and behavioural disorders (ICD codes: F07, F51-52, F54-55, F59, F99) were categorised as having 'other mental health problems' for this study.

The weighted number of individuals who reported having depression as their main long-term health condition in 2003 was 67,161 individuals, or 1.4% of the 45–64 year population; and 132,186 individuals, or 2.8% of the 45–64 years population reported having other mental health problems. Depression was analysed separately from other mental health problems.

The 8864 individual records for those aged 45–64 years and living in private accommodation were extracted from the 2003 SDAC to develop the base data file of *Health&WealthMOD*. The SDAC had a high response rate of 89% (Australian Bureau of Statistics, 2003). This base population was then linked with STINMOD, which provided a range of additional, detailed economic variables, such as income from various sources, tax liability, superannuation, shares, bank deposits and the individual share of equity in home and other properties. The original 2003 SDAC data were weighted by the Australian Bureau of Statistics to represent the whole Australian population in 2003 by broad population variables such as age and sex. The data was then updated to reflect 2009 to account for demographic, labour force, earnings growth and other changes between 2003 and 2009. Further details of *Health&WealthMOD* are provided in Schofield et al. (2009).

The focus of the *Health&WealthMOD* simulation was to estimate the level of retirement savings that will be available to an individual at age 65 and the income this would provide by converting superannuation¹ and other savings into an income stream. During the simulation stage of the model each person in the dataset was processed individually for each year until they would be 65 years of age. For each year until age 65 an annual calculation of earnings, contributions to superannuation and changes in asset values and savings was simulated. Only the change in value of cash deposits, shares, superannuation, investment properties and debt have been included. Other assets such as vehicles, home contents or the family home are not included as it is unlikely these will be used to finance retirement.²

To estimate savings and income for each person to the age of 65 years, respondents were assumed to continue earning at the same level, with an adjustment to increase earnings in line with long term average earnings growth rate less inflation (the real earnings growth rate). This rate was estimated by the change in Average Weekly Ordinary Times Earnings (AWOTE) trend data between May 1989 and May 2009 (Australian Bureau of Statistics, 2009b) and inflation as measured by the change in the Consumer Price Index (CPI) between June 1989 and June 2009 (Australian Bureau of Statistics, 2009c). The real earnings growth rate was estimated at 1.60% per annum using this calculation.

Growth was calculated for superannuation, housing, shares and cash. The superannuation return used in the model is derived from APRA annual superannuation returns over the period 1999 to 2008

(as measured by superratings.com.au (SR50 Balanced (60-76) Index)). This gives an average annual return of 5.2%. The modelling of superannuation calculates both the compulsory Superannuation Guarantee (SG) contribution and a voluntary superannuation contribution. The SG legislation states that employers are not obligated to make SG contributions if an employee earns less than \$450 per month and this is included in the modelling. If a person has wages above this level then a SG contribution rate of 9% of earnings is added to the superannuation balance. To grow this fund balance to age 65 years, the occurrence and level of voluntary contributions were modelled based on a person's age and sex. The probability of making a voluntary contribution increases with age and males are more likely to make a contribution than a female. The level of voluntary contribution is a percentage of earnings and increases with age.

The growth rate for investment housing was 5.97% derived from the Housing index (based on ABS House Price Index for eight capital cities tables 1 and 9 from June 1989 to June 2009 (Australian Bureau of Statistics, 2009d)). The growth rate for shares was 4.88% derived from the Australian Stock exchange All Ordinaries Index June 1989–June 2009 (Reserve Bank of Australia, 2009a). For cash deposits, two different rates were used, a low cash rate for deposits below \$5000 and the high cash rate for deposits above this level. The low rate uses the RBA Bulletin (Table F04) to average interest rates paid by banks on a transaction account of \$5000 over the last 10 years, with the average being 0.03%. For cash deposits over \$5000, the average interest rate on a three-month bank term deposit of \$10,000 was used (Reserve Bank of Australia, 2009b). This produced an average return of 3.8% over the last 10 years. As no growth rate is available for business assets, it is assumed business assets grow at the high cash rate.

The 20-year average CPI (Australian Bureau of Statistics, 2009c) was used as an indicator of inflation and subtracted from the average growth rates to give real growth rates. All dollar values are constant 2009 Australian dollars.

To estimate the impact that retirement savings would have on the living standard of a person in retirement, it was assumed that respondents would convert all their superannuation, cash, shares and other properties into cash, and invest it in an income stream such as lifetime annuity. The income stream is designed to be drawn down evenly over the duration of their life expectancy. Life expectancy is derived from the Australian Life Tables for a person aged 65 in 2007 (Australian Bureau of Statistics, 2009a). The life expectancy of a male aged 65 in 2007 is 18.5 years and a female of this age is 21.6 years. This means that a female will have withdrawn all of their savings (including interest) by the age of 87 (65 plus 22 years) and males by age of 84 years (65 plus 19 years).

Statistical methods

Initial descriptive analysis was undertaken for individuals who were employed full time with no health condition, employed part time with no health condition, not in the labour force due to depression and not in the labour force due to other mental health problems. This determined the numbers and proportion of individuals in each of these groups who were expected to have any savings at age 65, and for those who would have any savings what the mean and median values of these savings would be. Due to the skewed nature of the data only the median values of savings at age 65 are reported in the text, whereas, both median and means are reported in the table.

Two multiple linear regression models were used to analyse the differences between the savings and the annuity of people working full-time with no chronic condition, persons working part-time with no chronic condition and people not in the labour force due to depression and other mental health problems. One multiple linear regression model was undertaken on the log of the value of savings and the other for the log value of income derived from the purchase of an annuity at age 65. Full-time work with no chronic condition was used as the reference group.

These multiple regression analyses were undertaken on log-transformed data in order to satisfy the assumptions of linear regression analysis, and regression diagnostics confirmed that the assumptions were reasonably satisfied. In order to estimate the results for the entire Australian population of the 45–64 years age group, we performed weighted analysis using weights that represented the number of similar individuals in the Australian population. All analyses were undertaken using SAS V9.2 (SAS Institute Inc., Cary, NC, USA). All statistical tests were two sided with the significance level set at 5%. All results are presented with their 95% confidence intervals.

Sensitivity analysis

A potential weakness of this study is the low number of respondents who are out of the labour force due to depression or other mental health problems (only 97 respondents out of 8864). In order to determine if any errors were created due to the low number of sample respondents, a sensitivity analysis was undertaken by including all individuals who had depression or other mental health problems and were not in the labour force – regardless of their stated reason for not being in the labour force. The results for assessing the proportion of individuals who had any savings at age 65, and the value of these savings was repeated using this group.

Results

There were 8864 people living in private accommodation surveyed in the Survey of Disability, Ageing and

Carers, who were aged between 45 and 64 years and had valid savings responses (total savings equal to, or more than \$0). Of these, only those individuals who were employed full time and part time with no health condition, or were out of the labour force due to depression or other mental health problems were included in this study. There were 43 respondents who were out of the labour force due to depression and 54 who were out of the labour force due to other mental health problems and were aged 45–64 years in 2009. Once weighted these respondents represent 25,236 and 26,924 individuals in the Australian population, respectively.

Among both males and females a greater percentage of those out of the labour force due to either depression or other mental health problems will have no accumulated savings at age 65, compared to those who were healthy and in the labour force at the base year, 2009 (Table 1). Almost 100%, of females who were employed full time will have accumulated some savings by the time they reach age 65; whereas as little as 72% of females who were out of the labour force due to their depression, and 53% with other mental health problems will have done so. Proportionally, more women than men are likely to have no savings at age 65 if they retire from the labour force early due to both depression and other mental health problems (Table 1). This gender difference is greater for those with other mental health problems.

Reflecting the greater proportion of people who were out of the labour force due to depression or other mental health problems being expected to have no savings by age 65, these groups of the population will also have far lower median value total savings. When savings at age 65 are converted into an annuity at age 65, there is a corresponding marked reduction in the economic resources available as retirement income compared to those who were employed full time or part time.

Females who retired from the labour force early due to depression are expected to have a median value of total savings by the time they are 65 of only \$300.³ For those retiring early with other mental health problems the median figure was \$1. This is far lower than the expected median value of savings for females who remained in the labour force full time, with \$227,900 of savings at age 65. The corresponding resultant median annuity these savings would provide as an income stream in retirement is \$11,500 per annum (pa) for those in the labour force full time, and only \$0pa for those out of the labour force due to their depression and \$0 for those retired due to other mental health problems. Males out of the labour force due to depression or other mental health problems will also have less in accumulated savings by age 65 than those who were employed full time and those who were employed part time (Table 1).

