Mental Health Selection and Income Support Dynamics: Multiple Spell Discrete-Time Survival Analyses of Welfare Receipt

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What is already known on this subject?

The association between welfare receipt and mental illness is well established, particularly in countries with targeted welfare regimes such as Australia. The poorer mental health among welfare recipients can be attributed to health selection, causation or underlying vulnerability. Previous studies have demonstrated health selection to unemployment, but no studies have investigated the antecedent effects of mental illness on transitions to other categories of welfare benefits over multiple spells.

What this study adds

This study examines health selection explanations by examining the extent to which poor mental health independently predicts entry and re-entry to three different categories of income support over multiple spells. The results demonstrate that adults with mental health problems are more likely to experience multiple spells on welfare and are at increased risk of receiving single parenting, unemployment and disability payments compared to adults without mental health problems.

ABSTRACT

Background

The higher occurrence of common psychiatric disorders among welfare recipients has been attributed to health selection, social causation and underlying vulnerability. The aims of this study were to test for the selection effects of mental health problems on entry and re-entry to working age welfare payments in respect to single parenthood, unemployment and disability.

Methods

Nationally representative longitudinal data were drawn from the Household Income and Labour Dynamics in Australia (HILDA) survey. Multiple spell discrete time survival analyses were conducted using multinomial logistic regression models to test if pre-existing mental health problems predicted transitions to welfare. Analyses were stratified by sex and multivariate adjusted for mental health problems, father's occupation, socio-economic position, marital status, employment history, smoking status and alcohol consumption, physical function and financial hardship. All covariates were modelled as either lagged effects, or when a respondent was first observed to be at risk of income support.

Results

Mental health problems were associated with increased risk of entry and re-entry to disability, unemployment and single parenting payments for women, and disability and unemployment payments for men. These associations were attenuated but remained significant after adjusting for contemporaneous risk-factors.

Conclusions

Although we do not control for reciprocal causation, our findings are consistent with a health selection hypothesis and indicate that mental illness may be a contributing factor to later receipt of different types of welfare payments. We argue that mental health warrants consideration in the design and targeting of social and economic policies.

It is well established that the distribution of health inequalities in psychological wellbeing follow a social gradient whereby lower socio-economic position is associated with poorer mental health^{1,2}. Although this gradient is evident across the full spectrum of the general population^{2,3}, a particular focus is the consistent finding that common psychiatric disorders are more prevalent among disadvantaged populations relative to the broader community^{4,5}. For example, a number of studies have documented strong links between poor mental health and unemployment⁶⁻⁹, poverty^{10,11}, and welfare receipt¹²⁻¹⁸. A key question for health and social policy analysts with an interest in welfare reform is the extent to which these associations reflect processes of direct health selection, social causation, or underlying vulnerability^{5,19}. In this article, we examine the role of mental health selection to welfare receipt in Australia.

The health selection hypothesis identifies mental health as a contributing factor to socio-economic position^{5,20}. In this view, mental illness can act as a barrier to employment which leads to welfare dependency. Previous research testing selection explanations have generally focused on either markers of overall SEP^{21,22} or unemployment^{7,23-25}, with few studies looking specifically at welfare receipt^{15,17}. Although studies investigating the temporal associations between mental health and public service pay grades²² or (un)employment⁷ have found the effects of social causation to be stronger than those of health selection, this may not hold for welfare receipt. Welfare recipients comprise a highly vulnerable and stigmatised subset of persons who lack sufficient resources and therefore rely on state support. Those studies that have investigated mental health leading to welfare have either been cross sectional¹⁵ or focused on narrowly defined cohorts (e.g. young women¹⁷) over short time periods and so been unable to examine multiple entry and re-entry episodes of welfare receipt across a range of payment types.

The welfare system in Australia is classified as a liberal or radically targeted welfare regime in the Anglo-Saxon tradition²⁶. The system is highly redistributive but payments are low and not time-bound or linked to prior contributions to an insurance scheme. Rather, eligibility is universal

but determined by strict income and asset tests. Consequently welfare recipients in Australia represent a highly disadvantaged population. Further, the relative disadvantage of the welfare recipient population has been compounded over the past two decades as welfare benefits have not kept pace with rising living costs and greater rates of recipients have been observed to be living in poverty²⁷. The aims of this study are to test if adults with mental illness have a higher probability of receiving income support payments in future. We focus on three different types of income support that have previously been shown to have strong associations with poor mental health¹³, namely unemployment, disability and sole parenting payments. Our analyses investigate health selection over both short term (one year) and extended periods (up to 8 years) while accounting for early life circumstances, history of engagement with the workforce, and concomitant risk-factors.

