Do early episodes of depression and anxiety make homelessness more likely?

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Abstract

This paper studies the relationship between early mental health episodes and early homelessness, focusing on depression and anxiety amongst disadvantaged Australians. Using data from the Australian Journeys Home survey, we investigate whether the early onset of mental health conditions make a first transition into homelessness more likely. Similarly, we analyse whether early experiences of homelessness increase the likelihood of early onset of depression or anxiety. We perform our analysis separately for men and women since there are gender differences in rates of both mental health diagnosis and homelessness. After accounting for the effects of joint observed and unobserved determinants, we find that a person's first episode of depression makes a transition to homelessness more likely for both men and women. In contrast, anxiety disorders have no effect on the likelihood of experiencing homelessness. In addition, people's first experience of homelessness has no effect on the likelihood of developing depression, but does increase the likelihood of anxiety disorders for men only.

Keywords: Homelessness, mental health, depression, anxiety, mixed proportional hazard model.

JEL-codes: I12, I32.

1 Introduction

Although homelessness affects a minority of the population, it is an extremely costly social issue in developed countries. In 2016, under one percent of the Australian population was homeless (Australian Bureau of Statistics, 2018) but the Australian Government spent $870 million on specialist homelessness services (Productivity Commission, 2020). By 2018 this expenditure almost topped a billion dollars. These costs do not include the indirect costs associated with homelessness such as those relating to health care and justice.

Mental health issues and homelessness appear to go hand in hand and empirical research findings support this idea with consistent reports of a positive association between mental illness and homelessness. However, it is not so clear whether there is a causal relationship from one to the other, i.e., whether mental illness leads to homelessness or whether homelessness triggers mental health issues. In fact, this positive association may arise from common determinants that increase both the chances of experiencing homelessness and mental illness (such as the experience of domestic violence). Determining whether the relationship is causal or not is an important empirical question because understanding the determinants of both conditions can help to identify the groups most at risk, target government resources more effectively and develop the relevant preventative measures.

This paper addresses this correlation versus causation debate by exploiting rich biographical information in a bivariate duration framework to analyse the relationship between the onset of mental health conditions and the first experience of homelessness in young people (aged 30 and under). Our analysis uses longitudinal data from the Australian Journeys Home (JH) survey of individuals who are homeless or at risk of becoming homeless (see Wooden et al. (2012) for information about the survey). Importantly, and despite the focus of the survey on housing disadvantage, only 25 percent of respondents were homeless as of wave 1.[1] This dataset provides a rare opportunity to study a larger than usual number of people who experience homelessness while still not focusing exclusively on people who are currently homeless (which is the case of studies that use samples of homeless people selected from boarding houses or who are sleeping rough).[2] We use retrospective information about the age at which respondents first experienced homelessness and were first diagnosed with different mental health conditions, distinguishing between depression, anxiety, bipolar affective disorder, schizophrenia, and post-traumatic stress disorder. Using retrospective information may lead to biased estimates (see for example Henry et al. (1994) and Moffitt et al. (2010)), but results focusing on young respondents, who should be able to provide more accurate retrospective information, suggest that this is not the case here. Our main analysis focuses on depression and anxiety which are the two most common mental health conditions. Bipolar affective disorder, schizophrenia, and post-traumatic stress disorder are considered in sensitivity analysis.

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[1] Journeys Home identifies a broad concept of homelessness which is consistent with the Australian and the recent U.S literature, with homelessness including the following housing arrangements: sleeping rough; squatting; staying in crisis accommodation; staying in a hotel or motel; staying at a boarding house or hostel; staying in a caravan, mobile home, cabin, houseboat; staying at a friend's house temporarily; staying with relatives temporarily.

[2] Nevertheless, we address questions of sample selection and possible resulting biases for our estimates. and find that our results are unlikely biased by sample selection.

The relationship between mental health and homelessness is complicated because they share many common determinants, whether these determinants have been found to be causal or correlational. For example, wealth shocks have been shown to often precede changes in mental health as well as homelessness episodes (McInerney et al. 2013; Apouey and Clark 2015; O'Flaherty 2004, 2009, 2010). The literature has also investigated the role of job loss in triggering mental health issues (for example, Salm 2009; Marcus 2013; Bünnings et al. 2017) and homelessness episodes (Metraux et al. 2018 for a review). More relevant to young people, the use of illegal drugs has been linked to both mental health (Van Ours and Williams, 2012, Moschion and Powdthavee 2018) and to homelessness (McVicar et al. 2015, 2019). Likewise, experiences of trauma, and sexual and physical violence are associated with subsequent mental health conditions and homelessness. Mental health issues can also trigger events that may be pathways to homelessness by for example leading people to leave the labour market (Frijters et al. 2014) or impairing their decision making (Kung et al. 2018). Mental health issues can also be triggered by experiences of homelessness, and the hardship that comes with unstable housing arrangements over long periods of time. Yet, the sequence in which events occur is insufficient evidence to conclude that an earlier event affects a later event. Overall, the extensive list of common and intricate determinants (or correlates) complicates the analysis of causality between mental health and homelessness.

Previous research on the relationship between mental health and homelessness is often limited to establishing an association leaving aside the question of causality.[3] In a paper investigating the determinants of homelessness, Fitzpatrick (2005) argues that the homeless often face non-housing problems such as mental health issues but not all people who have mental health issues are homeless. Chamberlain and Johnson (2013) suggest that the likelihood of experiencing homelessness for people with mental health issues is age-related. While young people have parental support which acts as a protective factor, older people often cannot rely on such support (due to death or incapacity) which can increase their risk of homelessness. Previous research also indicates that the factors contributing to homelessness vary over the life course. While disruptive childhood events appear to coincide with early experiences of homelessness, episodes of mental health issues and substance abuse coincide with experiences of homelessness later in life (Brown et al. 2016).

Few studies have tried to identify causal determinants of homelessness. Moschion and Van Ours (2019) find that parental separation is a major contributor to childhood homelessness. Despite the strong association between substance use and homelessness, McVicar et al. (2015, 2019) find that substance use is rarely the cause of the first or subsequent episodes of homelessness. Looking more specifically at mental health episodes and how they relate to transitions in and out of homelessness in adulthood (beyond their onset), Moschion and Van Ours (2021) conclude that only episodes of depression increase the probability that a person subsequently becomes homeless. There is no evidence that other mental health episodes (anxiety, bipolar affective disorder, schizophrenia, or post-traumatic stress disorder) affect transitions into homelessness or that becoming homeless causes a person to have a mental health episode. Moschion and Van Ours (2021) focus on the short-term interaction between current mental health and homelessness episodes over a limited time period of three years using

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[3] See O'Flaherty (2019) for a survey of recent economic research on homelessness.

information in 6-months intervals. While that paper addresses the important policy question of how to support exits or manage episodes better, it does not address the question of the origin of the relationship between homelessness and mental health issues and how to design preventative measures that can detract people from falling into a cycle of homelessness and mental health episodes, including the role that early life intervention may play. The events studied in both papers are different events: while Moschion and Van Ours (2021) focus on events that occurred during the survey period when the respondents were on average 32 years old, the current paper analyses the relationship between mental health issues and homelessness episodes that occurred when the respondents were on average 17 and 18 years old (with none occurring during the survey).

This paper directly addresses the research question of the origin of the relationship between homelessness and mental health from an early age. In other words, while Moschion and Van Ours (2021) study recurrent interactions the current paper focuses on the relationship between the onset of mental health problems and the onset of homelessness. Specifically, the current paper focuses on people's *first* diagnosis of a mental health condition and their *first* experience of homelessness that occur *early in life* (by age 30) which may be critical in determining their trajectories later in life. As emphasised by Chamberlain and Johnson (2013) and Brown et al. 2016), early onsets of mental health issues and early experiences of homelessness most likely have different determinants from episodes that occur later in life. This entails that the nature of the relationship between mental health issues and homelessness as well as the specific mental health conditions that matters for homelessness are likely to differ at this early stage.

Our contribution to the literature is threefold. First, the detailed historical information provided in the data allows us to analyse the relationship between the age of onset of mental health conditions and homelessness while accounting for the timing of events and detailed observed characteristics. Further, the multivariate duration model allows us to account for time-invariant unobserved heterogeneity. These features enable us to investigate the potential for a causal relationship and push the frontier of homelessness research beyond establishing associations. Second, we use information on professionally diagnosed mental health conditions. Although this information is self-reported, it is a less subjective measure than self-report questionnaires designed to assess mental wellbeing (such as the Kessler Psychological Distress Scale). It also allows us to distinguish between depression and anxiety and it provides the necessary time anchor point (the onset) to conduct the analysis. Naturally, using diagnosed conditions raises the concern of the prevalence of undiagnosed conditions. Importantly, Moschion and Van Ours (2021) find: (i) similar results using current diagnosis of depression and the Kessler-6 scale; (ii) evidence that JH respondents use mental health services when they need to, including in periods of housing insecurity.[4] Finally, if undiagnosed conditions are the less severe cases, it is likely that our estimates would overestimate the relationships between

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[4] The coverage of mental health support services may have increased in the 15 years that separate the average onset and the average age of respondents. However, the prevalence of mental health first diagnosis in our sample (46% overall, i.e. for men and women, and respondents who experienced homelessness and those who did not, see Table 1) aligns with other available information on lifetime prevalence of mental health conditions amongst the homeless. For example, MacKenzie et al. (2016b) found that 53% of homeless youth reported being diagnosed with at least one mental health condition over the course of their life.

mental health and homelessness, thereby giving more credence to our conclusions that the causal links are much smaller than the raw associations. Third, we analyse the magnitude of our estimates relative to other childhood experiences and circumstances (such as, relationships with parents, experiences of violence) to gauge how significant of a pathway mental health conditions are to homelessness.

We find that after accounting for the effects of joint observed and unobserved determinants, the onset of depression increases the likelihood of transitioning to homelessness for the first time. But, the first episodes of anxiety disorders do not affect the chances of a young person's first transition into homelessness. These results hold for men and women. Looking at the reverse, we find there is no effect of a young person's first homelessness episode on the likelihood of developing depression for either gender. However, homelessness increases the likelihood of developing an anxiety disorder for men only. Results also indicate that the effect of depression on transitioning to homelessness is of the same magnitude as emotional abuse and neglect during childhood or not living with one's parents at age 14 because of divorce or separation, but smaller than not living with one's parents at age 14 because of conflict. This suggests that experiencing a mental health condition at a young age, depression specifically, seems to be a significant pathway to homelessness. Therefore, treating depression early could be an effective way of preventing homelessness for disadvantaged young people.

The rest of the paper is structured as follows. Section 2 describes the Journeys Home data, discusses our outcome and explanatory variables, and provides a descriptive analysis of people's first transitions to homelessness and the onset of depression and anxiety disorders. Section 3 presents the empirical strategy for investigating the possibility of a causal relationship between mental health conditions and first transitions into homelessness. Section 4 presents the baseline parameter estimates, the results of some sensitivity analysis and simulations based on the baseline parameter estimates to illustrate the magnitude of the effect of depression on the first transition to homelessness. Section 5 concludes with a summary and discussion.