While the value of total savings at age 65 for those who were employed part time is consistently less than those employed full time for males and females, the

value of their savings is still considerably higher than that of those out of the labour force due to depression or other mental health problems. Females who were out of the labour force due to their depression or other mental health problems accumulated less savings by age 65 than males who were also out of the labour force due to the same conditions, and as such, the females had correspondingly lower annuity value.

The sensitivity analysis shows the results of the descriptive analysis (Table 2) after including those with depression and other mental health problems who are out of the labour force due to any reason (not just those who are out of the labour force due to their ill health – in this case depression and other mental health problems). Table 2 shows that a smaller proportion of those who are out of the labour force with depression and other mental illness will have any savings by age 65 than those who are employed full time with no condition. Those who are out of the labour force and have depression and other mental health problems also have far lower expected median values of savings at age 65 than those who are employed full-time or part-time with no health condition.

The multiple regression models of total savings and annuity show (Table 3) that, after adjusting for age and education, those who were out of the labour force due to depression or other mental health problems will have significantly lower savings at age 65 than those who remained in the labour force full time. Males who were out of the labour force due to depression will have 97.9% (95%CI: –99.9% to –68.7%) less savings and 93.4% less annuity (95%CI: –99.5 to –73.5) by age 65 than those who remained in the labour force full time with no health condition. Females who were out of the labour force due to depression will have 99.5% (95%CI: –100.0% to –92.7%) less savings and 98.8% less annuity (95%CI: –99.8 to –90.3) by age 65 than those who remained in the labour force full time with no health condition. Males and females who were out of the labour force due to other mental health conditions also have significantly lower savings and annuity compared to those who were employed full time (after adjusting for age and education). Those who were employed part time will also have significantly lower savings and annuity than those who were employed full time; however, the percentage difference was not as great.

Discussion

People who retire from the labour force early due to depression and other mental health problems will face long-term financial disadvantage compared to people who are able to remain in full time employment. Those out of the labour force will accumulate a significantly lower amount of savings by the time they reach the traditional retirement age of 65, and thus are only able to purchase a significantly lower annuity to finance their retirement years. Indeed, for females who retire

Table 1. Comparison of the total savings and annuity at age 65 for people with no chronic condition in full time and part time employment, and those who are not in the labour force due to depression and other mental health problems.

	Value of savings at age 65					Value of annuity at age 65				
	Total population	N	Total population with any savings at age 65	% of total population with any savings at age 65	Mean	SD	Median	Mean	SD	Median
<i>Male</i>										
Employed full time no condition	950,921	1551	946,557	99.5	475,600	598,200	317,300	27,500	34,600	18,300
Employed part time no condition	83,503	167	83,159	99.6	354,800	495,000	174,000	20,500	28,600	10,100
Not in labour force due to depression	12,530	16	10,110	80.7	70,900	98,500	37,400	4000	5700	2200
Not in labour force due to other mental health problems	21,844	30	19,904	91.1	69,000	119,000	14,600	4000	6900	900
<i>Female</i>										
Employed full time no condition	464,993	732	463,101	99.6	353,900	359,500	227,900	18,000	18,200	11,500
Employed part time no condition	339,205	618	331,688	97.8	240,600	326,900	126,100	12,200	16,500	6400
Not in labour force due to depression	12,706	27	9686	72.2	70,400	94,700	300	3600	4800	0
Not in labour force due to other mental health problems	13,370	24	7020	52.5	37,100	56,100	0	1900	2800	0

Table 2. Sensitivity analysis – comparison of the total savings and annuity at age 65 for people with no chronic condition in full time and part time employment, and those who are not in the labour force (for any reason) and have depression and other mental health problems.

	Total population	N	Total population with any savings at age 65	% of total population with any savings at age 65	Value of savings at age 65			Value of annuity at age 65		
					Mean	SD	Median	Mean	SD	Median
<i>Male</i>										
Employed full time no condition	950,921	1551	946,557	99.5	475,600	598,200	317,300	27,500	34,600	18,300
Employed part time no condition	83,503	167	83,159	99.6	354,800	495,000	174,000	20,500	28,600	10,100
Not in labour force has depression	21,064	29	18,074	85.8	113,700	142,400	58,700	6600	8200	3400
Not in labour force has mental health problems	33,555	51	29,260	87.2	113,400	280,700	5300	6600	16,200	300
<i>Female</i>										
Employed full time no condition	464,993	732	463,101	99.6	353,900	359,500	227,900	18,000	18,200	11,500
Employed part time no condition	339,205	618	331,688	97.8	240,600	326,900	126,100	12,200	16,500	6400
Not in labour force has depression	26,315	70	30,162	71.1	115,000	445,700	400	5800	22,500	0
Not in labour force due has mental health problems	42,453	49	17,712	67.3	105,300	196,100	1400	5300	9900	100

Table 3. Percentage difference of total savings and annuity for those working part time or not in the labour force due to depression or other mental health problems compared to those working full time.

	Total savings (cash, super, shares, other property)				Annuity			
	% difference	<i>p</i> -value	95% CI		% difference	<i>p</i> -value	95% CI	
<i>Male</i>								
Employed full time no condition	0.0		0.00	0.00	0.00		0.00	0.00
Employed part time no condition	-51.8	0.0018	-69.4	-23.9	-52.0	0.0014	-69.3	-24.9
Not in labour force due to depression	-97.9	0.0051	-99.9	-68.7	-93.4	0.0011	-99.5	-73.5
Not in labour force due to other mental health problems	-99.2	<0.0001	-99.9	-92.1	-98.7	<0.0001	-99.8	-90.0
<i>Female</i>								
Employed full time no condition	0.00		0.00	0.0	0.0		0.00	0.0
Employed part time no condition	-54.5	<0.0001	-66.1	-39.1	-52.1	<0.0001	-62.5	-38.8
Not in labour force due to depression	-99.5	<0.0001	-100.0	-92.7	-98.8	<0.0001	-99.8	-90.3
Not in labour force due to other mental health problems	-99.9	<0.0001	-100.0	-98.9	-99.7	<0.0001	-100.0	-97.3

early due to mental health problems other than depression the median value of annuity available to them at age 65 is \$0. This confirms the view that mental health problems lead to a lifetime of economic, as well as social disadvantage (Waghorn & Lloyd, 2005).

This study does have a number of limitations that must be considered. The results are based on respondents' self-reported health status, rather than medically diagnosed. This is considered to produce valid results (Wannamethee & Shaper, 1991), but the potential for bias cannot be ignored. Second, it is unknown what the economic status of those who are now retired due to mental health problems were before the onset of the disease – this is a limitation of the cross-sectional data used. However, it has been noted that early retirement due to mental health problems tend to occur at earlier ages than for other conditions (McDaid, 2008), and as such would have a greater economic impact.

Without estimating the dollar value, other studies have concluded that mental health problems will have a large impact on patients and their families' lifestyles and financial situation (Davies & Drummond, 1994; Toder & Solanki, 1999). The findings of this study support this – but go further to conclude that not only will early retirement due to mental health problems limit the immediate income available to individuals, but will also reduce their long-term financial capacity by reducing their retirement savings. This study also estimates the extent to which people who retire early due to mental health problems are financially disadvantaged compared to those in the labour force.

Studies in the United States have looked at the impact of illness in general of savings. One study found that 38% of patients aged 45–64 lost all or most of their savings due to illness (Covinsky et al., 1994) and another found similar results with 36.7% of families losing most of their savings as the result of having a family member critically ill for 12 months or more

(Swoboda & Lipsett, 2002). While these results are not specifically for those with mental health problems, it shows that other international studies have found similar results regarding health and savings and thus the findings of this study may be of particular international relevance.

Caner and Wolf recognise that loss of income due to mental health problems related retirement is likely to leave people more dependent upon assets and savings, that is, their accumulated wealth to maintain their living standards before traditional retirement age (Caner & Wolff, 2004). Thus, mental health problems is likely to lead to a depletion of retirement savings leaving individuals and their families in fragile financial situations, with a reduced income stream to live on in retirement (Mills & Shillcutt, 2004).