METHODS

Sample

Data were drawn from nine waves from the HILDA Survey²⁸: a nationally representative longitudinal panel survey with a multistage sampling design that has collected data annually since 2001. Baseline personal interviews were completed for 13,969 respondents from 7,682 sampled households, and 66% of baseline respondents were retained at wave 9 (2009)¹³. Data on health, financial circumstances and living situation were collected through Self-Completion Questionnaire, which had an average completion rate of 91.4% among working age respondents. Ethical approval was granted by the Human Ethics Advisory Committee at the Melbourne University.

The sample in scope for this study was defined by baseline respondents who participated in at least one subsequent follow-up wave, experienced at least one spell where they were at risk of entry to income support (i.e. not receiving payment) and completed the self-completion questionnaire. Respondents were excluded from analyses at times when they were in receipt of income support, or when they met eligibility requirements for the age pension. The final in scope sample comprised 9,406 respondents who provided a total of 70,478 observations.

Measures

The outcome measure of this study was the probability of income support entry, which was defined as a transition to one of four mutually exclusive classes of payment after a period of not receiving income support. The four classes of income support were: 1) single parenting payments, 2) unemployment payments, 3) disability payments, and 4) other miscellaneous payments. This miscellaneous class comprised a mixed group of payments designed to support a range of recipients, including full-time students, carers, and older adults with limited workforce connection. We do not interpret the results for the miscellaneous group due to the heterogeneous nature of these payments, but retain them in our analyses so a distinction from respondents not in receipt of income support can be made.

Spells were defined as continuous and consecutive periods (years) where a person was at risk of income support entry. The minimum spell period was one year. Time within each spell was demarcated by discrete periods of one year's duration. It was possible for respondents to experience multiple spells, allowing for the modelling of entry (the opening spell) and re-entry (subsequent spells) into income support. Those in receipt of welfare payments at baseline were excluded from the opening spell but contributed to subsequent re-entry spell data from the first occasion that they reported no income support. Over the course of the study a maximum of four spells could be observed. Respondents were right censored if they were not in receipt of an income support payment at study exit, and left censored if they were not in receipt of income support at baseline (year 2001).

A binary measure of mental health problems experienced in the four-weeks prior to survey interview was defined by scores less than 50 on the five item mental health subscale (MH5) from the Short Form 36 (SF-36)²⁹. This cut-point has previously been reported as a valid indicator of common mental disorders, such as depression and anxiety, for epidemiological investigations of health inequalities in Australia³⁰. Socio-demographic covariates included age, marital status,

housing tenure and educational achievement. Work history was calculated as the proportion of time employed since first leaving full-time education. This variable is a proxy for previous unemployment that acts as a control for prior disengagement from the workforce (social causation). Life style factors included smoking status and alcohol use. The Physical Functioning sub-scale of the SF-36 was used as a measure of physical health and was centred at a score of 80. Financial hardship was defined by difficulties experienced due to shortage of money over the past 12 months. Household equivalised disposable income was estimated using the OECD modified scale to control for variations in household size and composition³¹. Father's occupation was included to capture respondents' early life circumstances and control for the effects of indirect selection. A binary indicator of the year 2009 was also included to adjust for the effects of the global financial crisis³². All variables were time-varying, with the exception of baseline age, sex, and father's occupation.

Analysis

As a preliminary analysis, multivariate Poisson regression models adjusted for all baseline covariates were used to test the independent association between mental health problems and cumulative total number of years in receipt of any income support payment. We then followed model building procedures outlined by Willet and Singer³³ for conducting multiple spell discrete time survival analysis. Multinomial logistic regression models were fit separately for women and men, and clustered by person ID to adjust for non-independence of repeated observations. Multinomial logistic regression is appropriate for simultaneously modelling competing risks when event times are discrete³⁴, but assumes that the hazards for each event are unrelated. A series of models were tested to identify the optimal parameterization of the baseline hazard, reflecting the effects of spell and period. These preliminary analyses indicated that the baseline hazards for re-entry spells were highly similar. Spell was therefore modelled as a binary variable distinguishing the opening entry spell from subsequent re-entry spells. To further reduce model complexity the natural logarithm of time at risk was used for interaction terms rather than modelling each time-

period individually. Fit indices (AIC, BIC and χ^2) indicated that this simplified baseline hazard model had optimal model fit relative to models that included dummy variables for all spells, periods, and their interactions.