2 Data, variable definitions and descriptive analysis

2.1 Journeys Home sample

Our analysis draws on data from Journeys Home, an Australian longitudinal dataset of individuals who are homeless or at risk of becoming homeless (see Wooden et al. (2012) for details). In contrast to other studies of homelessness which have traditionally drawn samples from homeless shelters or specialist homeless programs[5], the sample for JH was drawn from administrative data and covers a much broader sample of the most disadvantaged population. Back of the envelope calculations presented in Moschion and Van Ours (2019) show that the JH sample corresponds to the lowest percentile of the Australian population in terms of multi-dimensional disadvantage. As described below, JH respondents are disadvantaged along all standard socio-economic dimensions, but at wave 1, only 25 percent of respondents were

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[5] An exception is Shinn et al. (1998) which included both individuals that were homeless or at risk of homelessness, but this study was restricted to New York City.

actually homeless.[6] JH was launched in September 2011 and six waves of data were collected bi-annually between 2011 and 2014.

The respondents were sampled from the universe of income support recipients which is managed by a single entity in Australia – Centrelink. In May 2011 (when the sample was drawn), more than one in five Australian residents were receiving some kind of income support payment (such as childcare payments, rent assistance, disability benefits, unemployment benefits, and so on). From this population subset, the most disadvantaged income support recipients were identified using a two-step process – these people comprise the JH sample. First, about 70 percent of the JH sample was drawn from income support recipients who had been flagged by Centrelink as being homeless (N=581) or at-risk of homelessness (N=625). Second, the JH team used very detailed information about the histories of income support recipients and statistical modelling to estimate predicted probabilities of homelessness for all income support recipients that had not been flagged by Centrelink directly. The last 30 percent of the JH sample was drawn from the subsample of income support recipients whose predicted probabilities of homelessness were in the top 2 percent of all estimated probabilities (N=475, median predicted probability=12%) (Wooden et al. 2012).

Despite the multi-dimensional nature of disadvantage in the JH sample, the sampling methodology mainly focused on housing disadvantage. This link between the sample selection and our outcome of interest may generate a bias in our estimates of the relationship between the onset of mental health conditions and homelessness. This would occur if the sample was selected in a way that is also correlated with mental health conditions. That is, if the unobservables determining the selection into the JH sample are correlated with the unobservables determining our outcome (homelessness by age 30) in a way that relates to mental health conditions. Although this cannot be ruled out completely, several features of our modelling choices minimize scope for such bias to arise. First, the use of multivariate duration modelling means that unobserved heterogeneity is accounted for (under certain conditions outlined in section 3). Second, the selection of the JH sample is based on homelessness status and risk in 2011 when the respondents are aged 32 on average, while we are interested in the onset of homelessness by 30 years old (which is experienced at an average age of 17). As outlined in the introduction, the literature has described different processes and determinants for homelessness at different ages. The determinants of current homelessness at age 32 – used to select the JH sample – are likely to differ from the drivers of youth homelessness as studied in this paper. Third, our analysis includes individuals who have not been homeless by age 30 (25 percent of the sample) and who may or may not have had mental health conditions. Overall, a bias in our estimates would only arise if an event or characteristic related to the onset of mental health conditions affected the selection into the JH survey as well as the experience of homelessness by age 30.

Nevertheless, we test for the presence of a possible bias empirically using information on what determined selection into JH (whether respondents were attributed a Centrelink flag or

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[6] Despite the broad coverage of the JH sample, there may be concerns around missing significant segments of the most marginalized homeless population. Although we undoubtedly miss homeless people with no contact with the income support system, we expect this group to be small. Indeed, in 2009-10 about 85 percent of Australian residents using homelessness services relied on government support payments as their main source of income (Australian Institute of Health and Welfare, 2011).

had a high predicted probability of homelessness). As to be expected, we find that the rate at which respondents were flagged by Centrelink as "homeless" or "at risk of homelessness" is higher for those who were homeless at wave 1 compared to those who were not homeless (flag rate: 80% vs 69%). In this way, the selection of the JH sample is biased and relates to homelessness status at wave 1. But the predicted probability of homelessness (calculated for those who were not flagged by Centrelink) is similar between respondents who were homeless at wave 1 and those who were not (20% vs 18%). Importantly, we do not find any systematic relationship between these determinants and our outcome of interest –experience of homelessness by age 30. Specifically, the rates at which people were flagged by Centrelink and the predicted probability of homelessness are similar for the respondents who experienced homelessness by age 30 compared with those who had not (flag rate: 71% vs 72%; predicted probability: 18% vs 15%). The independence of our outcome to the determinants of sample selection gives us confidence that our estimates do not suffer from significant biases. Further, our sensitivity analysis shows that our results are robust to including the determinants of sample selection as controls in our analysis and separately studying respondents who were flagged by Centrelink and those who were not.

The sample of analysis includes all wave 1 respondents with complete information about their experience of homelessness and diagnosis of mental health conditions (N=1,457), which captures about 87 percent of the JH sample.

2.2 Variable construction

Information collected at wave 1 (September 2011) about respondents' experience of homelessness (occurrence and age of onset) is used to create our indicator of homelessness by age 30. Homelessness is identified retrospectively in the wave 1 survey with the following question: "Thinking about both your current and past experiences, have you ever stayed in any of the following places because you did not have a place to live?" Possible responses include: stayed with relatives temporarily; stayed at a friend's house temporarily; stayed in a caravan, mobile home, cabin, houseboat; stayed at a boarding house or hostel; stayed in a hotel or motel; stayed in crisis accommodation or a refuge; squatted in an abandoned building; slept rough (such as sleeping in cars, tents, trains or anywhere else outdoors).

We use a broad concept of homelessness which encompasses all living arrangements which do not provide the necessary security to qualify as a 'home'. This definition follows Australia's traditional definition of homelessness (Australian Bureau of Statistics; Johnson and Chamberlain 2008) and is consistent with the most recent developments in the U.S. (U.S. 2009 Homeless Emergency Assistance and Rapid Transition to Housing Act; Curtis et al 2013). JH contains specific information about all the types of homelessness the respondent has experienced in their life, which means experiences of literal homelessness can be identified (i.e., staying in crisis accommodation, squatting or sleeping rough). However, we are not able to study the relationship between the onsets of literal homelessness and mental health conditions directly as we do not know the age of onset for each particular type of homelessness. Instead, we can test whether the relationship between (broad) homelessness and mental health conditions is weaker or stronger for respondents who have ever been literally homeless compared with those who have never been literally homeless.

Information collected in wave 1 about the diagnosis of five mental health conditions (depression; anxiety disorder; PTSD; bipolar affective disorder; and schizophrenia) is used to create indicators of mental health issues. We complement this information with information collected at wave 3 about the age at which the five mental health conditions were first diagnosed by a mental health professional. We use this information to identify the age of onset for each mental health conditions as at wave 1 (i.e., we censor onsets for diagnoses which occurred between wave 1 and wave 3). Backfilling the data to wave 1 is preferred to using the balanced panel as at wave 3 because it retains a larger sample (i.e., we retain 66 non-respondents at wave 2 and 91 non-respondents at wave 3 who had not been diagnosed with any mental health conditions as of wave 1 and for who the wave 3 information is unnecessary – 11% of our sample). Using the balanced panel at wave 3 yields similar results (see sensitivity analysis).

We focus our analysis on the first episodes of homelessness and diagnosis of mental health conditions up to age 30. The processes leading to homelessness and to mental health conditions as well as the dynamics between them is likely to be different in adolescence and young adulthood compared to adulthood, when financial independence is established and the reliance on caregivers is less common (Chamberlain and Johnson 2013). As shown in figure 1, homelessness and mental health conditions often appear for the first time when respondents are younger than 30, making this period of life particularly interesting to study. As explained above, focusing on outcomes occurring by age 30 also minimises the potential bias arising from sample selection. In other words, our sample also includes respondents who, independent of their initial circumstances, did not become homeless and were not diagnosed with a mental health condition by age 30 (respectively 25% and 60%).

Figure 1 - Cumulative probability of having experienced homelessness or mental health conditions by age 30, by gender
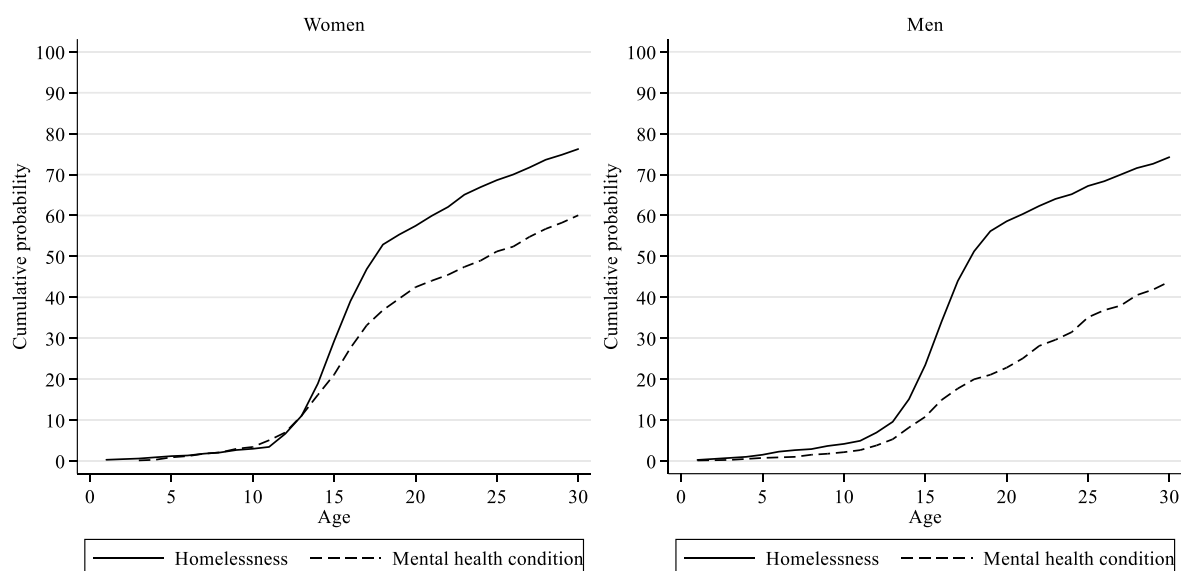
Notes: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions (669 women and 788 men). Onsets of homeless and mental health conditions are censored above age 30.

People experience peaks in first experience of homelessness or mental health conditions in their late teens. Figure 1 shows the cumulative starting probabilities for homelessness and the

diagnosis of any mental health condition up to age 30. For both men and women in the sample, mental health conditions are less prevalent than homelessness. For women, the starting rates of homelessness clearly accelerate between ages 14 and 18. From age 19 onward some respondents are still experiencing their first experience of homelessness but at a much slower rate. The rate of diagnosis of mental health conditions peaks between ages 13 and 17 although the slope is less pronounced than for transitions into homelessness. Beyond age 20, first experiences of homelessness and mental health conditions increase at the same speed. For men, the onset of homelessness accelerates between ages 15 and 17, while the pattern is not as stark for onsets of mental health conditions. While the age of onset patterns of homelessness and mental health diagnosis look quite similar for women, they are quite different for men.