Without adequate private savings, individuals may face dependency on government welfare payments, particularly as life expectancies increase and savings must cover longer periods of time (Bloom & Canning, 2000; Shea, Miles, & Hayward, 1996). However, it is documented that those who are dependent upon welfare as a primary source of income often have poor living standards and quality of life (Kelly, 2009; Saunders, 2005). Indeed, those who rely on the single aged pension may be below the poverty line, as it is less than the 50% median equivalence level income in Australia (Headey & Warren, 2008). With an ageing population living longer, greater expenditure on government support will be required for the elderly to maintain living standards in the future if they cannot finance their retirement periods from their own accumulated wealth (Heller, 1989).

Supporting elderly people with mental health problems in retirement will place a large burden upon government finances. Even at current levels of welfare, payments to people with mental health problems the cost which falls to the Australian government is far larger than their spending on mental health

services and prevention (Boston Consulting Group, 2006). There is thus an additional argument for governments to invest in mental health services and prevention and support measures, to stem these costs and improve the quality of life of people suffering from these conditions (Andrews, Hall, Teesson, & Henderson, 1999). Governments would benefit from reduction in the prevalence and severity of mental health problems through increased taxation (such as income and payroll tax), reduced welfare payments and reduced expenditure on other services (medical, justice, housing, etc) (Boston Consulting Group, 2006). Moving individuals back into the labour force through greater access to appropriate treatment, primary prevention strategies and participation assistance strategies would help avoid the poor living standards and low financial resources documented in this study. It will be those who have been able to maximise their labour force participation who will be more likely to have higher incomes and better living standards during their retirement (Australian Government, 2004).

The Council of Australian Government's *National Action Plan on Mental Health 2006–2011* is based upon a commitment to prevention and early intervention, which may translate into increased labour force participation (Council of Australian Governments, 2006). Those with mental health problems are often willing and skilled workers and employment can assist them maintain a connection with the community (Mental Health Council of Australia, 2007). The United Kingdom has a similar policy regarding prevention and early treatment of mental illness. The *New Horizons: A shared vision for mental health* developed by the UK Department of Health recognises that intervention and prevention will have economic benefits (Mental Health Division Department of Health, 2009). This study shows the economic benefits of increased savings for the individual, that the prevention called for in these plans may have.

Due to increased life expectancies, the number of years spent in retirement is increasing. Current and previous Australian governments have specifically encouraged greater self reliance for those with a mental health problem. In general, the greater self-reliance comes from continuing participation in the labour force. Those that are forced to leave the labour force early due to mental health problems are clearly less able to be self-reliant. They have fewer years in which to save from their income and they have fewer years in which their employer is contributing to their superannuation. They may also need to drawdown on their retirement savings earlier than expected to support themselves during their period of illness.

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Notes

1. 'Superannuation' is the Australian term for private retirement pension plans, compulsory contributions are made to superannuation by a person's employer and voluntarily contributions can be made by the employee.
2. The proportion of each asset that is owned by the subject individual was recorded in the survey (i.e. an asset may be jointly owned by a household or family) and this value was used as the value of assets attributable to the individual.
3. All dollar values are in 2009 Australian dollars.

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Quantifying the effect of early retirement on the wealth of individuals with depression or other mental illness

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Background

In addition to the health burden caused by mental illnesses, these conditions contribute to economic disadvantage because of their impact on labour force participation.

Aims

To quantify the cost of lost savings and wealth to Australians aged 45–64 who retire from the labour force early because of depression or other mental illness.

Method

Cross-sectional analysis of the base population of Health&WealthMOD, a microsimulation model built on data from the Australian Bureau of Statistics' Survey of Disability, Ageing and Carers and STINMOD, an income and savings microsimulation model.

Results

People who are not part of the labour force because of

depression or other mental illness have 78% (95% CI 92.2–37.1) and 93% (95% CI 98.4–70.5) less wealth accumulated respectively, compared with people of the same age, gender and education who are in the labour force with no chronic health condition. People who are out of the labour force as a result of depression or other mental illness are also more likely to have the wealth that they do have in cash assets, rather than higher-growth assets such as superannuation, home equity and other financial investments.

Conclusions

This lower accumulated wealth is likely to result in lower living standards for these individuals in the future. This will compound the impact of their condition on their health and quality of life, and put a large financial burden on the state as a result of the need to provide financial assistance for these individuals.

Declaration of interest

None.

The large direct medical costs of mental illness are generally attributed to the condition's high prevalence rates.^{1,2} Mental illness prevalence rates of one in four people are not uncommon in many countries.^{2,3} For individuals with depression and other mental illness, in addition to the impact on health and quality of life these conditions contribute to economic disadvantage because of the impact on labour force participation.

The labour force participation rate for people with a mental illness is acknowledged to generally be poor.⁴ A recent study estimated that 51% of Australians aged 45–64 with a mental illness and 53% of those with depression are not part of the workforce, significantly more than the 17% of 45–64 year olds with no chronic health conditions who are not part of the labour force.⁵ The impact of this low rate of labour force participation is reflected in the incomes of those with a mental illness; they have 37% lower average weekly incomes than people without a chronic illness (details available from the author on request). This reduction in labour force participation and income can have a lifetime impact.

Early retirement may leave a large number of mentally ill people with reduced savings or accumulated wealth to finance their retirement years. The impact of the loss of savings is particularly significant for those aged 45–64, as this is the age bracket where most lifetime savings and wealth accumulation occurs.⁶ This wealth is generally required to finance retirement, and as life expectancy increases, this wealth will have to support longer periods in retirement.^{7–9}

Although there have been studies that link mental illness with reduced incomes,^{1,2,10} there is little published research assessing the impact of early retirement owing to mental illness on wealth

or savings. Indeed, there has been little research on the link between early retirement due to any illness and lost savings and wealth, with just a handful of studies examining the relationship between general health status and wealth.^{11,12} This study uses the recently developed Health&WealthMOD – an up-to-date microsimulation model of health, employment, income, and wealth – to quantify the cost of lost savings and wealth on people aged 45–64 who retire from the labour force early because of mental illness.

Method

Data

For this study the output data-set of a microsimulation model, Health&WealthMOD, was analysed. Health&WealthMOD was specifically designed to measure the economic impact of ill health on Australian workers aged 45 to 64 years. It is Australia's first microsimulation model of health and its associated impact on labour force participation, personal income and wealth and government revenue. Health&WealthMOD was built on the unit record data of the 2003 Survey of Disability, Ageing and Carers conducted by the Australian Bureau of Statistics¹³ and the output data of a microsimulation model of income and wealth, STINMOD, developed by the National Centre for Social and Economic Modelling for the Australian Government.¹⁴

The Survey of Disability, Ageing and Carers provides detailed self-reported data on sociodemographic status, labour force participation and health and disability status (such as chronic conditions) for each individual in Health&WealthMOD.

Respondents' health conditions were classified by the Australian Bureau of Statistics using ICD-10¹⁵ codes. People who reported their main long-term health condition as depression/mood/affective disorders (excluding postnatal depression) (ICD code F30–39) were considered to have 'depression'. Those who reported their main long-term health condition as mental and behavioural disorders, dementia, schizophrenia, phobic and anxiety disorders, nervous tension/stress, attention-deficit disorder/hyperactivity, and other mental and behavioural disorders (ICD codes F00–29, F40–99) were categorised as 'other mental illness' for this study. Depression was analysed separately from other mental illnesses owing to its high prevalence in the population.

In this study those who reported themselves as being out of the labour force because of their illness and listed depression as their main condition were considered to be out of the labour force because of depression. Those who reported being out of the labour force because of their illness and listed one of the other mental illness conditions as their main condition were deemed to be out of the labour force as a result of other mental illnesses. All people who are out of the labour force, regardless of the reason for it, are assumed to be permanently retired.

Economic information such as income and wealth were imputed from STINMOD. The imputation was carried out by synthetically matching person records with similar socio-demographic and labour force participation characteristics in the two data-sets. Synthetic matching was based on nine matching variables that were common to both data-sets and strongly related to income: gender, income unit type, type of government pension/support, income quintile, age group, labour force status, hours worked per week, highest educational qualification and home ownership. The data were reweighted to represent the 2009 population and up-rated to reflect the demographic, labour force, income and wealth, and other changes that had occurred between 2003 and 2009. The development of Health&WealthMOD is explained in detail elsewhere (details available from the author on request).