After modelling the baseline hazards, three sets of survival analyses were conducted to test if mental health problems predicted future entry to income support. The first (Model 1) assessed time-varying lagged covariates, reflecting the circumstances of respondents in the previous year. The second set (Model 2) assessed covariates at spell baseline, reflecting the circumstances of respondents when first at risk of income support entry for each spell. The final set of analyses (Model 3) also tested covariates at spell baseline, but excluded individuals who entered income support the next year (i.e. the year immediately following when first at risk). In each set of analyses, the indicator of mental health problems (SF36 MH5 <50) was entered first, then all covariates included in a second block. The equation for multivariate adjusted Model 1 is presented in Figure 1. Interactions with spell were included to test if the risk of income support entry differed between the opening entry spell and the subsequent re-entry spells. Proportional hazards assumptions were tested by interactions with time period.

As a sensitivity analysis, marginal structural models were implemented to control for time-varying covariates, such as financial hardship, that could act as both confounders and mediators of the association between mental health and welfare receipt. Failure to account for this dual role could produce biased estimates and limit causal inference. Marginal structural model analysis involved re-estimating the Model 1 with stabilized inverse probability weights, which were calculated from each individual's probability of having a mental health problem conditional on baseline and lagged covariates^{35, 36}. All analyses were conducted using Stata 11.

RESULTS

Baseline sample characteristics for model covariates are presented in Table 1. On average, covariates had 1% missing data, ranging from 0% for sex to 6.5% for employment time. Overall,

there were 4,717 women (age range: 15-60) and 4,689 (age range: 15-65) men observed to be at risk of income support receipt during the study. Of these, 31.6% of women and 26.2% of men were identified with mental health problems on at least one occasion, with the average overall prevalence being 9.9% for women and 7.9% for men. Table 2 presents descriptive statistics for MH5 scores and the percentage of men and women identified with mental health problems ($MH5 < 50$) by future income support category. Results for men reporting Single Parenting payments are not reported due to small numbers. Compared to censored respondents who never reported receipt of a welfare payment, those who reported unemployment or disability payments at spell exit, or experienced multiple spells had a higher prevalence of mental health problems. Of the respondents at risk of income support at baseline (2001), those with mental health problems were observed to be in receipt of any welfare payment for an average cumulative total of 1.15 years ($SD=2.11$) over the following eight years, whereas those without mental health problems were observed to have a cumulative average of 0.52 years ($SD=1.35$) on welfare benefits over the same period. Multivariate Poisson regression models adjusted for all covariates indicated that for those not in receipt of payment at baseline, mental health problems were associated with a greater number of years on any income support payment ($IRR=1.62$, 95% $CI=1.48, 1.77$) and more spells on income support ($IRR=1.25$, 95% $CI=1.05, 1.41$).

Figure 2 presents the baseline hazard function for each payment class and spell. Across all payment types, hazards of income support were greater for respondents who had previously been welfare recipients relative to those who had no observed history of welfare receipt. There was also a faster rate of decline in hazards over time for the re-entry spells compared to the hazards of the opening spell. With the exception of Unemployment payments for men, there was no difference in the hazards to entry or re-entry to income support after a period of 4 to 6 years.

Table 1: Sample characteristics at baseline (year 2001) for women and men.

	Women				Men			
	Censored (n=3342)		Recipient (n=1469)		Censored (n=3693)		Recipient (n=1151)	
Age, M (SD)	38.2	(11.7)	32.6	(11.2)	38.9	(12.5)	37.1	(15.8)
Education, %								
Tertiary	26.5		13.8		23.2		9.6	
Post-Secondary	22.0		20.8		37.4		31.6	
Secondary	17.2		20.8		14.1		16.2	
Early School Leaver	34.3		44.6		25.3		42.7	
Marital Status, %								
Married/Partnered	71.9		51.8		69.9		48.0	
Separated	6.7		13.6		5.6		9.1	
Widowed	1.2		1.2		0.3		0.5	
Never Married/Single	20.3		33.4		24.3		42.4	
Housing Tenure, %			0.0				0.0	
Own Home	78.4		58.6		76.2		62.3	
Rent	19.7		39.5		21.6		35.8	
Rent Free	1.9		1.8		2.2		1.9	
Time Employed, M (SD)	0.8	(0.3)	0.6	(0.3)	0.9	(0.2)	0.8	(0.3)
Smoking Status, %								
Never	57.3		49.5		48.1		40.9	
Former	23.8		19.1		26.9		24.7	
Current	19.0		31.4		25.0		34.5	
Alcohol Consumption, %								
Abstainer	11.9		17.7		8.1		18.4	
≤ 2 standard drinks	59.8		44.7		39.9		30.6	
> 2 standard drinks	28.3		37.7		52.0		51.0	
Physical Function, M (SD)	89.0	(16.7)	87.1	(19.0)	90.3	(17.2)	82.6	(23.9)