Figure 2 shows the cumulative starting probabilities for the separate mental health conditions up to age 30. Depression is clearly the most common mental health condition for both women and men reaching almost half of women and a third of men in our sample by age 30. In fact, the progression of the cumulative probabilities of depression and any mental health condition are very similar to each other suggesting a possible overlap between the diagnosis of depression and other mental health conditions. Anxiety disorder is the second most common mental health condition among the population we study. The other mental health conditions are less common.

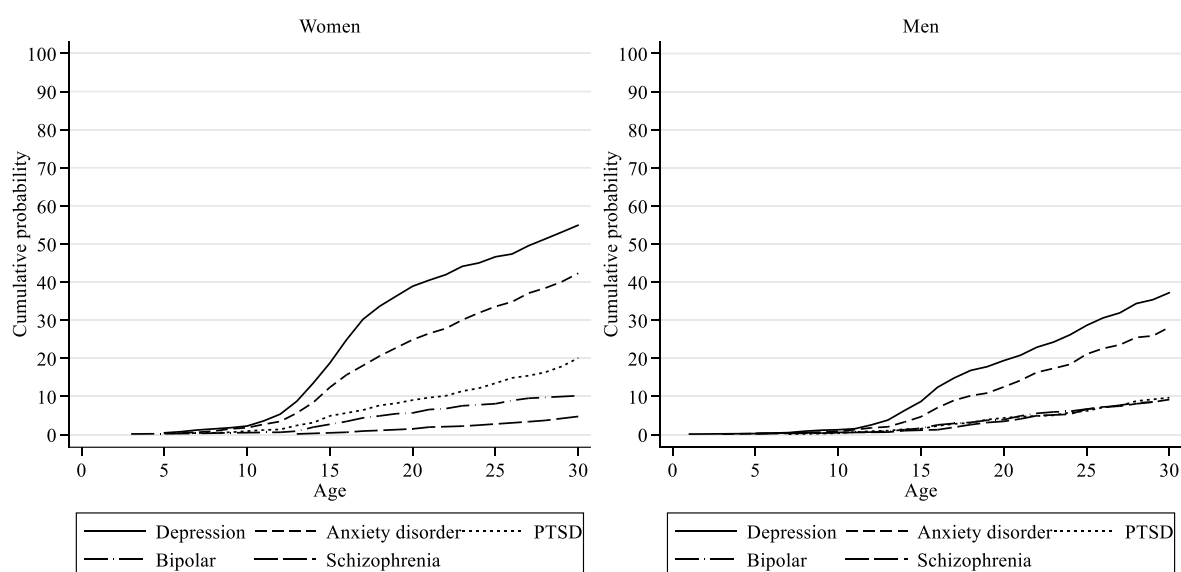**Figure 2 - Cumulative probability of having experienced mental health conditions by age 30, by gender**

Notes: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions (669 women and 788 men). Onsets of mental health conditions are censored above age 30.

Table 1 shows the prevalence rates of our variables of interest by age 30 and the mean age of onset (conditional on having been homeless or diagnosed with a certain mental health condition). By age 30, 76 percent of the women and 74 percent of the men in our sample have been homeless at least once with a mean age of onset of 17.3. Mental health conditions are also extremely common in our sample with 49 percent of women and 32 percent of men having been diagnosed with depression by age 30. The mean age of onset of depression is 17.3 for women

and 19.3 for men. The second most common mental health condition diagnosed is anxiety disorder with 35 percent of women and 23 percent of the men diagnosed by age 30. The other mental health conditions are less common and tend to happen on average slightly later. For example, only 3 percent of women and 8 percent of men were diagnosed with schizophrenia, and the diagnosis occurred on average in their early twenties. When comparing the age of onset of homelessness and the age of diagnosis of any mental health condition, we find that for women both happen on average at the same time (at just over 17 years old). Whereas for men, homelessness tends to happen on average 1.7 years earlier than any mental health condition (at 17.3 years old). Again, there is significant comorbidity in mental health conditions, with depression being the most common. For example, of the 54 percent women who had a mental health condition almost all of them had depression (49 percent) leaving only 5 percent of women with mental health condition(s) not involving depression. The same is evident for men.

Table 1 - Prevalence and age of onset of mental health conditions and homelessness (by age 30)

	Prevalence (%)		Age of onset (mean)	
	Women	Men	Women	Men
Homelessness	75.6	74.2	17.3	17.3
	(43.0)	(43.8)	(5.0)	(4.9)
Literal homelessness	50.7	57.2	16.9	17.2
	(50.0)	(49.5)	(5.1)	(5.1)
Depression	48.6	31.9	17.3	19.3
	(50.0)	(46.6)	(5.1)	(5.7)
Anxiety disorder	34.7	23.2	18.3	20.1
	(47.6)	(42.3)	(5.6)	(5.7)
PTSD	16.0	9.1	19.5	20.4
	(36.7)	(28.7)	(6.3)	(6.1)
Bipolar affective disorder	8.6	8.1	18.1	19.1
	(28.0)	(27.2)	(5.5)	(5.8)
Schizophrenia	3.1	8.3	21.8	20.7
	(17.5)	(27.7)	(5.5)	(6.0)
Any mental health condition	53.7	39.1	17.2	19.0
	(49.9)	(48.8)	(5.3)	(5.9)

Note: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions (669 women and 788 men). The age of onset is conditional on the event occurring by age 30. Literal homelessness is defined as having stayed in crisis accommodation, squatted in abandoned buildings or slept rough. The age of onset for literal homelessness is the age of onset of homelessness (any type) for the subset of respondents who have experienced literal homelessness by age 30 (the age of onset was not collected separately for each type of homelessness).
Standard deviations in parentheses.

2.3 Descriptive analysis

In the empirical analysis, the sequence of events for each individual is important. The order in which events happen help determine whether mental health conditions can lead to homelessness, or whether it is the other way around. Table 2 shows the sequence of events for

diagnosis of depression, anxiety disorder and any mental health condition up to age 30. Despite the mean ages of onset not being very different there is a substantial number of people for whom homelessness did not occur at the same age as the diagnosis of mental health conditions. Almost 19 percent of women and 9 percent of men were diagnosed with depression before they became homeless while 16 percent of women and men became homeless before they were diagnosed with depression. For women, depression most often happens first, while for men, homelessness happens first. In contrast, the diagnosis of anxiety disorders tends to happen after homelessness for both genders (14 percent), but there are still 11 percent of women diagnosed with anxiety disorder before becoming homeless while this is only the case for 5 percent of men. About 11 percent of the individuals in our sample received their first diagnosis for a mental health condition at the same age as the age at which they became homeless for the first time (8 percent of women and 3 percent of men). The evidence suggests that for men mental health conditions develop (or are diagnosed) after their first episode of homelessness rather than the reverse, while for women the timing is more heterogeneous. There are also a substantial proportion of the sample who experience homelessness but not any mental health condition (30 percent of women and 40 percent of men).

Table 2 - Sequence of events (by age 30)

	Depression (%)		Anxiety disorder (%)		Any mental health condition (%)	
	Women	Men	Women	Men	Women	Men
Mental health condition first	18.7	9.4	10.9	5.2	21.4	11.6
Homelessness first	15.6	15.9	13.9	13.6	16.3	18.9
Same age	7.2	3.1	5.1	1.9	7.7	3.2
Not homeless, mental health condition	7.2	3.6	4.8	2.5	8.1	4.9
No mental health condition, homeless	34.2	45.9	45.7	53.6	30.1	40.2
Neither	17.2	22.2	19.6	23.2	16.3	21.2
Total	100	100	100	100	100	100

Note: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions (669 women and 788 men).

Figure 3 plots the age of onset of both homelessness and the diagnosis of any mental health condition for the sample of respondents who experienced both (first three rows of table 2). It shows that for women, apart from a few cases in which both events happened at the same age, there is a relatively good balance of cases in which homelessness or mental health diagnosis occurred first (either side of the diagonal line). For men, the cases are less evenly distributed and there are clearly more cases in which homelessness happened before the diagnosis of a mental health condition (below the diagonal line).

Figure 3 – Sequence of the onsets of homelessness and mental health conditions
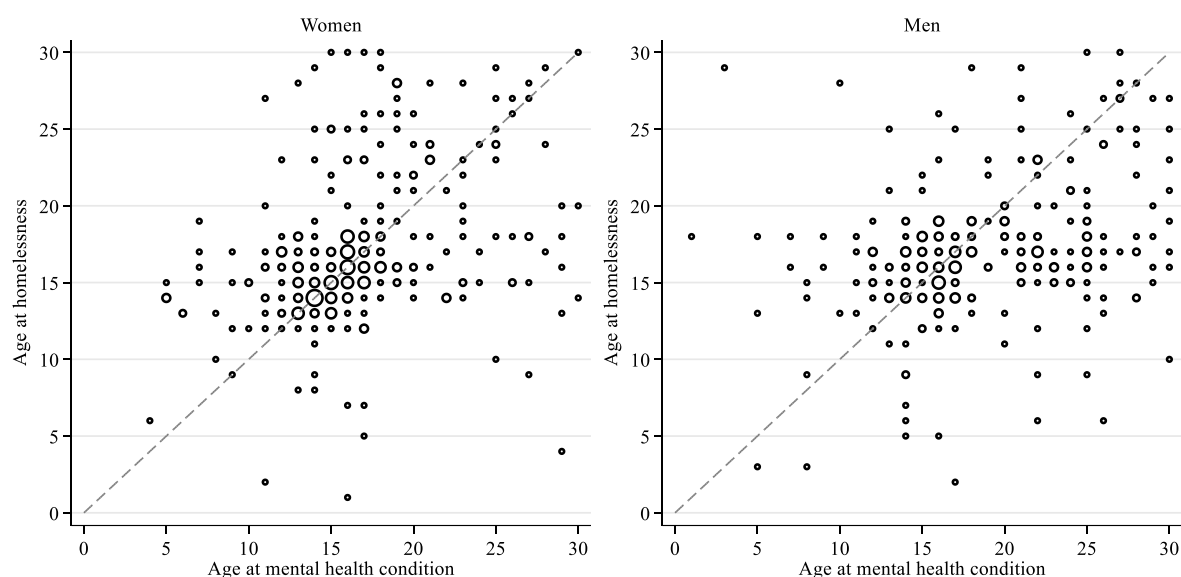
Notes: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions (669 women and 788 men). Onsets of homeless and mental health conditions are censored above age 30.

As mentioned earlier, our sample is disadvantaged along every socio-economic dimension, both in comparison with the broad Australian population but also in comparison with the income support population (see Scutella et al. (2013) for more details). In essence, the JH respondents have lower levels of education, employment, income and higher levels of income support receipt, mental health conditions, substance use and incarceration to cite a few examples.