Statistical methods

Logistic regression models were used to compare the odds of owning wealth by those who reported being out of the labour force owing to depression and other mental illness (that is, people who were out of the labour force owing to ill health, and identified depression or mental illness as their main health condition) with those who were in full-time work and had no chronic condition. Multiple linear regression models of the log of the value of wealth were used to analyse the differences between the wealth of people working full time with no chronic condition, people working part time with no chronic condition and people not in the labour force because of depression and other mental illness. Full-time work with no chronic condition was used as the reference group. Four different classes of wealth were included – cash, superannuation, value of owner-occupied home and value of other financial investments – as well as the total value of an individual's wealth, which was calculated as the sum of all the above four classes of wealth, and analysed in this paper.

Analyses were separately conducted for all four different classes of wealth and total wealth in both the logistic regression and multiple regression models, adjusted for age group, gender and highest education. Multiple regression analyses were undertaken on log-transformed data in order to satisfy the assumptions of linear regression analysis, and regression diagnostics confirmed that the assumptions were reasonably satisfied. A conservative measure of the impact of retirement as a result of depression or other mental illness on the wealth of individuals was used: only including individuals with depression or another mental illness

and who stated that their reason for being out of the labour force was their ill health. A sensitivity analysis was undertaken by including all individuals who had depression or other mental illness and were not in the labour force – regardless of their stated reason for not being in the labour force. The results for assessing the value of total wealth were repeated using this measure.

In order to estimate the results for the entire Australian population in the 45–64 years age group, we performed weighted analysis using weights that represented the number of similar individuals in the Australian population. All analyses were undertaken using SAS V9.2 for Windows. All statistical tests were two sided with the significance level set at 5%. All results are presented with their 95% confidence intervals.

Results

Of the 8864 people living in private accommodation and aged between 45 and 64 years surveyed in the Survey of Disability, Ageing and Carers, there were 43 individuals who were not in the labour force because of depression, and 56 individuals who were not in the labour force because of other mental illnesses. Once weighted, there are 25 236 individuals within the Australian population aged 45 to 64 years who were out of the labour force as a result of depression and 39 159 individuals who were out of the labour force owing to other mental illness (Table 1). Those who were not in the labour force owing to depression and other mental illness were only 0.09 times (95% CI 0.02–0.41) and 0.03 times (95% CI 0.01–0.10) as likely to have accumulated any type of wealth than those who were employed full time and had no ill health.

Among those who had accumulated any wealth, the median value of this wealth for those who were out of the labour force owing to mental illness other than depression was AU\$112 315 (£61 773), which is around half of that for those who are in the labour force either part time or full time with no condition (Table 2). (In 2009, AU\$1 = approximately £0.55. In 2009, the purchasing power parity was 1.46 for Australia and 0.619 for the UK with the USA being 1. The purchasing power parity represents the number of monetary units needed to buy the same representative basket of consumer goods and services.¹⁶) The median value of accumulated wealth for those not in the labour force as a result of depression was AU\$212 809 (£117 045), which is larger than the median value of wealth for those out of the labour force because of other mental illness, and only slightly less than the value of total wealth of those in the labour force full time (\$255 199, equivalent to £140 359) and part time (\$225 652, equivalent to £124 109) (Table 2).

Individuals not in the labour force owing to depression or other mental illness who had accumulated some wealth were more likely to have this in cash and were less likely to have other forms of wealth assets (superannuation, home equity and other financial assets) than those in full-time employment but without a chronic condition (Table 3). In particular, they were far less likely to have wealth in superannuation: 0.03 times as likely (95% CI 0.02–0.08), or 97% less likely to have accumulated wealth in this asset class for those with depression and 0.02 times as likely (95% CI 0.01–0.05) or 98% less likely for those with other mental illnesses, compared with those in full-time employment without a chronic condition.

Figure 1 shows that within the population, there were 70 360 people who had depression or another form of mental illness who were not in the labour force but stated that the reason for this was factors other than their ill health. The results of a sensitivity analysis including these people are shown in Table 4. When all people with depression or other mental illness who are not in the labour force regardless of their reason for this are included

Table 1 Age and gender distribution of those out of the labour force because of depression and other mental illnesses in the Australian population aged 45–64, 2009

Gender	Age, years				Total
	45–49	50–54	55–59	60–64	
Not in the labour force owing to depression					
Male	3556	2854	3700	2420	12 530
Female	5049	2572	1461	3624	12 706
Not in the labour force owing to other mental illness					
Male	8189	7405	6511	3684	25 789
Female	4884	3627	2910	1949	13 370

Table 2 Value of, and odds ratio of having, all wealth assets for those with depression and other mental illness who are out of the labour force owing to ill health and those who are in full-time and part-time employment with no condition, for people with any wealth

Total wealth	Those with any wealth				Value of wealth ^e			
	Population with any wealth ^a	<i>n</i> ^b	% ^c	OR (95% CI) of having wealth ^d	<i>P</i>	Mean value of wealth, AU\$ (£)	s.d.	Median value of wealth, AU\$ (£)
Employed full time, no condition	1 403 163	2256	99.7	1		398 098 (218 954)	490 038	255 199 (140 359)
Employed part time, no condition	417 098	774	99.8	1.92 (0.42–8.75)	0.4018	360 071 (198 039)	405 432	225 652 (124 109)
Not in labour force owing to depression	24 390	40	96.7	0.09 (0.02–0.41)	<0.05	236 727 (133 200)	321 339	212 809 (117 045)
Not in labour force owing to other mental illness	35 329	51	90.2	0.03 (0.01–0.10)	<0.0001	148 771 (81 824)	176 799	112 315 (61 773)

a. All Australians aged 45 to 64 who have any wealth.
b. The number of records in Health&WealthMOD of those aged 45–64 who have any wealth.
c. The proportion of individuals in the 45- to 64-year-old population who have any wealth.
d. Adjusted for age, gender and education.
e. In 2009 Australia dollars (AU\$): 1 AU\$ = approximately £0.55.

in the analysis, the median amount of wealth for those with other mental illness is AU\$112 315 (£61 773), and for those with depression the median value is AU\$212 695 (£116 982). The odds, or chance, of having any wealth for those out of the labour force and reporting other mental illness is 0.03 (95% CI 0.01–0.08) and for those out of the labour force with depression the odds are 0.03 (95% CI 0.01–0.12), times the likelihood of having wealth for those in the labour force full time with no chronic condition.

These results are very similar to those in Table 2 for those who have depression or other mental illness who are out of the labour force and state that the reason for this is their ill health. This indicates that the more conservative measure of the impact of retirement because of depression and other mental illness on the wealth of individuals, given in Table 2, is likely to be accurate. Regardless of the measure used there is still a significant difference between the likelihood of having any accumulated wealth for those out of the labour force with mental ill health and for those in the labour force with no ill health.

Of those who reported having any savings, the multiple regression model shows that, compared with those employed full time with no condition, individuals who are not in the labour force owing to depression and other mental illness have on average significantly less wealth overall after adjusting for age, gender and education (Table 4). On average, those who are not in the labour force because of depression have 78% (95% CI 92.17–37.09) less wealth than those who are employed full time with no condition (Table 5). Those who are out of the labour force because of other mental illness have 93% (95% CI 98.44–70.45) less wealth than those in the labour force full time.

Discussion

Main finding

This study has quantified the amount of wealth held by people who have retired from the labour force as a result of depression

or other mental illness and also the difference in this amount compared with those who are in the labour force with no chronic ill health. Those out of the labour force because of depression or other mental illness have significantly less wealth. These individuals are also more likely to have the wealth that they do have in cash assets, rather than higher-growth assets such as superannuation, home equity and other financial investments.

The comparatively few individuals out of the labour force because of depression and other mental illness who have any wealth in superannuation is a reflection of the impact of the lower labour force participation rates for these individuals. The impact of depression and other mental illness on labour force participation is significant – those with depression are 6.71 times more likely to be out of the labour force, and those with other mental illness are 5.71 times more likely to be out of the labour force than those with no health condition.⁵ (Although depressive episodes do fluctuate, it has been found that 44% of people with depression have reoccurring episodes, and individuals with depression spend as much as 19% of their time in a depressive state¹⁷ – which indicates why depression, although a fluctuating condition, does cause labour force disruption.) Being absent from the labour force because of depression results in 43% lower income than being in the labour force full time; and being absent from the labour force owing to other mental disorders results in an income 37% lower (details available from the author on request). Thus those out of the labour force owing to depression and other mental health conditions do not have the same income with which to accumulate wealth assets; they may even be drawing upon these assets to supplement lost income. However, because of data limitations it is not clear how long the individuals in this study have been out of the labour force.