Equivalised Income (AUD\$1000), M (SD)	32.9	(17.4)	22.6	(13.6)	32.8	(16.9)	22.5	(12.9)
Financial Hardship, %								
No Items	75.7		48.0		74.8		54.3	
1 item	12.1		18.8		12.7		14.4	
2 items	6.4		12.7		6.4		12.4	
>2 items	5.8		20.5		6.2		19.0	

Table 2: Mental Health (MH5) descriptive statistics for men and women at the time they are first observed to be at risk of entry or re-entry to income support.

		Opening Entry Spell				Subsequent Re-entry Spells			
		MH5		MH5<50	MH5		MH5<50		
Payment at Spell Exit		n	Mean	(SD)	%	n	Mean	(SD)	%
Women	Censored	2,865	74.9	(15.8)	7.4	972	72.5	(17.3)	11.4
	Single Parent	147	74.1	(16.1)	8.8	140	64.9	(18.3)	22.1
	Unemployment	178	67.0	(21.0)	20.0	100	69.0	(16.1)	13.0
	Disability	63	70.7	(21.5)	17.5	53	57.5	(23.6)	35.8
	Other	582	71.2	(17.8)	12.4	359	69.4	(17.3)	14.2
	Men	Censored	3,248	76.9	(14.9)	5.9	824	73.5	(17.3)
Single Parent		13	67.1	(16.7)	23.1	14	66.3	(14.1)	7.1
Unemployment		232	70.1	(19.2)	16.8	137	68.5	(18.5)	16.8
Disability		100	68.1	(19.8)	22.0	91	61.3	(21.5)	26.4
Other		384	75.1	(16.8)	8.9	145	74.7	(19.0)	13.8

Note: Censored respondents in the opening spell never report receipt of income support payments. Respondents in receipt of income support payments at study baseline contribute to re-entry spell data from the first occasion they report no income support.

Estimates are calculated at the year 2001 for participants with a single spell, and at the year of income support exit (year>2001) for participants with multiple spells.

Lagged multivariate analyses (Multivariate Model 1) indicated that mental health problems (MH5<50) experienced in the prior year were independently associated with increased risk of entry to single parent, unemployment and disability payments for women, and unemployment and disability payments for men (Table 3). A similar pattern of results was observed for the multivariate analyses testing for the effects of mental health problems at spell baseline (Multivariate Model 2). Mental health problems experienced in the initial spell period reliably predicted future entry to unemployment and disability payments for both women and men, independently of the contemporaneous effects of other spell baseline covariates. For women, the increased risk of single parenting payments associated with mental health problems was explained by financial hardship and household income. After excluding individuals who entered income support after one year, (that is, when spell baseline corresponds to the lagged term) mental health problems at spell baseline no longer independently predicted entry to any income support payment for women, but remained independently associated with increased risk of disability payments for men (Multivariate Model 3). The inclusion of stabilised inverse probability weights in the marginal structural models resulted in slightly stronger associations between lagged mental health problems and entry to income support payments, but the overall substantive results were unchanged (results not reported).

Overall, the strongest association between mental health problems and welfare receipt was observed for disability payments, followed by unemployment payments. A significant interaction term with spell indicated that the association between mental health problems and entry to single parenting payments was more pronounced for women during re-entry spells compared to the opening spell (Spell baseline: HR=2.41, 95% CI=1.11, 5.23; Lagged: HR=2.81, 95% CI=1.34, 5.91). The association between mental health problems and entry to income support was otherwise consistent across spells. Across all models, higher physical functioning predicted lower risk of receiving disability payments (supplementary Tables 4 and 5 depict all estimates from the multivariate adjusted Model 1 and Model 3).

Table 3: Hazards of entry to income support (single parent, unemployment and disability payments) associated with mental health problems (SF36 MH5<50) for women and men estimated from recurrent spell discrete time-multinomial survival models.