The first two columns of Table A1 shows averages of the characteristics that are used as controls in the empirical analysis separately for women and men in our sample. They characterise different aspects of respondents' childhood and clearly demonstrate the very high levels of adversity the JH respondents faced during their formative years. For instance, almost half of our sample did not live with their biological parents at 14 (either because of separation, death or conflict), more than half of the sample endured emotional abuse and physical violence during childhood. Finally, the rate of sexual violence experienced during childhood are extremely high and vary by gender with 36 percent of women and 15 percent of men having suffered from it. Their caregivers had low levels of education (only 25% finished secondary school) and high levels of substance abuse (29% of male caregivers and 17% of female caregivers), incarceration (11% of male caregivers and 2% of female caregivers), hospitalisation for mental health issues (5% of male caregivers and 11% of female caregivers), long-term unemployment (17% of male caregivers and 38% of female caregivers) and gambling problems (9% of male caregivers and 7% of female caregivers).

In the last two columns of Table A1, we compare our sample with the 14 percent JH respondents that were excluded from it because they had missing information on characteristics critical to our analysis, namely about their experiences of homelessness or mental health diagnosis. The missing information mostly comes from respondents who experienced the condition but have not given the age of onset for it, either because of item non-response or, for mental health conditions, because they did not respond in wave 3 of the survey (when age of

onset was collected). By construction, rates of homelessness and mental health conditions are therefore extremely high for the respondents that are dropped from the analysis. Apart from these, the characteristics of respondents in our sample are overwhelmingly similar to that of respondents that are excluded from the sample. The only notable exception appears for a variable that captures missing information on the reasons for not living with their parents at age 14 and on whether they experienced violence during their childhood. This means that respondents who have missing information on homelessness and mental health diagnoses also more often have missing information on those variables. This supports the method of controlling for missing information on these sensitive variables rather than dropping additional respondents from the sample.

3   Empirical methodology

The empirical method we use in our analysis follows from the research question we are addressing around the origin of the relationship between mental health and homelessness. This issue is best investigated using life histories in a duration framework.[7] Our lifetime histories are from a non-random sample of Australians who are homeless or at-risk of homelessness, potentially leading to biases in our estimates. Our empirical methodology allows us to take this selectivity into account and we provide evidence that our results are robust to controlling for characteristics that determine sample selection. We first discuss the set-up of our empirical analysis and then return to this selectivity issue.

The aims of our analysis are to study: (i) whether the onset of a mental health condition makes it more likely for individuals to become homeless; and (ii) whether the onset of homelessness makes it more likely for individuals to be diagnosed with a mental health condition. To investigate these relationships, we use a trivariate simultaneous duration model for homelessness onset and the diagnosis of two mental health conditions, i.e., depression and anxiety disorder. In this model, a transition into homelessness may causally affect the transition rate into a mental health condition while similarly the transition into a mental health condition may affect the transition into homelessness. In other words, the realisation of one duration can be considered as a treatment that causally affects the other duration.

The trivariate model we estimate expands on earlier work that was predominantly based on bivariate duration models with a one-sided effect direction. In these models, there are two transition processes in which the realisation of one transition could affect the other transition but not vice versa. In our model, we consider three processes with bi-directional effects from homelessness to mental health conditions and vice versa. A critical feature of these duration models is that identification of the treatment effect does not rely on a standard conditional independence assumption (Abbring and Van den Berg, 2003). In other words, by conditioning the estimation on both observables and jointly distributed unobservables, it is not necessary to have a valid instrument. Rather, identification stems from the sequence in which events occur, i.e., the timing of onsets of mental health conditions and homelessness. In this context,

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[7] This is in contrast to Moschion and Van Ours (2021) who investigate interactions between current mental health and homelessness episodes over a short period of time and therefore use a linear fixed-effects model as the appropriate method.

the causal interpretation relies on the no-anticipation assumption and the estimation of unobserved heterogeneity.

The inclusion of correlated unobserved heterogeneity critically allows these duration models to account for time-invariant characteristics that, in our application, may lead individuals to be simultaneously more prone to developing mental health conditions and experiencing homelessness. In addition, the identification of treatment effects relies on a 'no-anticipation' assumption, which is set out formally and discussed at length in Abbring and van den Berg (2003) and again in Abbring and Heckman (2007). The no-anticipation assumption implies that although individuals may have an *expectation* of an outcome occurring, because they cannot foresee the exact time at which it will occur they do not change their (other outcome-relevant) behaviour in anticipation of it. In our specific case, it assumes that, conditional on observable controls and jointly distributed unobservables, individuals do not alter behaviours relevant to their mental health as a result of knowing that they will become homeless in a future year, and vice versa. As we will show later on, the onset of homelessness is driven by a wide variety of factors, the most common of which involve the actions of others (e.g., family members and care takers, landlords, employers). These actions are not perfectly foreseeable by individuals. They are therefore unlikely to pre-emptively change behaviours related to future mental health conditions prior to becoming homeless but based on knowing that they will and when. Similarly, the timing of diagnosis of a mental health condition is likely to depend on imperfectly predictable factors such as the degree to which mental health conditions run in the family. These factors seem equally unlikely to change behaviours relevant to transitions into homelessness in advance.

More generally, the violation of the no-anticipation assumption requires that: (i) individuals have information regarding their future transition into the treatment (respectively homelessness and mental health conditions); (ii) they know precisely when this transition will occur; (iii) they alter their behaviour with respect to the other outcome of interest in anticipation (respectively mental health conditions and homelessness); and (iv) that the model does not account for the factors that led them to anticipate their transitions (via observed or unobserved characteristics).[8] It is in this sense that the no-anticipation assumption is arguably weaker than a standard conditional independence assumption (for a more detailed discussion see Lalive et al. 2008).

The trivariate model is expressed as mixed proportional hazard (MPH) specifications of three transition rates: to depression, to anxiety and to homelessness. The rate of onset of a mental health condition m (with $m=d$ or a referring to depression or anxiety) at duration t

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[8] Some people may know some time in advance the exact date at which they will become homeless and experience depression (for example if they know several weeks in advance that they will get evicted). If this is modelled following the sequence of events as they actually occur – first depression, then homelessness – it would lead to the erroneous conclusion that depression causes homelessness. However, in our estimates we ignore the sequence of events if they occur close to each other. As we only know the age at which each event first occurs and not the actual date, we are unable to determine whether homelessness occurred first if both the onsets of homelessness and mental health conditions occurred at the same age. We therefore allow homelessness to impact mental health onsets if and only if it occurred at a younger age, i.e. at least six months before on average, making these anticipation effects unlikely.

conditional on observed characteristics x and unobserved characteristics v_m and whether an individual has been homeless before t, is given by:[9]

$$\theta_m(t|x, t_h, v_m) = \lambda_m(t)\exp\left(x'\beta_m + v_m\right) \text{ for } t \leq t_h \qquad \text{and } m = d, a$$
$$\theta_m(t|x, t_h, v_m) = \lambda_m(t)\exp\left(x'\beta_m + \delta_{m,h} + v_m\right) \text{ for } t > t_h \quad \text{and } m = d, a \qquad (1)$$

where t_h is the duration at which the individual first experiences homelessness. The effect of homelessness on the diagnosis of a mental health condition materializes as a shift factor indicated by $\delta_{m,h}$. This shift factor will be positive if individuals who have been homeless are more likely to be diagnosed with a mental health condition. It will be negative if homeless individuals are less likely to be diagnosed with a mental health condition. The unobserved characteristics v_m are assumed to be independent of the observed characteristics x, i.e., the unobserved characteristics are specified as random effects. Similarly, the rate of transition to homelessness at duration t conditional on observed and unobserved characteristics x and v_h and whether an individual was diagnosed with a mental health condition before t, is given by:

$$\theta_h(t|x, t_d, t_a, v_h) = \lambda_h(t)\exp\left(x'\beta_h + v_h\right) \text{ for } t \leq t_d, t_a$$
$$\theta_h(t|x, t_d, t_a, v_h) = \lambda_h(t)\exp\left(x'\beta_h + \delta_d + v_h\right) \text{ for } t_d < t \leq t_a$$
$$\theta_h(t|x, t_d, t_a, v_h) = \lambda_h(t)\exp\left(x'\beta_h + \delta_a + v_h\right) \text{ for } t_a < t \leq t_d \qquad (2)$$
$$\theta_h(t|x, t_d, t_a, v_h) = \lambda_h(t)\exp\left(x'\beta_h + \delta_d + \delta_a + v_h\right) \text{ for } t > t_d, t_a$$

where t_d, t_a represent the times at which the individual is respectively diagnosed with depression and anxiety disorder. The effect of having one of the mental health conditions on the onset of homelessness is measured by δ_d and δ_a. These are the key parameter of interest as they inform us as to whether a previous diagnosis of a mental health condition increases the risk of homelessness, reduces the risk of homelessness, or has no direct effect on the likelihood of experiencing homelessness. Again, the unobserved characteristics are assumed to be independent of the observed characteristics. The baseline hazards $\lambda_d(t)$, $\lambda_a(t)$ and $\lambda_h(t)$ capture duration dependence of individual transition rates. Furthermore, β_d, β_a and β_h are vectors of parameters capturing the effects of observable characteristics on the transition rates into depression, anxiety disorder and homelessness.

When modelling the onset of mental health conditions, we assume that potential exposure to mental health conditions occurs throughout life. We model transitions up to and including age 30 to capture early onsets of mental health conditions and early onsets of homelessness. As discussed earlier, the onset of homelessness that occurs later in life appear to be driven by a different set of factors than when the onset occurs when a person is young.

We model duration dependence in the transition hazard into mental health conditions in a flexible way using a step function $\lambda_m(t) = \exp\left(\sum_k \lambda_{m,k} I_k(t)\right)$, where $k = (1, ..., 10)$ is a subscript for age categories and $I_k(t)$ are time-varying dummy variables that equal one in the relevant category. We specify 10 dummies to capture age: a dummy for aged less than 12;

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[9] The control variables included in our model are listed in Appendix A and described in Table A1.

separate dummies for ages 12 to 18; a dummy for ages 19 to 21; and a dummy for ages 22 to 30. Because we also estimate a constant term, we normalize $\lambda_{m,1} = 0$.

The conditional density function for the completed durations until the onset of mental health conditions can be written as:

$$f_m(t|x,t_h,v_m) = \theta_m(t|x,t_h,v_m)\exp\left(-\int_0^t \theta_m(s|x,t_h,v_m)\,ds\right) \text{ and } m = d, a. \qquad (3)$$

Individuals who have not being diagnosed with mental health conditions by the age they are last observed in the survey are assumed to have a right-censored duration of no mental health condition.

In the transition rate to homelessness, $\lambda_h(t)$ represents individual duration dependence which is modelled using a step function which is specified in the same way as for mental health conditions. The conditional density function for the completed duration until first homelessness can be written as:

$$f_h(t|x,t_d,t_a,v_h) = \theta_h(t|x,t_d,t_a,v_h)\exp\left(-\int_0^t \theta_h(\sigma|x,t_d,t_a,v_h)\,d\sigma\right). \qquad (4)$$

Individuals who have not experienced homelessness by the age they are last observed in the data are assumed to have a right-censored duration until the onset of homelessness.