The full cost of mental illness

The findings add further support to the arguments that highlight the full extent of the cost of depression and other mental illness. It

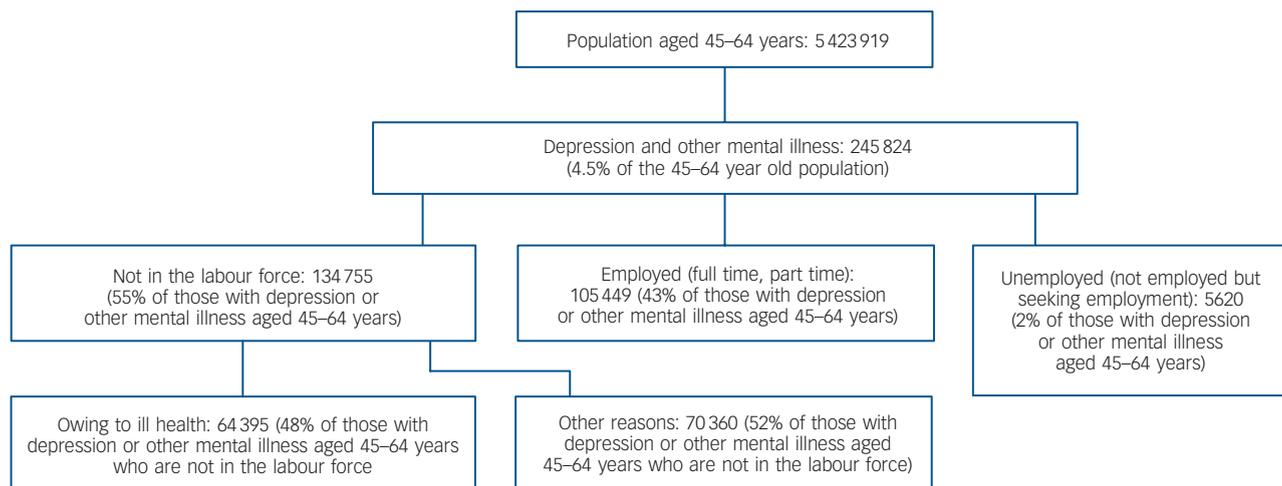


Fig. 1 Flow chart of labour force status for those with depression and other mental illness within the Australian population aged 46-64 years.

has been noted that mental illness alone is responsible for 13.3% of the burden of disease in Australia, only falling behind cancer and cardiovascular disease.¹⁸ This highlights the cost of the disease to the health of the Australian population. However, the economic costs are also significant. The cost of treating mental health conditions was estimated to be AU\$3741 million (£2058 million) in 2000-01. This estimate covered health expenditure in hospitals, aged care homes, non-hospital medical services, pharmaceuticals, research and community and public health.¹⁹ However, it should be noted that only 62% of those with a mental illness seek medical help in Australia²⁰ and thus the potential direct medical costs may be higher if adequate services were available.

In addition to the direct health system costs, mental illness also has significant additional costs to society, which are incurred indirectly through lost labour force participation for example. This study has quantified the indirect costs of mental illness through early retirement and the effect this has on individuals' wealth. However, there are additional costs because of early retirement. In previous studies it has been found that those

retiring early as a result of depression pay 96% less tax (tax on income from all sources), and those with other mental illnesses pay 91% less tax than those who are healthy and remain in the labour force (details available from the author on request). Further, in 2006, 101 936 people with psychological/psychiatric disorders who were over the age of 45 claimed a Disability Support Pension, adding to the cost of mental illness to the state.²¹ (The Disability Support Pension is AU\$644.20 (£354.31) per week for single people and AU\$485.60 (£267.08) each for couples. In total, AU\$1468 million in Disability Support Pension payments are made to Australians aged 45-54 years of age per annum).

Analyses of the numbers needed to treat (NNT) to achieve good clinical outcomes for people with depression have demonstrated high efficacy: most antidepressants an NNT < 5.²² Given the low cost and cost-effectiveness of these drugs²³⁻²⁵ the cost to the government of appropriate treatment is likely to be more than offset by reductions in the Disability Support Pension payments.

The Australian universal healthcare system and more generous social security system may to some extent help to protect

Table 3 Odds of having any wealth by different classes of wealth, labour force participation and health status, Australia, 2009 - adjusted for age, gender and education

Wealth class	Population with this asset type	n	%	OR (95% CI)	P
Cash					
Employed full time, no condition	1 102 671	1732	78.4	1	
Employed part time, no condition	330 764	638	79.1	1.07 (0.78-1.46)	0.695
Not in labour force owing to depression	18 114	31	71.8	0.72 (0.29-1.76)	0.4664
Not in labour force owing to other mental illness	31 956	45	81.6	1.23(0.51-2.98)	0.6482
Superannuation					
Employed full time, no condition	1 312 882	2105	93.3	1	
Employed part time, no condition	358 589	674	85.8	0.40 (0.27-0.59)	<0.0001
Not in labour force owing to depression	7 866	13	31.2	0.03 (0.02-0.08)	<0.0001
Not in labour force owing to other mental illness	8 811	18	22.5	0.02 (0.01-0.05)	<0.0001
Home equity					
Employed full time no condition	1 252 878	1971	89.0	1	
Employed part time no condition	389 209	709	93.1	1.57 (0.99-2.50)	0.0557
Not in labour force owing to depression	18 939	27	75.1	0.35 (0.16-0.75)	<0.05
Not in labour force owing to other mental illness	21 864	32	55.8	0.16 (0.07-0.36)	<0.0001
Other financial investments					
Employed full time, no condition	719 575	1142	51.1	1	
Employed part time, no condition	213 800	391	51.2	1.05 (0.81-1.35)	0.7174
Not in labour force owing to depression	8 288	11	32.8	0.50 (0.20-1.27)	0.1434
Not in labour force owing to other mental illness	9 338	13	23.9	0.33(0.15-0.76)	<0.05

Table 4 Sensitivity analysis – value of, and odds ratio of having, all wealth assets for those with depression and other mental illness who are out of the labour force for any reason and those who are in full-time and part-time employment with no condition, for people with any wealth

Total wealth	Those with any wealth					Value of wealth ^e		
	Population with any wealth ^a	<i>n</i> ^b	% ^c	OR (95%CI) of having wealth ^d	<i>P</i>	Mean value of wealth, AUS (£)	s.d.	Median value of wealth, AUS (£)
Employed full time, no condition	1 403 163	2256	99.7	1		398 098 (218 954)	490 038	255 199 (140 359)
Employed part time, no condition	417 098	774	99.8	2.37 (0.51–10.96)	0.2700	360 071 (198 039)	405 432	225 652 (124 109)
Not in labour force owing to depression	41 124	74	86.8	0.03 (0.01–0.12)	<0.0001	273 824 (150 603)	452 572	212 695 (116 982)
Not in labour force owing to other mental illness	78 359	115	89.7	0.03 (0.01–0.08)	<0.0001	206 886 (113 787)	315 729	112 315 (61 773)

a. All Australians aged 45 to 64 who have any wealth.
b. The number of records in Health&WealthMOD of those aged 45–64 who have any wealth.
c. The proportion of individuals in the 45- to 64-year-old population who have any wealth.
d. Adjusted for age, gender and education.
e. In 2009 Australia dollars (AUS): 1 AUS = approximately £0.55.

Table 5 Difference in value of total wealth for those who were employed part time with no health condition, and those who were not in the labour force because of illness with depression or other mental illness, compared with those who were employed full time with no health condition, adjusted for age, gender and education

Labour force status	% increase	<i>P</i>	95% CI
Employed full time, no condition	0		
Employed part time, no condition	–6.51	0.4683	–22.07 to 12.15
Not in labour force owing to depression	–77.80	0.0047 ^a	–92.17 to –37.09
Not in labour force owing to other mental illness	–93.21	0.0003 ^a	–98.44 to –70.45

a. Significant at the 0.05 level.

individuals with depression and other mental illness from loss of all their savings and associated deterioration in living standards. Nonetheless, the savings of those with depression and other mental illness are still significantly compromised relative to those who are well. This study showed that if people out of the labour force because of depression or other mental illness do have any wealth, on average they have AU\$236 727 (£130 200) and AU\$148 771 (£81 824) in accumulated wealth respectively. This is far lower than the amount held by those in full- and part-time employment without ill health.