	Model 1: Lagged Predictors				Model 2: Spell Baseline Predictors				Model 3: Spell Baseline Predictors, excluding entry at k=1			
	Crude		Multivariate ^a		Crude		Multivariate ^a		Crude		Multivariate ^a	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Women												
Single Parent	1.93	(1.37,2.73)	1.45	(1.00,2.11)	1.71	(1.20,2.44)	1.40	(0.95,2.04)	1.24	(0.70,2.18)	1.03	(0.57,1.86)
Unemployment	3.00	(2.24,4.01)	2.05	(1.47,2.85)	2.15	(1.57,2.94)	1.50	(1.04,2.17)	1.97	(1.30,2.98)	1.40	(0.83,2.35)
Disability	4.23	(2.75,6.49)	2.23	(1.32,3.76)	3.39	(2.23,5.17)	2.35	(1.40,3.96)	2.78	(1.55,4.99)	2.09	(0.98,4.48)
Men												
Unemployment	2.91	(2.18,3.90)	1.73	(1.22,2.46)	2.49	(1.86,3.32)	1.48	(1.04,2.11)	2.19	(1.46,3.30)	1.54	(0.96,2.5)
Disability	4.09	(2.74,6.10)	2.02	(1.21,3.35)	3.73	(2.57,5.42)	2.36	(1.46,3.80)	4.43	(2.79,7.02)	3.52	(2.05,6.07)

^aMultivariate models adjusted for age, education, father's occupation, marital status, housing tenure, employment time, smoking and alcohol use, physical function, financial hardship, household equivalised disposable income, and calendar year 2009.

Note: Estimates for other miscellaneous payment types (student, parenting payments for partnered parents, mature age partner, carer, and undisclosed) and Single Parent payments for men are not reported.

DISCUSSION

The purpose of this study was to investigate the extent to which mental health problems are independent predictors of future welfare receipt. All analyses provided evidence that recent mental health problems were contributing factors that led to receipt of income support payments. For adults not on welfare in 2001, mental health problems predicted multiple spells on welfare and more years on income support over the ensuing decade. Higher rates of transition to unemployment and disability payments were observed for women and men with mental health problems compared to those without mental health problems. In addition, women had a greater probability of becoming recipients of single parenting payments if they had mental health problems in the preceding year. Although the association was robust over long-term periods for men entering disability payments, generally the association between poor mental health and subsequent entry to income support was driven by more immediate circumstances. In these lagged models, the increased risk was not explained by inclusion of covariates reflecting childhood circumstances, prior history of disengagement from the workforce, or the contemporaneous (time-dependent) effects of socio-economic position, marital status, lifestyle behaviours, physical health, or financial status. Importantly, these results remained unchanged after additionally accounting for dynamic inter-associations between these factors (i.e. potential time-varying confounders and mediators) with mental health problems over time.

Whereas previous research has examined mental health selection in relation to single states such as unemployment or receipt of a specific welfare payment, the present study considers a broad range of welfare payments. This is important because welfare recipients comprise a diverse and highly disadvantaged population, such heterogeneity should be considered in research and welfare policy designed to reduce social exclusion and health inequalities. Each category of welfare payment is tied to specific circumstances, which overlap strongly with established risk-factors for mental illness (e.g. unemployment and redundancy, relationship dissolution, poor physical health

and long-term illness) so it is unsurprising that poor mental health is a persistent characteristic of welfare recipients^{13, 16}.

The present findings provide some support for health selection hypotheses which suggest that welfare dependency may be a consequence of poor mental health. However, it is only in the short term (one year) that mental health problems are contributing factors that lead to subsequent welfare receipt over and above the effects of underlying social disadvantage and limited human capital. Alternatively, these anticipatory mental health effects could reflect other unobserved events tied to both mental health and increased risk of welfare receipt. With regard to unemployment payments, this could be due to difficulties securing suitable employment, maintaining employment, or having higher job insecurity²⁴. Job applicants with mental illness may perform poorly during job interviews and be perceived to be low quality candidates, lowering their success when seeking employment. Alternatively, poor mental health may mean being more vulnerable to structural changes in the workforce (i.e. redundancy or downsizing)^{20, 24, 37}. It is also possible that people with mental health problems are more susceptible to the onset of stressors in the workplace (e.g. harassment and bullying)³⁸. In part, the increased long-term risk for disability payments could be a reflection of mental illness being a qualifying factor for payment eligibility³⁹. Alternatively, the gendered nature of the workforce may explain the more pronounced and longer term effects observed among men taking-up disability payments. This is in line with a recent study of British panel data reporting evidence of direct mental health selection to exit from the labour force for men, which was attributed to long-term illness⁷. Our findings regarding sole parenting payments are similar to results reported in the USA, where the increased risk of receiving a comparable payment, (Aid to Families with Dependent Children), for young women with mental health problems was explained by their socio-economic position and family background¹⁷. However, we also found the immediacy of the experience of mental health problems did place women at increased risk of sole parenting payments. Again, this could reflect anticipation effects, with situational factors such as job insecurity, relationship dissolution or unplanned pregnancy in the preceding 12 months

impacting on mental health and playing an important role in subsequent transition to welfare receipt.