The potential correlation between the unobserved components in the hazard rates for mental health conditions and homelessness is considered by specifying the joint density function for the three durations of time until a first depression diagnosis t_d, until a first anxiety diagnosis t_a and until homelessness t_h conditional on x as:

$$f(t_d,t_a,t_h|x) = \int_{v_h}\int_{v_d}\int_{v_a} f_d(t|x,t_h,v_d).f_a(t|x,t_h,v_a)f_h(t|x,t_d,t_a,v_h)dG(v_h,v_d,v_a). \qquad (5)$$

As is standard in recent applications of multivariate duration models, $G(v_h,v_d,v_a)$ is assumed to be a flexible discrete distribution with an unknown number of points of support. We start by assuming that for every transition process its unobserved heterogeneity can be specified by a discrete distribution with two points of support. In combination across the three transitions, this leads to eight points of support:

$$(v_{h1},v_{d1},v_{a1}), (v_{h2},v_{d1},v_{a1}), (v_{h1},v_{d1},v_{a2}), (v_{h2},v_{d1},v_{a2}),$$
$$(v_{h1},v_{d2},v_{a1}), (v_{h2},v_{d2},v_{a1}), (v_{h1},v_{d2},v_{a2}), (v_{h2},v_{d2},v_{a2}),$$

reflecting two types of individuals in the hazard rates for both types of mental health conditions and two types in the hazard rate for homelessness (high susceptibility and low susceptibility). Because we also estimate three constants in the hazard rates, we normalize $v_{h1}=v_{d1}=v_{a1}=0$. The eight mass points imply that conditional on observed characteristics there could be eight types of individuals. The associated probabilities are denoted as follows:

$$\Pr(v_h = 0, v_d = 0, v_a = 0) = p_1, \qquad \Pr(v_h = v_{h2}, v_d = 0, v_a = 0) = p_2$$

$$\Pr(v_h = 0, v_d = 0, v_a = v_{a2}) = p_3, \qquad \Pr(v_h = v_{h2}, v_d = 0, v_a = v_{a2}) = p_4$$
$$\Pr(v_h = 0, v_d = v_{d2}, v_a = 0) = p_5, \qquad \Pr(v_h = v_{h2}, v_m = v_{m2}, v_a = 0) = p_6$$
$$\Pr(v_h = 0, v_d = v_{d2}, v_a = v_{a2}) = p_7, \qquad \Pr(v_h = v_{h2}, v_m = v_{m2}, v_a = v_{a2}) = p_8$$

with $0 \leq p_j \leq 1$ for $j = 1, ..., 8$. These probabilities are modelled using a multinomial logit specification, i.e., *$p_j = \exp(\alpha_j)/(\sum_j \exp(\alpha_j))$* and we normalize $\alpha_8 = 0$. The parameter estimates are obtained using the method of maximum likelihood.[10]

As indicated when discussing the Journeys Home sample, our data are from disadvantaged Australians and this selectivity may bias our estimates of the effects of the onset of mental health conditions and the initiation into homelessness and our estimates of the onset of homelessness on the initiation into mental health problems. Using time-invariant unobserved characteristics and allowing these to be correlated across the different transition rates accounts for this selectivity. In addition to this, we also present a sensitivity analysis in which potential selectivity is explicitly modelled. The unobserved characteristics are assumed to be uncorrelated to the observed characteristics. In another sensitivity analysis we investigate how robust our main findings are to variation in the set of observed characteristics and variations in the selection of the sample of analysis.

4   Estimation Results

4.1   Baseline parameter estimates

The relevant parameter estimates of our baseline model estimated separately for women and men are shown in Table 3.[11] Panel a shows the parameter estimates for the single risk models in which the effect of the onset of homelessness on the onset of mental health conditions and the reverse are considered to be exogenous, i.e., in which there is no issue of correlated unobserved heterogeneity. In this model, for women, a diagnosis of depression increases the likelihood of transitioning to homelessness for the first time and their first experience of homelessness increases the likelihood of women being diagnosed with both depression and anxiety disorder for the first time. For men, the parameter estimates are similar to that of women, but their magnitude is nearly twice as large. The onset of anxiety disorders does not seem to have a significant effect on the transition into homelessness for either gender. Overall, before accounting for unobserved common factors of homelessness and mental health disorders, we find results consistent with the significant associations between homelessness and mental health conditions reported in the literature.

Panel b of Table 3 shows the relevant parameter estimates for the trivariate model, i.e., accounting for correlated unobserved heterogeneity. For men and women, the magnitudes of

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[10] The likelihood takes into account that our duration information relates to intervals rather than to exact durations. For example, if someone indicated to have become homeless at age 16, we don't know exactly whether this was close to their 16th birthday, close to their 17th birthday or somewhere in between. In this case, the likelihood is based on this individual not having been homeless at age 15 but having become homeless before their 17th birthday.

[11] Appendix B provides a full overview of all parameter estimates of the trivariate baseline model.

all parameter estimates are reduced and for women only the onset of depression still has a statistically significant positive effect on their first transition into homelessness. Their first experience of homelessness does not have significant effect on the chances of being diagnosed with anxiety disorder or depression. But, the effect of homelessness on the likelihood of being diagnosed with anxiety disorders is marginally statistically significant for men (at a 10% level). The main takeaway is that a lot of the associations between homelessness and mental health conditions are driven by unobserved correlated factors which need to be accounted for.

Table 3 - Baseline parameter estimates

	Depression to Homeless	Anxiety to Homeless	Homeless to Depression	Homeless to Anxiety	-Logl.	Obs.
Women						
a. Single risk	0.68 (0.22)***	0.43 (0.26)	0.34 (0.20)*	0.56 (0.25)**	3826.6	669
b. Trivariate	0.45 (0.21)**	0.02 (0.26)	0.24 (0.17)	0.21 (0.21)	3703.1	669
Men						
a. Single risk	0.95 (0.26)***	-0.16 (0.30)	0.78 (0.25)***	0.98 (0.32)***	3886.9	788
b. Trivariate	0.62 (0.27)**	-0.17 (0.34)	0.34 (0.24)	0.48 (0.27)*	3767.2	788

	Probability distributions three transition rates				
	Depression	Anxiety	Homeless	Males	Females
p1	+	+	−	0.08	0.02
p2	+	+	+	0.22	0.27
p3	+	−	−	0.01	0
p4	+	−	+	0.05	0
p5	−	+	−	0	0
p6	−	+	+	0	0
p7	−	−	−	0.38	0.29
p8	−	−	+	0.26	0.42
				1.00	1.00

Note: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions. Standard errors in parentheses; *,**,*** indicates significance at the 10%, 5%, 1%, respectively.

The bottom half of Table 3 shows the estimated probability distribution for the trivariate model. Although the model allows for eight masspoints six were identified for men and four for women. Combinations of a high transition rate into depression and a low transition rate into anxiety disorder and vice versa could not be identified for women and are rare (5+1=6%) for men. If the unobserved heterogeneity is positive for one it is also positive for the other. This may be a result of high comorbidity in these disorders. The correlation between the unobserved components that determine onsets of mental health conditions and those that determine homelessness is mixed. For 60 percent of the men and 56 percent of the women a high (low) susceptibility to mental health conditions coincides with a high (low) transition rate into homelessness. For 34 percent of the men and 44 percent of the women the correlation is negative. The overall correlation between the unobservables for mental health conditions and homelessness is positive which explains why the estimated parameters in the trivariate model are smaller than in the single risk model and often not significantly different from zero. This suggests that the experience of homelessness and mental health issues have common unobserved determinants.

Appendix B provides an overview of the observed determinants of the three transition rates. Family disruption at a young age with parents separating, conflicts with parents or parental deaths increase transitions into homelessness for both men and women. Some of these variables affect the onset of anxiety disorders and depression in particular for women. Emotional abuse or neglect during childhood increases the likelihood of homelessness for both men and women and the diagnosis of depression and anxiety for women. Physical and sexual violence have little effect on transitions into homelessness, but sexual violence displays strong and positive effects on the likelihood of anxiety disorders and depression. In terms of the caregivers' characteristics two appear particularly relevant to their children's homelessness and mental health conditions. Male caregiver's unemployment has positive effects on transitions to homelessness and on the onset of anxiety disorders. Female caregivers' mental health problems increase the likelihood of their children's transition into homelessness and diagnosis of anxiety disorders and depression.

Relative to the size of these effects, the effect of depression on homelessness is of the same magnitude as emotional abuse and neglect during childhood or not living with one's parents at age 14 because of divorce or separation, but smaller than not living with one's parents at age 14 because of conflict.

These results show support for a causal relationship between a diagnosis of depression and the probability of experiencing homelessness for the first time, but not the reverse and not for anxiety disorders. Earlier experiences of homelessness may lead to further homelessness experience and even chronic homelessness (defined as having been homeless for four years or more). Using information collected in wave 1 about the "total time spent without place to live before Journeys Home", we find that respondents who were diagnosed for the first time with depression between 0-14 years old are at the highest risk of experiencing chronic homelessness, by around 14pp more than respondents who were never diagnosed with depression. Taken together, our results suggest that earlier onsets of depression lead to earlier experiences of homelessness and are associated with a higher risk of chronic homelessness.[12]

4.2   *Sensitivity analyses*

Table 4 shows the relevant parameter estimates for several types of sensitivity analysis using our trivariate model. For ease of comparison panel a represents the baseline parameter estimates from the trivariate model (from Table 3).

Panel b shows the parameter estimates when the sample is restricted to wave 3 respondents (when the age of onset of each mental health condition was collected). As explained in section 2.3, our estimation sample has lower rates of homelessness and mental health conditions by age 30 than the full JH sample. This happened by construction because we excluded respondents who had been homeless or diagnosed with a mental health condition but for who we do not know the age of onset. When we restrict the estimation sample to wave 3 respondents, we also exclude respondents who had not been homeless or been diagnosed with a mental health condition and did not respond to wave 3, therefore mechanically increasing the

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[12] Note that the lifetime homelessness duration before JH refers to cumulative duration. There is no information about the timing and duration of episodes. Therefore, the cumulative duration of homelessness cannot be integrated in the current analysis and can only be used descriptively.

rates of homelessness and mental health conditions. The magnitude and significance levels in panel b are almost identical to panel a, suggesting that this sample selection doesn't change our conclusions.

Panel c shows the parameter estimates if we exclude individuals who have missing information on their male or female caregiver (except for missing information about their educational attainment) or missing information about violence or abuse during childhood. This reduces the number of women in the sample to 475 and the number of men to 585. The parameters are less precisely estimated but our main result remains: a diagnosis of depression increases the likelihood of transitions into homelessness for both genders.