This lower amount of accumulated wealth is likely to result in lower living standards for these individuals. Wealth is generally used to protect against unexpected events (such as a deterioration in health), finance large financial commitments (such as children's education), and also allow for general daily consumption.^{26–28} Indeed Dvornak & Kohler found that a \$1 increase in the value of wealth stored in housing assets is likely to result in a 3% increase in consumption spending.²⁸

Findings from other studies

The quantification of lost savings and wealth because of mental illness has not been reported in other studies. Furthermore, there have been few studies on the impact of ill health in general on savings or wealth with which to compare these findings. However, one study conducted in the USA by Covinsky *et al* found that 38% of patients aged 45–64 lost all or most of their savings owing to illness.²⁹ More recently, another USA study by Swoboda & Lipsett found similar results, with 36.7% of families losing most of their savings as the result of having a family member critically ill for 12 months or more.³⁰ However, these studies only considered the impact on savings, and did not consider other wealth assets

available to individuals such as home equity or investment properties, nor did they quantify the value of wealth held by individuals, as our study did.

Implications

Although comorbidities may contribute to the reduced labour force participation, and hence income and wealth accumulation, of people with mental illness, the analysis undertaken focused on people who identified their mental illness as their main health condition, and their health condition as being the reason for retirement. Other people who identified other illnesses as their main condition may have a concurrent mental illness that also contributes to their non-participation in the labour force. Thus, it is likely that our analysis has underestimated the total impact of mental illness on individuals' wealth accumulation.

The Council of Australian Government has developed a *National Action Plan on Mental Health 2006–2011*, which is based upon a commitment to the prevention of mental illness and early intervention (depression was included under the broader term of 'mental illness' in the plan).³¹ Prevention and early intervention is anticipated to reduce the severity, length and reoccurrence of mental illness, and will focus on increasing access to health services.³¹ *New Horizons: A Shared Vision for Mental Health*, published by the UK Department of Health, explores the need for prevention and early treatment of mental illness.³² It recognises that doing this will have economic benefits because of the large financial burden of mental illness on the state.

Preventing mental illness is likely to be a cost-effective activity for governments, and in the long term save on the costs of financially supporting those who are forced to exit the workforce early because of their ailment and thus are unable to support

themselves financially. This paper has shown that those who have retired early as a result of mental ill health will not only have a loss of immediate income from employment but also have very low value of wealth assets and savings – thereby drastically reducing their ability for financial self-sufficiency. Thus the responsibility of providing financial support for these individuals falls to the state – a hefty financial burden that may be avoided through actions to prevent the occurrence of mental illness.

The ultimate aim of the Australian *National Action Plan on Mental Health 2006–2011* is to allow individuals to live ‘independent and fulfilling lives’, which includes increasing capacity for labour force participation.³¹ Although this study looked at the impact of depression and other mental illness separately, and showed that each condition has different effects on wealth accumulation, the findings of our study highlight the need for such overall preventive action, in light of the costs to both individuals and to governments as the result of early retirement because of ill health.

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RESEARCH ARTICLE

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The personal and national costs of mental health conditions: impacts on income, taxes, government support payments due to lost labour force participation

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Abstract

Background: Mental health conditions have the ability to interrupt an individual's ability to participate in the labour force, and this can have considerable follow on impacts to both the individual and the state.

Method: Cross-sectional analysis of the base population of Health&WealthMOD, a microsimulation model built on data from the Australian Bureau of Statistics' *Survey of Disability, Ageing and Carers* and STINMOD, an income and savings microsimulation model was used to quantify the personal cost of lost income and the cost to the state from lost income taxation, increased benefits payments and lost GDP as a result of early retirement due to mental health conditions in Australians aged 45-64 in 2009.

Results: Individuals aged 45 to 64 years who have retired early due to depression personally have 73% lower income than their full time employed counterparts and those retired early due to other mental health conditions have 78% lower incomes. The national aggregate cost to government due to early retirement from these conditions equated to \$278 million (£152.9 million) in lost income taxation revenue, \$407 million (£223.9 million) in additional transfer payments and around \$1.7 billion in GDP in 2009 alone.

Conclusions: The costs of mental health conditions to the individuals and the state are considerable. While individuals has to bear the economic costs of lost income in addition to the burden of the conditions itself, the impact on the state is loss of productivity from reduced workforce participation, lost income taxation revenue, and increased government support payments - in addition to direct health care costs.

Background

Mental health conditions are a highly prevalent condition in numerous countries [1]. Within Australia it is the third largest proportion of the burden of disease [2]. In 2007, almost half of the Australians aged 16 to 84 had experienced a mental health condition at some stage in their lives, and in 2005 the prevalence rate of long-term mental illness was 11% (a figure which has progressively increased since 1995) [3,4].

Due to the high prevalence rates, the economic costs of mental health conditions are large [1]. In Australia in 2004-05, AU\$4.1 billion (£2.3 billion) was allocated to be spent on mental health [5]. In the United Kingdom in the same period the £4.5 billion was invested in adult mental health services [6]. In addition to these large national costs, the personal economic costs are also great: people with mental health conditions are recognised as being some of the most socially marginalised and economically disadvantaged members of the community [7].

Mental health conditions have significant impacts on an individual's employment. The labour force participation rates of people with a mental health condition are generally poor - people with a mental health condition

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have unemployment levels of 75-90% in the US; and 61-73% in the UK. Within Australian individuals with a mental health condition have unemployment rates up to four times higher than healthy Australians [8].

While less prevalent in older age groups [9], older workers who suffer from mental health conditions may be more likely to retire from the workforce early, due to a combination of the effects of ageing and the disabling impacts of the mental health condition [8]. Indeed, within Australia more than half of those with a mental health condition who are aged 45 to 64 years are not in the labour force (106 100 individuals) [10] and this results in reduced savings for these individuals [11].

However, there have been no detailed, comprehensive studies on the economic impacts of early retirement due to mental health conditions to both the individual and the state in Australia. The studies that have looked at the indirect costs of mental illness have generally focused only on loss of income from wages and salaries. They exclude, for example, reduction in income from other sources and for government reductions in income taxation revenue and an increase in social security payments.

This paper quantifies, for the 45 to 64 year old Australian population, the amount of income available to those who have retired early due to depression and also for those with other mental health conditions, the amount of taxation revenue these individuals pay to the Australian government, and the amount of government benefits paid to these individuals. It will quantify the difference of these values between those who have retired early due to depression and other mental health conditions and those in the labour force with no health condition to give a more complete picture of the costs of mental health conditions, and show how much better off the affected individuals and the government would be if the conditions had been prevented and individuals remained in the labour force. It also quantifies the aggregate cost to the state from lost taxation revenue, increased social welfare payments, and estimates the national GDP loss due to individuals exiting the labour force due to depression and other mental health conditions.

Methods

Data

The output dataset of a microsimulation model, Health&WealthMOD, which is Australia's first microsimulation model of health and disability, was used to analyse the associated impacts that ill health has on labour force participation, personal income, and government revenue and expenditure. It was specifically designed to measure the economic impacts of ill health on Australian workers aged 45 to 64 years.

The base population of Health&WealthMOD was unit record data extracted from the Survey of Disability, Ageing

and Carers conducted by the Australian Bureau of Statistics in 2003 [12]. From this dataset, individual records were extracted for those aged 45-64 years. The details extracted for each individual in the base population included demographic variables (for example, age, sex, family type, state of residence, and ethnic background), socioeconomic variables (level and field of education, income, benefits received), labour force variables (labour force participation, employment restrictions, retirement), and health and disability variables (chronic conditions, health status, type and extent of disability, support and care required).