It is important to interpret our results in their political, social and temporal context. It is likely that the links between mental health and welfare receipt will differ across alternate welfare systems. Welfare in Australia is means tested and universal uptake by eligible persons makes receipt a marker of disadvantage, whereas internationally welfare receipt is generally time bound and determined by prior contributions. We were therefore unable to draw a comparison with people in similarly disadvantaged circumstances without welfare support. However, other international research has shown that welfare programs have the potential to reduce poverty. For example, a study employing a randomized control design recently demonstrated that Medicaid reduced depression and financial hardship, while improving access to health services⁴⁰. Outside of the welfare context, there is evidence that changes in employment grade are not predicted by prior physical or mental health²¹. This contrast with the present findings may indicate that health selection only applies in disadvantaged and vulnerable populations. The impact of health on labour force exit has also been shown to differ across socio-demographics groups²³, suggesting that social context influences mental health selection processes. The present findings also provide evidence of the importance of contextual factors, as the risk of entry to income support associated with mental health problems varied across the payment types. Similarly, the way in which mental health acts as a precursor to welfare receipt may be moderated by the broader macro-economic context. Health selection effects may be enhanced during times of economic prosperity. For example, mortality and unemployment are more strongly associated during times of low unemployment^{41, 42}. It is notable that the data analysed here were collected during a period of low unemployment, high economic growth and tightening of payment eligibility.

The present analyses were subject to left-censoring. It is likely that respondents who transitioned onto payments were welfare recipients before study commencement. However, our

results suggest that the increased risk associated with prior welfare receipt dissipates after 4 to 6 years. While our analyses control for the effects of work history and early-life circumstances, our focus was on direct health selection so we have not explicitly investigated indirect selection or the mental health consequences of welfare receipt. Further, studies that have directly contrasted the reciprocal associations between health and employment status⁷ or public service pay-grade²¹ have reported stronger and more consistent evidence of social causation. However, we do not consider selection and social causation to be mutually exclusive processes. Indeed they should be expected to have differential effects across the lifespan and operate in a complex interplay of reciprocal and cumulative effects²⁰. Thus, it is unclear from these analyses to what extent social causation will attenuate the effects of social selection.

In summary, this study presents evidence of mental health selection to entry unemployment, disability and sole parent income support payments, extending previous work demonstrating cross-sectional and longitudinal associations between mental health and welfare receipt^{13, 16}. The strongest effect of mental health was over the short-term. Our results highlight another aspect of why mental health is relevant to social policy and welfare reform, and point to potential benefits for welfare policy of community level mental health interventions. Understanding of the dynamics of welfare receipt and mental health would be enhanced by further research that simultaneously contrasts the relative contributions of social causation and health selection.

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Competing Interests

We have read and understood the BMJ Group policy on declaration of interests and have no competing interests to declare.

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Contributor Statement

KK contributed to the study design, wrote the statistical analysis plan, cleaned the data and conducted all analyses, interpreted the data, drafted and revised the manuscript. He is the guarantor. PB contributed to the study conception and design, wrote the statistical analysis plan, interpreted the data and made critical revisions to the manuscript.

Equation for Multivariate Model 1:

$$\text{logit}(h_{sj}(k)) = [\text{baseline hazard}] + \beta_{tv,s}X_{tv} + \beta_{ti,s}X_{ti}$$

Where:

$h_{sj}(k)$ denotes the hazard of entry to income support payment s within period k of spell j ;

X_{tv} is a vector of lagged (k-1) time-varying covariates and $\beta_{tv,s}$ is the corresponding vector of coefficients for income support payment s . Time varying covariates include mental health problems, education, work history, tenure, marital status, smoking status, alcohol consumption, physical function, household income and financial hardship.

X_{ti} a vector of time-invariant baseline (k=0) covariates and $\beta_{ti,s}$ is the corresponding vector of coefficients for income support payment s . Time invariant baseline covariates include age and father's occupation.

Figure 1: Equation for Multivariate adjusted survival Model 1

Figure 2: Baseline Hazard function for entry and re-entry into Single Parent, Unemployment, Disability payments for women (top row) and men (bottom row). The Baseline Hazard for Other miscellaneous payments is not shown.

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Supplementary Table 4: Full multivariate adjusted model estimates for Women (Other miscellaneous payments not reported).