Panels d to f provide empirical tests to address concerns related to the selection of the JH sample based on the outcome (i.e., homelessness by age 30). The sample mainly consists of two subpopulations: respondents who were flagged by Centrelink as homeless or at risk of homelessness (70% of the wave 1 sample) and respondents who were not flagged but were vulnerable (30% of the wave 1 sample) in that they displayed the same patterns of disadvantage as those flagged and had predicted probabilities of homelessness in the top 2 percent of the full income support population. This predicted probability varies between 0.07 and 0.97, with a mean of 0.175 and a median of 0.12 in our sample.

Table 4 – Sensitivity analysis – trivariate models

	Depression to Homeless	Anxiety to Homeless	Homeless to Depression	Homeless to Anxiety	-Logl	Obs.
Females						
a. Baseline	0.45 (0.21)**	0.02 (0.26)	0.24 (0.17)	0.21 (0.21)	3703.1	669
b. Wave 3 respondents	0.44 (0.21)**	0.01 (0.26)	0.26 (0.17)	0.19 (0.21)	3591.5	637
c. No missing controls	0.47 (0.27)*	-0.18 (0.32)	0.19 (0.21)	0.05 (0.27)	2636.1	475
d. Control for sample select.	0.40 (0.21)*	0.07 (0.25)	0.30 (0.18)*	0.20 (0.21)	3695.9	669
e. Flagged	0.52 (0.27)*	0.04 (0.32)	0.37 (0.21)*	0.11 (0.26)	2745.0	497
f. Not flagged	0.67 (1.49)	0.17 (1.82)	-0.17 (0.99	0.93 (1.64)	876.9	172
g. Literal homelessness	0.14 (0.24)	0.05 (0.29)	0.16 (0.18)	0.12 (0.22)	3343.7	669
h. Born 1980s or 1990s	0.16 (0.24)	0.30 (0.33)	0.26 (0.25)	0.15 (0.25)	2332.9	416
i. Birth-cohort dummies	0.23 (0.21)	0.21 (0.25)	0.20 (0.12)	0.20 (0.22)	3548.3	669
	Depression to Homeless	Other MHc to Homeless	Homeless to Depression	Homeless to Other MHc	-Logl	Obs.
j. Other mental health cond.	0.70 (0.20)***	-0.33 (0.35)	0.20 (0.17)	0.04 (0.30)	3319.2	650
	Depression to Homeless	Anxiety to Homeless	Homeless to Depression	Homeless to Anxiety	-Logl	Obs.
Males						
a. Baseline	0.62 (0.27)**	-0.17 (0.34)	0.34 (0.24)	0.48 (0.27)*	3767.2	788
b. Wave 3 respondents	0.66 (0.28)**	-0.13 (0.34)	0.34 (0.24)	0.51 (0.27)*	3600.0	729
c. No missing controls	0.90 (0.34)***	-0.51 (0.49)	0.18 (0.31)	0.34 (0.32)	2740.2	585
d. Control for sample select.	0.70 (0.27)**	-0.14 (0.34)	0.35 (0.23)	0.52 (0.26)*	3763.5	788
e. Flagged	0.62 (0.35)*	-0.13 (0.42)	0.48 (0.30)	0.41 (0.41)	2541.6	540
f. Not flagged	0.55 (0.84)	0.05 (2.06)	0.26 (0.73)	0.54 (1.66)	1123.6	248
g. Literal homelessness	0.80 (0.28)***	-0.14 (0.33)	0.52 (0.24)**	0.64 (0.28)***	3481.1	788
h. Born 1980s or 1990s	1.20 (0.52)**	-0.23 (0.66)	0.44 (0.44)	0.63 (0.46)	1900.8	404
i. Birth-cohort dummies	0.44 (0.23)*	-0.20 (0.30)	0.51 (0.25)**	0.73 (0.29)**	3648.2	788
	Depression to Homeless	Other MHc to Homeless	Homeless to Depression	Homeless to Other MHc	-Logl	Obs.
j. Other mental health cond.	0.89 (0.24)***	-0.23 (0.37)	0.62 (0.24)***	0.37 (0.41)	3446.3	754

To test whether our estimates are biased because the selection into the JH sample is correlated with the outcome, we explore whether our estimates vary with the determinants of sample selection. First, in panel d, we check whether our results hold when we add controls for: (i) having been flagged by Centrelink as being "homeless or at risk of homelessness"; and (ii) the predicted probability of homelessness for respondents who were not flagged. Results are very similar with a robust effect of diagnosed depression on the onset of homelessness and a weak effect of homelessness on the diagnosis of anxiety for men. The effect of homelessness on depression appears statistically significant at 10% but is only marginally lower than the estimated parameter in the baseline model. The parameter estimates for the flag and the predicted probability are statistically insignificant for homelessness and significantly positive for both depression and anxiety. Note, however, that overall the additional parameter estimates are not statistically significant such that their inclusion does not significantly improve the estimation results, nor does it affect the other relevant parameter estimates.

In panels e and f, we estimate our model separately for respondents who were flagged and those who were not. Results are in line with our main results and there is no systematic difference in estimates between the two subpopulations (apart from a small statistically significant effect of homelessness on depression for flagged women). With respect to our main finding of a positive effect of depression on homelessness, the effects for the respondents not flagged are statistically insignificant but the magnitude of this parameter estimate appears slightly larger for women and slightly smaller for men than the baseline estimates. Unless the bias in estimates is gendered, this suggests that the selection of the JH sample is not affecting our results in a systematic way.

In panel g, we report results for literal homelessness, i.e., of the estimated relationships between depression and anxiety and the likelihood of literal homelessness. Note that we use the age of onset of broad homelessness as we do not have information on the age of onset of literal homelessness. None of the parameter estimates are significant for women indicating that the diagnosis of mental health conditions is not a cause or consequence of literal homelessness. For men, however, we find that a diagnosis of depression results in a larger increase in the likelihood of experiencing literal homelessness than broad homelessness; and that literal homelessness increases the likelihood of being diagnosed with depressions and anxiety.

Since the information with respect to the age of onset of homelessness and mental health problems is based on retrospective information, it is possibly affected by recall errors which could bias our estimates. These recall errors also have the potential to generate measurement error and drive estimates towards zero. To test the possible impact of recall errors on our estimates, we estimate our model on a subsample of young individuals, i.e., persons born in the 1980s or 1990s (maximum age 31). The idea is that young people's retrospective information should be more accurate, i.e. less prone to measurement error. Finding larger effects for young people in the sample could be the sign of recall issues. The relevant parameter estimates are presented in panel h. For young females, none of the estimated effects are significant and in particular there is no significant effect of depression on homelessness. This suggests that recall errors are most likely not affecting our results for women but that the effect of depression on

homelessness may have decreased over time, possibly as a result of depression becoming more socially acceptable or of milder conditions being diagnosed. For young males, most estimates are very similar except a larger effect of depression on homelessness. This gender pattern suggest that recall errors may play a role but for males only.

To further analyse the effect of recall errors and account for the fact that they may affect older birth cohorts more than younger birth cohorts, we introduce birth cohort dummies for the 1960s, 1970s, 1980s and 1990s in panel i. Note that in our baseline specification, we do not control for birth cohort dummies as this washes out all concomitant evolution of mental health diagnosis and homelessness over time including if it arises because they affect each other. For females, the effect of depression on homelessness becomes insignificant. However, this is due to the overlap in depression and anxiety. In a sensitivity analysis not reported in the table, after imposing the effect of anxiety on homeless to be equal to zero there is a significant positive effect of depression on the initiation into homelessness. For men, introducing birth-cohort dummies confirms the main effects of depression on homelessness and of homelessness on anxiety.

In panel j, we present results with depression and other diagnosed mental health conditions (PTSD, bipolar affective disorder and schizophrenia) instead of anxiety. Results are again broadly consistent with our main results and confirm the effect of depression on homelessness mainly. In these models, the magnitude of the estimates of depression on homelessness appears larger. This is likely due to less overlap between depression and other mental health conditions than between depression and anxiety, such that part of the effect of depression also captures the effect of anxiety. Other mental health conditions do not appear causally related to homelessness for neither gender.

Overall, the main result is a clear, robust and significant effect of depression on homelessness for both genders, which appears to have become less pronounced for women over time. In addition, some smaller effects appear occasionally like an effect of homelessness on anxiety and depression for men, especially for those that have experienced literal homelessness. But in the main results, anxiety does not appear to lead to homelessness and homelessness does not appear to trigger onsets of depression and anxiety.

4.3 *Magnitude of the effects of depression on homelessness*

Figure 4 provides an indication of the magnitude of the effects of depression on homelessness for men and women by comparing the effects for four types of people characterised by their childhood experiences of parental conflict and sexual violence parameter estimates presented in Appendix B. Figures 4.a and 4.b show the cumulative probabilities of being diagnosed with depression up to age 30, if no homelessness occurred. Figures 4.c and 4.d show the cumulative probabilities of becoming homeless up to age 30, if no depression occurred. Figures 4.e and 4.f show the cumulative probabilities of becoming homeless up to age 30 if an episode of depression occurred at age 15.

We show simulation results for four types of respondents: the first type with reference characteristics - lived with parents at age 14, no emotional abuse, physical violence or sexual violence experienced during childhood, male and female caregivers with no schooling or

primary education and no negative caregiver's characteristics such as gambling problems, long-term unemployment, substance abuse, incarceration or hospitalisation for mental health issues. The second type are individuals with reference characteristics except that they experienced sexual violence during childhood, the third type did not live with their parents at age 14 because of conflict. Finally, the fourth type both experienced sexual violence during childhood and did not live with his parents at age 14 because of conflict. These two childhood characteristics have been chosen because they display significant associations with transitions into mental health conditions and into homelessness.

Figure 4.a and 4.b show that the probability of being diagnosed with depression by age 30 is 11 percent for type 1 women and 5 percent for type 1 men (those with the most favourable childhood circumstances). An experience of sexual violence during childhood increases these numbers considerably to 20 percent for women and 22 percent for men. Not living with one's parents because of conflict also increases the probability of being diagnosed with depression but not to the same degree, i.e., by an extra 4 percentage points for women and 6 percentage points for men (insignificant).