Using a separate microsimulation model—STINMOD—additional economic information such as individual income, government support payments and tax liability was imputed onto the base data. STINMOD is Australia's leading model of income tax and government support payments [13,14] and is maintained and developed for the Australian Government by the National Centre for Social and Economic Modelling. Income and wealth information was imputed onto the base population of Health&WealthMOD by identifying persons with similar characteristics on STINMOD and “donating” their income and wealth information onto

Health&WealthMOD using a process commonly used in microsimulation modelling called ‘synthetic matching’ [15]. Nine variables: sex (2 groups), income unit type (4 groups), type of government pension/support (3 groups), income quintile (5 groups), age group (4 groups), labour force status (4 groups), hours worked per week (5 groups), highest educational qualification (2 groups) and home ownership (2 groups), that were common to both datasets and strongly related to income were chosen as matching variables for synthetic matching. To check the assumption that the information contained on the STINMOD records accurately reflected the economic status of those records on the 2003 SDAC they were matched with, the accuracy of the matching of these variables were checked. It was found that each of the matching variables on each record were matched within a 5% accuracy, except for age, which was matched within 6% accuracy [16]. Due to the very small matching error it is not expected that the results in this study will be meaningfully affected.

The data were then aged to reflect the 2009 Australian 45 to 64 year old population. The up-rating was used to account for the disability and illness, demographic, labour force, earnings growth and other changes that had occurred between 2003 and 2009. The process by which Health&WealthMOD was built is outlined in detail in Schofield *et al.* [17].

The Survey of Disability, Ageing and Carers provides detailed self-reported data on socio-demographic status, labour force participation and health and disability status (such as chronic conditions) for each individual in

Health&WealthMOD. Respondents health conditions were classified by the Australian Bureau of Statistics using ICD10 codes which were developed by the World Health Organisation and endorsed by the 43rd World Health Assembly in 1990 [18]. People who reported their main long term health condition as depression/mood affective disorders (excluding postnatal depression) (ICD code F30-39) were considered to have 'depression'. Those who reported their main long term health condition as mental and behavioural disorders, dementia, schizophrenia, phobic and anxiety disorders, nervous tension/stress attention deficit disorder/hyperactivity, and other mental and behavioural disorders (ICD codes F00-29, F40-99) were categorised as 'other mental health conditions' for this study. Depression was analysed separately from other mental illnesses due to its high prevalence in the population.

In this study those who reported to be out of the labour force due to their illness and listed depression as their main condition were considered to be out of the labour force due to depression. Those who reported being out of the labour force due to their illness and listed one of the other mental health conditions as their main condition were deemed to be out of the labour force due to other mental health conditions. All people who are out of the labour force, regardless of the reason for it, are assumed to be permanently retired.

Statistical methods

Initial descriptive analysis was undertaken to determine the mean and median weekly income, taxation payments, and social security benefits attributable to individuals employed full time, employed part time, not in the labour force due to depression and not in the labour force due to other mental health conditions. Income was defined as total gross income from all sources, including employment earnings, transfer income, and income from other sources such as investment properties. A multiple linear regression model of the log of weekly income was used to analyse the differences between weekly incomes of people in the labour force (full-time and part-time) with no health condition and people not in the labour force due to depression and due to other mental health conditions. Analyses were repeated for weekly transfer income and weekly tax liability. Age group, sex and highest education were adjusted for in all regression models. Regression analysis was undertaken on log-transformed data in order to satisfy the assumptions of linear regression analysis, and regression diagnostics confirmed that the assumptions were reasonably satisfied.

The national economic impacts of depression and other mental health conditions, when it leads to exit from the labour force were estimated with the assumption that

people who reported being out of the labour due to depression or other mental health conditions would have the same labour force participation rates as of the people with no chronic condition if they did not have the mental health condition. Some of these people who were out of the labour force due to depression and other mental health conditions might still have other chronic conditions other than the mental health conditions (which they cite as their main condition). These other conditions might keep them out of the labour force even if they did not have depression and other mental health conditions. However, there was no data available to estimate what proportion of these people would be out of the labour force due to other chronic conditions if they did not have depression and other mental health conditions. Thus, we conducted a sensitivity analysis assuming:

- (1) that if individuals who were out of the labour force due to depression and other mental health conditions did not have these conditions that they would otherwise have had the same labour force participation rates as people with no chronic health conditions, or
- (2) that individuals who were out of the labour force due to depression and other mental health conditions would otherwise have had the same labour force participation rates as people with conditions other than depression and other mental health conditions. This assumption was used as the sensitivity analysis for estimating the national economic impacts.

The impact of depression and other mental health conditions on national GDP was calculated based on the Commonwealth Treasury's GDP formula:

$$\text{GDP} = (\text{GDP}/\text{H}) \times (\text{H}/\text{EMP}) \times (\text{EMP}/\text{LF}) \times (\text{LF}/\text{Pop15+}) \times \text{Pop15+}$$

where GDP = Gross Domestic Product; H = total hours worked; EMP = total number of persons employed; LF = total labour force; and Pop15+ = population aged 15 years and over [19]

The analyses were undertaken using SAS V9.1 (SAS Institute Inc., Cary, NC, USA). All statistical tests were two sided with the significance level set at 5%. Currency figures are given in 2009 Australia dollars - 1 Australian dollar = approximately 0.55GBP in 2009. In 2009 the Purchasing Power Parity (PPP) was 1.46 for Australia and 0.619 for the United Kingdom with the United States being 1. PPP represented the number of monetary units to buy the same representative basket of consumer goods and services [20].

Results

Amongst those surveyed in the Survey of Disability, Ageing and Carers who were aged between 45 and 64 years, there were 43 individuals who were out of the labour force due to depression, and 54 individuals who were out of the labour force due to other mental health conditions; there were 2 273 who were employed full time with no chronic health condition, and 781 who were employed part time with no chronic health condition. Once weighted, these data represented 25 200 individuals not in the labour force due to depression, 35 200 individuals not in the labour force due to other mental health conditions, 1, 410, 000 individuals employed full time with no chronic health condition, and 421 300 individuals employed part time with no chronic health condition within the Australian population aged 45 to 64 years.

Those who were out of the labour force due to depression had a median weekly income (income from all sources, including government transfer income) of \$3671 (£202), and those out of the labour force due to other mental health conditions \$312 (£172). This is around half of the median weekly income of those employed part-time with no condition (\$657 per week (£361), and around one-quarter of the median weekly income of those employed full time with no chronic condition, \$1 226 (£ 674) (Table 1).

Of their total weekly income - those not in the labour force due to depression received a median value of weekly transfer income of \$254 (£140) (government support payments) and those not in the labour force due to other mental illnesses received \$274 (£151); whereas those in employment receive none (as a median value). Not being in employment and typically with little or no other income, those out of the labour force due to depression and other mental illness paid a median value of zero in tax per week - whereas those employed full-time pay a median value of \$223 (£123) per week in tax.

When compared to those with no health condition in full time employment and adjusted for age, sex and education, those out of the labour force due to depression receive 73 per cent less per week on average in total income (Table 2), and those out of the labour force due to other mental health conditions receive 78 per cent less. They also pay almost 100 per cent less per week in taxation, and receive significantly more in government transfer payments.

Those employed part-time with no long term health condition also have significantly lower incomes, pay less taxation, and receive more in transfer payments than those employed full time. However the percentage differences between those employed full time and those employed part time, is not as great as those employed full time and those not in the labour force due to mental health conditions (Table 2).

When aggregated, the national impact of depression when it leads to exit from the labour force is \$1 billion (£0.55 billion) in lost income, \$154 million (£84.7 million) in lost taxation revenue, and an additional \$129 million (£71.0 million) in government transfer payments per year. When aggregated, the national impact of labour force exit due to other mental health conditions is \$1.5 billion (£0.83 billion) in lost income, \$124 million (£68.2 million) in lost taxation revenue, and an additional \$278 million (£152.9 million) in government transfer payments per year (Table 3) assuming that otherwise those with mental health conditions would have had the same labour force participation rates as people with no chronic health conditions. The results of the sensitivity analysis show that lost income, tax and additional social security payments would be about 10% lower if it were assumed that if individuals who were out of the labour force due to mental health conditions would otherwise have had the same labour force participation rates as people with conditions other than mental health conditions.