	Single Parent Payments				Unemployment Payments				Disability Payments			
	Model 1:		Model 3:		Model 1:		Model 3:		Model 1:		Model 3:	
	HR	(95% CI)	HR	(95% CI)	HR	(95% CI)	HR	(95% CI)	HR	95% CI	HR	(95% CI)
Mental Health Problems	1.448	[1.000,2.111]	1.029	[0.570,1.859]	2.050	[1.474,2.852]	1.4	[0.834,2.348]	2.226	[1.319,3.757]	2.09	[0.984,4.486]
Age	0.941	[0.926,0.956]	0.931	[0.913,0.950]	1.011	[0.991,1.031]	1.014	[0.989,1.039]	1.077	[1.045,1.111]	1.097	[1.063,1.133]
Education (Tertiary)												
Post-Secondary	1.814	[1.128,2.917]	2.738	[1.415,5.296]	2.034	[1.269,3.261]	2.251	[1.228,4.127]	1.134	[0.512,2.513]	1.918	[0.616,5.968]
Secondary	1.760	[1.057,2.930]	2.552	[1.298,5.016]	1.524	[0.927,2.506]	2.379	[1.286,4.398]	1.128	[0.438,2.904]	3.898	[1.304,11.652]
Early School Leaver	1.720	[1.050,2.820]	2.659	[1.371,5.159]	2.212	[1.369,3.575]	2.494	[1.343,4.631]	1.877	[0.901,3.912]	3.139	[1.083,9.096]
Work History	0.531	[0.319,0.884]	1.181	[0.597,2.334]	0.361	[0.203,0.642]	0.220	[0.116,0.417]	0.733	[0.271,1.983]	1.435	[0.459,4.487]
Tenure (Own home)												
Rent	1.348	[0.995,1.824]	1.136	[0.745,1.733]	1.661	[1.180,2.340]	1.475	[0.934,2.330]	1.712	[0.986,2.971]	1.995	[1.072,3.714]
Rent Free	1.05	[0.500,2.207]	0.519	[0.126,2.132]	1.079	[0.465,2.506]	1.6	[0.610,4.197]	0.758	[0.129,4.434]	0.575	[0.044,7.586]
Marital Status (Partnered)												
Separated	7.107	[4.873,10.366]	2.248	[1.245,4.061]	2.743	[1.779,4.231]	3.009	[1.778,5.095]	1.729	[0.938,3.188]	0.9	[0.434,1.863]
Widowed	6.040	[2.525,14.451]	0.000	[0.000,0.000]	1.89	[0.694,5.145]	2.816	[0.868,9.143]	2.149	[0.620,7.456]	2.18	[0.546,8.708]
Never Married/Single	1.04	[0.657,1.645]	0.481	[0.275,0.842]	4.564	[3.120,6.676]	2.991	[1.889,4.735]	4.955	[2.573,9.540]	1.73	[0.801,3.736]
Smoking Status (Current)												
Former	1.898	[1.287,2.798]	1.417	[0.877,2.290]	0.763	[0.504,1.156]	1.425	[0.893,2.275]	1.719	[0.929,3.181]	1.139	[0.550,2.359]
Current	2.202	[1.545,3.139]	2.096	[1.353,3.248]	1.578	[1.131,2.203]	1.925	[1.234,3.004]	1.904	[0.987,3.672]	2.483	[1.280,4.814]
Alcohol Consumption (Abstain)												
≤ 2 standard drinks	0.872	[0.587,1.296]	0.886	[0.505,1.557]	0.915	[0.585,1.431]	0.846	[0.472,1.516]	0.541	[0.290,1.012]	0.664	[0.308,1.432]
> 2 standard drinks	0.671	[0.433,1.041]	0.733	[0.394,1.362]	1.21	[0.762,1.920]	1.345	[0.735,2.464]	0.462	[0.226,0.946]	0.954	[0.424,2.149]
Physical Function	1.000	[0.993,1.008]	0.995	[0.986,1.004]	0.990	[0.983,0.996]	0.990	[0.982,0.999]	0.966	[0.959,0.974]	0.973	[0.965,0.982]
Financial Hardship	1.223	[1.125,1.330]	1.151	[1.022,1.296]	1.310	[1.189,1.443]	1.210	[1.049,1.395]	1.151	[0.977,1.356]	1.231	[0.980,1.547]
Household Income (\$1000)	0.959	[0.948,0.970]	0.968	[0.949,0.988]	0.979	[0.965,0.992]	0.977	[0.962,0.993]	0.98	[0.957,1.004]	0.966	[0.943,0.990]
Father's Occupation (None)												
Professional	1.299	[0.676,2.496]	1.444	[0.623,3.347]	1.01	[0.578,1.763]	1.208	[0.581,2.510]	0.306	[0.131,0.714]	0.232	[0.102,0.528]
Administrative	1.608	[0.813,3.181]	1.705	[0.689,4.220]	1.096	[0.579,2.076]	1.547	[0.697,3.432]	0.283	[0.096,0.833]	0.176	[0.054,0.580]
Trade, manual labour	1.397	[0.728,2.682]	1.342	[0.573,3.142]	0.962	[0.558,1.657]	0.943	[0.458,1.945]	0.55	[0.282,1.072]	0.324	[0.149,0.708]