Figure 4 Simulated cumulative starting probabilities

  a. Depression, men   **b. Depression, women**

  c. Homelessness, men   **d. Homelessness, women**
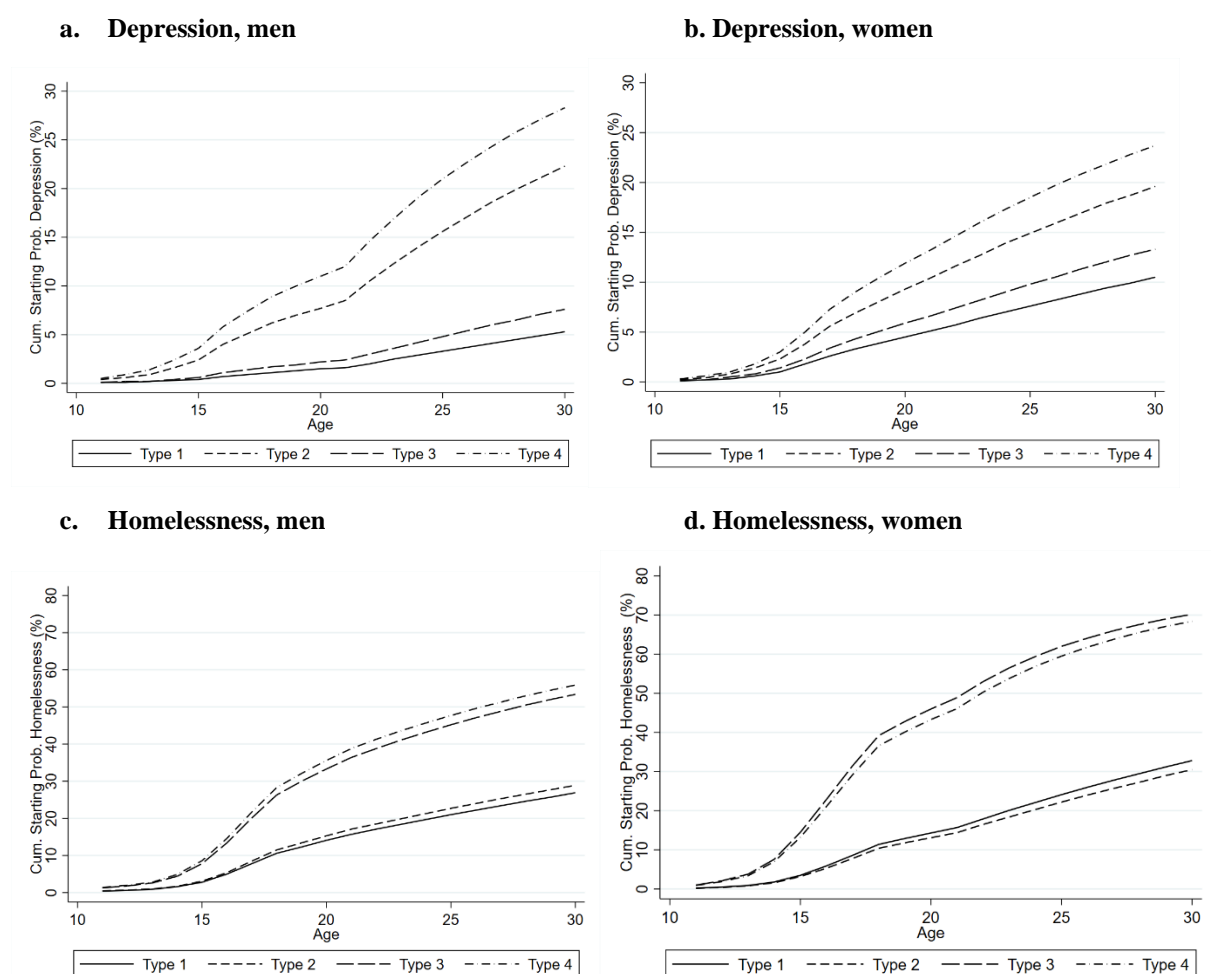
e. Homelessness, men (depression age 15)   **f. Homelessness, women (depression age 15)**
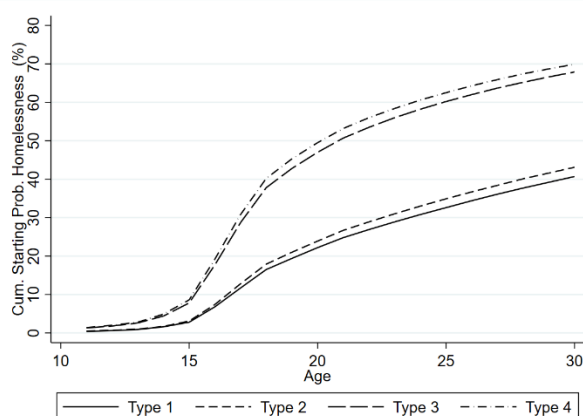
Note: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions (669 women and 788 men). The sample is divided in four types along two childhood characteristics: conflict with parents,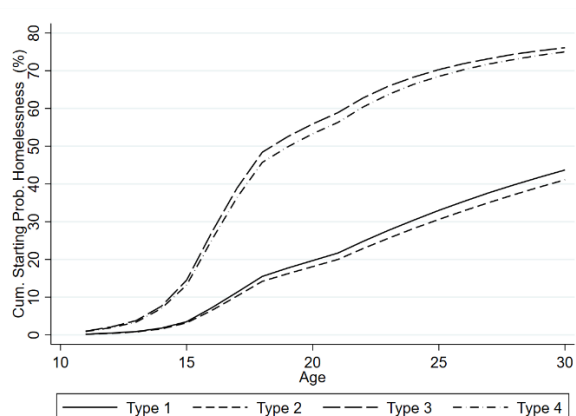 i.e., that the respondent did not live with their parents at age 14 because of a conflict; and sexual violence, i.e., whether the respondent suffered from sexual violence during their childhood. Type 1 corresponds to no conflict with parents and no sexual violence; type 2 corresponds to no conflict with parents and sexual violence; type 3 corresponds to conflict with parents and no sexual violence; type 4 corresponds to conflict with parents and sexual violence.

Figures 4.c and 4.d show that type 1 individuals have a high probability to have been confronted with homelessness by age 30: 32 percent of women and 27 percent of men. Experience with sexual violence during childhood hardly affects these numbers but conflict with parents results in a large increase in these percentages: the probability of experiencing homelessness by age 30 increases to 70 percent for women and 53 percent for men. Housing stability of women is much more sensitive to early conflict with their parents than men, but the effect is still substantial for both genders.

Figures 4.e and 4.f show the effect of having experienced an episode of depression at age 15 on the likelihood of experiencing homelessness by age 30, which stems from our main result. Compared to the probability of experiencing homelessness without depression (figures 4.c and 4.d), the probability of experiencing homelessness by age 30 is substantially increased when associated with depression: for type 1 women the probability increases from 32 percent to 43 percent and for type 1 men from 27 percent to 41 percent, representing respective increases of more than 30 percent for women and 50 percent for men. When looking at type 3, those who experienced conflict with their parents but not sexual violence, the probability of homelessness is 76 percent for women and 68 percent for men (also an increase compared with figure 4.c and 4.d). Experiencing an episode of depression has a large effect on the probability to become homeless in and of itself. If an episode of depression is associated with childhood experiences that also have a large effect on the probability of homelessness the effects are compounded. Childhood experiences of sexual violence do have a direct effect on the probability to become homeless but also increase this probability indirectly via their impact on the incidence of depression.

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5   Summary and conclusions

Mental health conditions and homelessness are two phenomena that are expensive for government budgets and costly for the individuals involved. Both are intertwined with each other and other aspects of social and intergenerational disadvantage such as low education levels, unemployment, drug use, incarceration, family violence and conflict. Previous studies have established an association between homelessness and mental health conditions without addressing the question of the causal nature of this association. Understanding the causal pathways is important from a policy point of view. This is what helps identify the best time in people's lives to provide support as well as the type of support needed. It also helps predict the effects that can be expected from a specific intervention, for example the effects on homelessness from an intervention decreasing the onsets of depression.

Our paper attempts to progress our understanding of these causal pathways using data from the Australian Journeys Home survey. We investigate whether the diagnosis of depression and anxiety disorders lead to first-time transitions to homelessness for young people. Similarly, we analyse whether the onset of homelessness makes early onsets of depression and anxiety more likely.

Our main result is that, after accounting for the effects of joint observed and unobserved determinants, the onset of depression increases the likelihood of experiencing homelessness for the first time for both genders. We also find suggesting evidence that this effect may have become less pronounced for women over time. In addition, we also find that homelessness tends to make a diagnosis of anxiety disorders slightly more likely for men, especially those that have experienced literal homelessness. None of the other relationships appear to be causally relevant. In particular, anxiety disorders have no effect on first transitions to homelessness for either gender and the onset of homelessness has no effect on the onset of depression.

Using our baseline parameter estimates we illustrate the magnitude of the effect of depression relative to the effects of other determinants. Experiencing an episode of depression increases the probability of experiencing homelessness by age 30 by around 30 percent for women and 50 percent for men. These effects are statistically significant and robust to alternative specifications of the sample and model. They are larger than the effects of experiences of sexual violence on the likelihood of homelessness but smaller than the effects of not living with one's parents because of conflict.

Previous research has shown that for homeless people with mental health issues different policy interventions may be effective (O'Flaherty, 2019). In particular, there is an ongoing debate about whether mental health support or housing support should be offered first. By focusing on the onset of mental health conditions and the onset of homelessness, our findings may help design programs to prevent mental health conditions and homelessness from occurring in the first place. In particular, our finding that depression increases the probability that people become homeless offers interesting avenues for early policy intervention. Indeed, programs that can prevent depression in childhood or adolescence or that offer ways to improve mental wellbeing at a young age can have the additional benefit of reducing the chances of disadvantaged children (those most at risk of homelessness) experiencing homelessness. In contrast, our result that homelessness does not lead to mental health issues suggests that housing

policies aimed at avoiding homelessness should not be expected to have additional indirect beneficial effects on mental health.

The efficiency of treating depression early to reduce transitions into homelessness for young disadvantaged Australians depends on how widespread depression is. If it is widespread in the general population, treating depression may have only limited effects on homelessness. Depression is a significant issue in Australia but to a much lesser extent in the general population than among disadvantaged Australians. A 2007 survey of mental health and wellbeing estimated the lifetime prevalence of depression among the 16-85 years old to be 8.8 percent for men and 14.5 percent for women. This is clearly below the lifetime rates in our study of 32 percent for men and 49 percent for women despite the latter being over a shorter period of time (up to 30 years old). In the past two years though, the COVID-19 pandemic has increased depression amongst young people who are not necessarily at risk of homelessness (Racine et al; 2021). In this new context, prioritising young people at risk of homelessness for treatment of depression has the potential to reduce their risk of homelessness in addition to improving their mental health.

References

Abbring, J. H. and J. J. Heckman (2007). Econometric evaluation of social programs, part III: Distributional treatment effects, dynamic treatment effects, dynamic discrete choice, and general equilibrium policy evaluation, Chapter 72, *Handbook of Econometrics*. Elsevier, pp. 5145-5303.

Abbring, J.H. & van den Berg, G. (2003). The nonparametric identification of treatment effects in duration models. *Econometrica* 71, 1491–1517.

ABS (Australian Bureau of Statistics) 2007. National Survey of Mental Health and Wellbeing. Canberra: ABS

Australian Institute of Health and Welfare (2011). Government-funded Specialist Homelessness Services : SAAP National Data Collection Annual Report 2009-2010: Australia (AIHW cat. no. 246). AIHW, Canberra.

Apouey, B. and Clark, A.E. (2015) Winning big but feeling no better? The effect of lottery prizes on physical and mental health, *Health Economics* 24 (5), 516-538.

Australian Bureau of Statistics (2018) *Census of Population and Housing: Estimating Homelessness; estimates of persons who were homeless or marginally housed as calculated from the Census of Population and Housing*, Australian Bureau of Statistics, Cat. no. 2049.0, Canberra.