Table 1 Average and median* weekly income, transfer payments and tax liability by labour

Labour Force Status	Weekly income AU\$ (£) received by individuals			Weekly transfer income AU\$ (£) received by individuals			Weekly tax liability (includes Medicare levy) AU\$ (£) paid by individuals		
	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
Employed fulltime, no chronic health condition	1 507 (£829)	33 575	1 226 (£674)	9 (£5)	1 082	0 (£0)	344 (£189)	11 746	223 (£123)
Employed part time, no chronic health condition	657 (£361)	11 714	559 (£307)	28 (£15)	1 661	0 (£0)	78 (£43)	3 066	30 (£17)
Not in labour force due to depression	367 (£202)	6 147	286 (£157)	228 (£125)	3 563	254 (£140)	15 (£16)	1 143	0 (£0)
Not in labour force due to other mental health conditions	312 (£172)	4 705	310 (£171)	274 (£151)	3 952	281 (£155)	0 (£0)	27	0 (£0)

*all results given in 2009 Australian dollars (AU)

Table 2 Differences in average weekly income, transfer payments and tax liability between labour force status, adjusted for age group, sex and education, for the Australian population aged 45-64 years, 2009

Labour force status	Income			Transfer income			Tax liability (includes Medicare levy)		
	% difference	95%CI	p-value	% difference	95%CI	p-value	% difference	95%CI	p-value
Employed full-time, no health condition	<i>Reference</i>			<i>Reference</i>			<i>Reference</i>		
Employed part-time, no health condition	-54.5	(-60.1, -48.1)	<.0001	65.7	(27.6, 115.2)	<.0001	-90.1	(-92.8, -86.4)	<.0001
Not in labour force due to depression	-73.2	(-79.9, -64.3)	<.0001	18 018.6	(8 469.9, 38 606.9)	<.0001	-99.9	(-100.0, -99.7)	<.0001
Not in labour force due to other mental health conditions	-77.8	(-86.2, -64.3)	<.0001	27 862.5	(12 367.2, 62 616.5)	<.0001	-100.0	(-100.0, -99.9)	<.0001

As a result of the 25 200 workers missing from the labour force due to early retirement as a result of depression, there is a annual loss of \$698 million (£383.9 million) in GDP. As a results of the 35 200 workers missing from the labour force due to early retirement as a result of other mental health conditions, there is a annual loss of \$975 million (£536.3 million) in GDP.

Discussion

The costs of depression and other mental health conditions are considerable both at the individual level and at the aggregate national level. Individuals aged 45 to 64 years who have retired early due to depression personally have 73% lower income then their full time employed, healthy counterparts and those retired early due to other mental health conditions have 78% lower incomes. This equated to an annual national loss of income of \$1 billion (£0.55 billion) for those with depression and \$1.5 billion (£0.83 billion) for those with other mental health conditions. The national aggregate impact of depression and other mental health conditions through the loss of labour force participation amongst 45 to 64 year olds, equated to \$278 million (£152.9 million) in lost income taxation revenue, \$407 million (£223.9 million) in additional transfer payments and around \$1.7 billion in GDP in 2009 alone.

A limitation of this study is that the results are based on a relatively small sample size of individuals who are

not in the labour force due to depression and other mental ill health - 43 and 54 individuals from the original 2003 SDAC survey respectively. The findings are also based upon cross sectional data from the original 2003 SDAC, rather than longitudinal data, although respondents do identify the reason they left the labour force including whether this was due to illness and what their main health condition was. The findings are also based upon respondents' self-reported data, and as such the potential for bias in the results cannot be excluded. However, self-report health and economic status are regarded as valid measures [21,22].

The direct health costs of treating mental health conditions was estimated to be \$4.1 billion (£2.3 billion) for all age groups in 2003-04. This estimate covered health expenditure in hospitals, non-hospital medical services, pharmaceuticals, research, and community mental health services; with the majority being spent on hospital patients and community mental health services [5]. (The United Kingdom, with a population about three times that of Australia invests £3.9 billion per annum in mental health services for adults alone). However, it should be noted that only 62% of those with a mental illness seek medical help in Australia [23] and thus the potential direct medical costs may be higher if adequate services were available. It is also estimated that \$1.2 billion (£0.66 billion) is spent on aged care programs in Australia, and significant other amounts on housing and accommodation programs, workforce participation

Table 3 National annual impact of persons not in the labour force due to depression and other mental illness (adjusted for age, sex and education) for the Australian population aged 45-64 years, 2009

	Lost income \$AU (£)	Additional transfer payments \$AU (£)	Lost taxation revenue \$AU (£)
Not in the labour force due to depression	1,018,918,000 (£560,404,900)	129,455,000 (£71,200,250)	154,033,000 (£84,718,150)
Not in the labour force due to other mental health conditions	1,530,353,000 (£841,694,150)	277,655,000 (£152,710,250)	124,055,000 (£68,230,250)

Note: Based on the differences between persons not in the labour force due to depression and other mental illness and the weighted average of persons employed full time and part time with no chronic conditions.

programs and disability services for those people with a mental illness [24].

So while the direct costs are significant, so too are the indirect costs, with the combined costs of lost income, lost taxation revenue, increased government social security payments, and lost GDP in 2009 totalling more than the estimated government expenditure on mental health in 2003. Other studies have estimated the costs of workforce participation in terms of the number of working days lost due to mental ill health, lost income or disability support payments [1,24-32]. However, these studies were more limited in scope and did not include taxation and GDP costs. They also have a number of additional limitations, including only using average earnings, or average disability support payments, to estimate costs of lost income, or only presenting the aggregate national cost - not the cost to individuals [1,28-32].

Average estimates of earnings and disability support payments may not be representative of the population with mental health conditions. Our study used individual level income, tax payment and government support payment data to estimate the cost to individuals because of their early retirement due to mental illness.

There are numerous cost effective drugs for treating mental illness [33-36], these may be used to help overcome the costs to both individuals and governments that can result when conditions impact on the functional capacity of individuals, and lead to early retirement. The UK Department of Health has support the prevention and early treatment of mental health conditions in recognition of the potential to avoid the large financial burden of the disease on the state [37]. However, within Australia only 62% of those with a mental illness seek medical help [23] and as such there is much room for improving the management of these conditions. Amongst those who do seek treatment in Australia, only six visits per year to a psychologist are funded under Medicare [38] as such, there may be gap in what is provided to patients and what is actually required to meet their medical needs, Furthermore, it has been noted that there is a shortage of psychiatrists in Australia [39] that may be leaving some mental health patients without access to care or with long waiting periods. The role for government in supporting the wider uptake of the management or prevention of mental health conditions, can well be justified when the savings in terms of increased labour force participation and the associated avoidance of taxation revenue loss and increased disability payments outlined in this paper are considered.

Despite the increases of government spending on mental health services [40,38], the costs of mental health conditions which falls to governments is still far larger than their spending on mental health services. These arguments provide further support to the need for governments to invest in mental health services and prevention

and support measures, to steam these costs [23]. There is currently limited government spending on prevention and early intervention [41,39]. Governments would benefit from prevention and reduction of mental health through increased taxation (income tax, payroll tax, etc), reduced transfer payments, and reduced expenditure on other services (medical, justice, housing, etc) [41,39]. For example, it has been estimated that in Victoria (Australia's second most populated state) a 1% reduction in the burden of mental health would cost around \$26 million (AU) and would deliver a net benefit of \$7 million (AU) [41,39].

Australia has a poor record of employing those with any disability, ranking amongst the lowest for OECD countries [42,40]. The current Australian employment system is failing to maximise the employment of those with a mental health condition in the labour force [42,40]. This suggests that a multifaceted strategy is required that aims to prevent the onset on mental health conditions, assist sufferers in manage much of their mental health conditions when it is occurring, and also helping individuals remain integrated within society.

Conclusion

While the cost to government is considerable, the economic cost of mental health conditions to individuals is also large. Due to low rates of labour force participation in their working years, people who suffer from mental health conditions may be more prone to poverty in retirement, due to lack of accumulated savings [8,11]. As such, mental illness can lead to a lifetime of social and economic marginalisation [8].

Furthermore, not only is employment essential for economic security, employment is vital for those with a mental health condition in maintaining a connection with the community, and potentially also for their own mental health (indeed, long-term unemployment itself is associated with mental illness) [42,40]. Employment is important for self-esteem, creating a social identity and places people within social networks [43,41].

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Authors' contributions

DS led the study and conceived the original study design. RS created the dataset, Health&WealthMOD, and led the generation of the results. RP, MP

and SK all contributed expert advice and/or technical assistance in the respective areas of income, mental health and wealth. EC contributed to the generation of results, and drafted the manuscript. All authors contributed to the interpretation of the results, and edited the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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