Supplementary Table 5: Full multivariate adjusted model estimates for Men (Single Parent and Other miscellaneous payments not reported).

	Unemployment Payments				Disability Payments			
	HR	Model 1 (95% CI)	HR	Model 3 (95% CI)	HR	Model 1 (95% CI)	HR	Model 3 (95% CI)
Mental Health Problems	1.732	(1.220,2.459)	1.541	(0.958,2.478)	2.017	(1.213,3.353)	3.524	(2.046,6.068)
Age	1.014	(1.000,1.029)	1.020	(1.002,1.039)	1.089	(1.067,1.112)	1.081	(1.051,1.112)
Education (Tertiary)								
Post-Secondary	1.064	(0.695,1.627)	1.16	(0.691,1.947)	1.807	(0.971,3.361)	1.663	(0.847,3.268)
Secondary	1.356	(0.857,2.145)	1.378	(0.767,2.474)	1.138	(0.491,2.639)	0.693	(0.239,2.005)
Early School Leaver	1.885	(1.253,2.836)	1.919	(1.139,3.233)	2.494	(1.326,4.691)	1.884	(0.912,3.893)
Work History	0.249	(0.140,0.443)	0.439	(0.203,0.948)	0.033	(0.012,0.090)	0.042	(0.011,0.164)
Tenure (Own home)								
Rent	1.18	(0.879,1.585)	1.003	(0.686,1.466)	1.391	(0.881,2.196)	0.786	(0.400,1.542)
Rent Free	0.953	(0.469,1.936)	1.004	(0.428,2.356)	2.31	(0.983,5.427)	1.165	(0.269,5.053)
Marital Status (Partnered)								
Separated	2.434	(1.671,3.547)	2.139	(1.262,3.624)	1.111	(0.632,1.954)	1.345	(0.685,2.643)
Widowed	0.000	(0.000,0.000)	0.000	(0.000,0.000)	0.000	(0.000,0.000)	3.41	(0.410,28.395)
Never Married/Single	2.281	(1.631,3.191)	2.424	(1.618,3.633)	1.64	(0.965,2.785)	1.279	(0.610,2.682)
Smoking Status (Current)								
Former	1.334	(0.946,1.880)	1.279	(0.821,1.993)	1.103	(0.687,1.772)	1.143	(0.641,2.039)
Current	1.655	(1.192,2.298)	1.646	(1.088,2.492)	1.509	(0.929,2.451)	1.567	(0.847,2.899)
Alcohol Consumption (Abstain)								
≤ 2 standard drinks	0.689	(0.460,1.033)	0.399	(0.240,0.665)	0.843	(0.494,1.438)	1.939	(0.792,4.749)
> 2 standard drinks	0.743	(0.507,1.090)	0.561	(0.357,0.879)	0.575	(0.339,0.977)	1.424	(0.567,3.575)
Physical Function	0.994*	(0.988,0.999)	1.005	(0.996,1.015)	0.972	(0.967,0.978)	0.974	(0.968,0.981)
Financial Hardship	1.227	(1.133,1.329)	1.263	(1.138,1.401)	1.09	(0.931,1.276)	1.04	(0.875,1.237)
Household Income (\$1000)	0.972	(0.963,0.981)	0.970	(0.957,0.983)	0.986	(0.974,0.999)	0.973	(0.954,0.993)
Father's Occupation (None)								
Professional	1.106	(0.686,1.782)	0.78	(0.433,1.404)	1.314	(0.605,2.854)	1.018	(0.344,3.010)
Administrative	1.105	(0.643,1.900)	0.977	(0.508,1.878)	1.212	(0.495,2.964)	0.817	(0.256,2.603)
Trade, manual labour	1.18	(0.739,1.884)	0.882	(0.500,1.554)	1.423	(0.664,3.050)	1.022	(0.354,2.952)