Brown R.T., Goodman, L., Guzman, D., Tieu, L., Ponath, C. and Kushel, M.B. (2016) Pathways to homelessness among older homeless adults: Results from the HOPE HOME study, *PLoS ONE* 11 (5), e0155065.

Bünnings, C., Kleibrink, J. and Wessling, J. (2017) Fear of unemployment and its effect on the mental health of spouses, *Health Economics* 26 (1), 104-117

Chamberlain, C. and Johnson, G. (2013) Pathways into adult homelessness, *Journal of Sociology* 49 (1), 60–77.

Curtis, M.A., Corman, H., Noonan, K. and Reichman. N.E. (2013) Life shocks and homelessness, *Demography* 50, 2227–2253.

Fitzpatrick, S. (2005) Explaining homelessness: A critical realist perspective, *Housing, Theory and Society* 22 (1), 1-17.

Frijters, P., Johnston, D.W. and Shields, M.A. (2014) The effect of mental health on employment: Evidence from Australian panel data, *Health Economics* 23 (9), 1058-1071.

Henry, B., Moffitt, T. E., Caspi, A., Langley, J., & Silva, P. A. (1994). On the "remembrance of things past": A longitudinal evaluation of the retrospective method. *Psychological Assessment*, 6(2), 92.

Johnson, G. and Chamberlain, C. (2008) Homelessness and substance abuse: Which comes first? *Australian Social Work* 61 (4), 342–356.

Kung, C.S.J., Johnston, D.W. and Shields, M.A. (2018) Mental health and the response to financial incentives: Evidence from a survey incentives experiment, *Journal of Health Economics* 62(1), 84-94.

Lalive, R., van Ours, J. C. and Zweimüller, J. (2008) The impact of active labour market programmes on the duration of unemployment in Switzerland. *Economic Journal*, 118, 235–257.

MacKenzie, D., Flatau, P., Steen, A. and Thielking, M. (2016). *The cost of youth homelessness in Australia, Research Briefing*. Melbourne: Swinburne University, University of Western Australia, Charles Sturt University, The Salvation Army, Mission Australia, Anglicare Canberra and Goulburn.

Marcus, J. (2013) The effect of unemployment on the mental health of spouses – Evidence from plant closures in Germany, *Journal of Health Economics* 32 (3), 546-558.

McInerney, J.M., Mellor, M. and Hersch, L. (2013) Recession depression: Mental health effects of the 2008 stock market crash, *Journal of Health Economics* 32 (6), 1090-1104.

McVicar, D., Moschion, J. and Van Ours, J.C. (2015) From substance use to homelessness or vice versa? *Social Science & Medicine* 136-137, 89-98.

McVicar, D., Moschion, J. and Van Ours, J.C. (2019) Early illicit drug use and the age of onset of homelessness, *Journal of the Royal Statistical Society, series A (Statistics in Society)* 182 (1), 345-372.

Metraux, S., Fargo, J. D., Eng, N., & Culhane, D. P. (2018). Employment and earnings trajectories during two decades among adults in New York City homeless shelters. *Cityscape*, *20*(2), 173-202.

Moffitt, T. E., Caspi, A., Taylor, A., Kokaua, J., Milne, B. J., Polanczyk, G., & Poulton, R. (2010). How common are common mental disorders? Evidence that lifetime prevalence rates are doubled by prospective versus retrospective ascertainment. *Psychological medicine*, 40(6), 899-909.

Moschion, J., and Powdthavee, N. (2018). The welfare implications of addictive substances: A longitudinal study of life satisfaction of drug users. *Journal of Economic Behavior & Organization*, *146*, 206-221.

Moschion, J. and Van Ours, J.C. (2019) Do childhood experiences of parental separation lead to homelessness? *European Economic Review* 111 (1), 211-236.

Moschion, J. and Van Ours, J.C. (2021) Do transitions in and out of homelessness relate to mental health episodes? A longitudinal analysis in an extremely disadvantaged population, *Social Science & Medicine* 279, 113667, 1-10.

O'Flaherty, B., (2004) Wrong person and wrong place: For homelessness, the conjunction is what matters. *Journal of Housing Economics*, 13 (1), 1–15.

O'Flaherty, B., (2009). *What shocks precipitate homelessness?* Columbia University, New York Unpublished manuscript.

O'Flaherty, B., (2010). *Homelessness as bad luck: implications for research and policy*. In: Ellen, I.G., O'Flaherty, B. (Eds.), How to House the Homeless. Russell Sage Foundation, New York, pp. 143–182.

O'Flaherty, B. (2019) Homelessness research: A guide for economists (and friends). *Journal of Housing Economics* 44, 1-25.

Productivity Commission (2020). *Report on Government Services*, Part G, Section 19, Productivity Commission, Canberra.

Racine N, McArthur BA, Cooke JE, Eirich R, Zhu J, Madigan S. Global Prevalence of Depressive and Anxiety Symptoms in Children and Adolescents During COVID-19: A Meta-analysis. JAMA Pediatrics. 2021;175(11):1142-50.

Salm, M. (2009) Does job loss cause ill health? *Health Economics* 18 (9), 1075-1089.

Scutella, R., Johnson, G., Moschion, J., Tseng, Y. and Wooden M. (2013) Understanding Lifetime Homeless Duration: Investigating Wave 1 Findings from the Journeys Home Project, *Australian Journal of Social Issues* 48(1): 83-108

Shinn, M., Weitzman, B., Stojanovic, D., Knickman, J., Jimenez, L., Duchon, L., James, S. and Krantz, D. (1998), Predictors of homelessness among families in New York City: From shelter request to housing stability, *American Journal of Public Health* 88, 1651–1657.

Van Ours, J.C. and Williams, J. (2012) The effects of cannabis use on physical and mental health, *Journal of Health Economics* 31 (4), 564-577.

Wooden, M., Bevitt, A., Chigavazira, A., Greer, N., Johnson, G., Killackey, E., Moschion, J., Scutella, R., Tseng, Y., Watson, N. (2012) Introducing 'Journeys Home', *Australian Economic Review* 45 (3), 368–378.

Appendix A: Control variables and sample selection

Our econometric model includes a large set of control variables that describe the respondents' characteristics and early life circumstances. They are summarized in the table below for our complete sample and separately by gender. The controls include three dummy variables for whether the respondent was not living with their parents at age 14 because they were separated, because they were dead, or because of conflict; three dummy variables for whether the respondent experienced emotional, physical or sexual abuse as a child; five dummy variables for the highest level of education of the main male and female caregivers of the respondent while growing up (including a missing category); and five (for males) and four (for females) dummy variables characterizing the behaviour of the main male and female caregivers (substance abuse, incarceration, mental health problems, long-term unemployment and gambling issues).[13]

Because some of this background information is missing for a significant portion of our sample (in some cases more than 10 percent), and because this is unlikely to be random, we also include dummy variables for missing information on control variables: one dummy for missingness on any of the childhood violence variables; one dummy for missingness on any of the male caregiver's information and one for the female caregiver's information.[14] For example, if the male caregiver had a certain characteristic, the relevant variable is coded 1, 0 if he did not have this characteristic, if the respondent had no male caregiver or if the information on the caregivers' characteristic is missing. The missing dummies for the male caregiver characteristics are coded 1 if the respondent had missing information on the presence of a male caregiver or if any of the male caregiver's characteristic is missing, 0 if none is missing. As a result, the male caregiver's variables capture the effect of having a male caregiver with a certain negative characteristic (jail time, substance use, long-term unemployment, mental health issues, gambling issues) relative to caregivers with no known such issues or no caregiver.

Table A1 provides an overview of our sample's characteristics separately for women and men, along with average characteristics of respondents who are excluded from our sample (i.e., respondents for whom we either do not know if they have experienced homelessness or mental health issues or we do not know the age of onset of these issues).

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[13] Note that the concepts of parents and caregivers are two very different things in our sample: 47% of respondents were not living with their parents at age 14 but only 2% cannot identify a female caregiver and 3% cannot identify a male caregiver (i.e., have all caregiver characteristics missing). Note also that too few female caregivers were incarcerated to be able to estimate an incarceration effect for female caregivers.

[14] Alternatives, including dropping observations for which there are missing data, are explored in a sensitivity analysis discussed in Section 4.2.

Table A1: Sample averages

	Women	Men	Our sample	Other wave 1 resp.	Difference
Homelessness by age 30	75.6	74.2	74.9	82.1	7.2**
Mental health condition by age 30 (any)	53.4	38.3	45.8	81.5	35.7***
Do not live with parents because div/separated	35.9	31.0	33.2	31.6	-1.7
Do not live with parents because dead	6.6	6.3	6.5	6.7	0.2
Do not live with parents because conflict	9.0	6.1	7.4	6.2	-1.2
Emotional abuse during childhood	55.9	56.7	56.3	57.8	1.4
Physical violence during childhood	55.5	60.3	58.1	57.8	-0.3
Sexual violence during childhood	36.3	15.2	24.9	28.4	3.5
Male caregiver's education					
No schooling or primary school	7.1	7.1	7.1	12.0	2.7
Some secondary, <=Y10	22.3	21.3	21.8	17.8	-4.0
Y11 or equivalent	3.4	2.2	2.7	2.7	-0.1
Y12 or equivalent	12.6	10.0	11.2	8.4	-2.7
Technical College/TAFE	6.4	6.5	6.5	8.0	1.5
University	6.4	8.4	7.5	4.9	-2.6
Missing	41.7	44.5	43.2	46.2	3.0
Male caregiver's characteristics					
Substance abuse	29.4	28.8	29.1	32.0	2.9
Incarceration	10.2	10.9	10.6	9.3	-1.2
Hospitalisation for mental health issues	5.5	4.4	4.9	5.8	0.8
Long-term unemployment	17.2	16.8	17.0	16.0	-1.0
Gambling problems	8.8	8.8	8.8	7.6	-1.2
Female caregiver's education					
No schooling or primary school	9.4	8.0	8.7	13.8	2.7
Some secondary, <= Y10	31.2	26.4	28.6	25.3	-3.3
Y11 or equivalent	3.7	3.0	3.4	3.1	-0.3
Y12 or equivalent	13.9	12.9	13.4	9.8	-3.6*
Technical College/TAFE	4.9	4.8	4.9	5.3	0.5
University	5.8	7.6	6.8	4.9	-1.9
Missing	30.9	37.2	34.3	37.8	3.5
Female caregiver's characteristics					
Substance abuse	18.7	15.6	17.0	20.0	3.0
Hospitalisation for mental health issues	12.0	9.6	10.7	12.4	1.7
Long-term unemployment	41.1	35.7	38.2	36.4	-1.7
Gambling problems	9.4	5.7	7.4	5.8	-1.6
Missing info on violence	14.5	10.7	12.4	20.4	8.0***
Missing info male caregiver	11.2	11.0	11.1	12.4	1.3
Missing info female caregiver	12.0	12.7	12.4	15.6	3.2
N	669	788	1,457	225	

Notes: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions (1,457 observations). Difference between our sample and other wave 1 respondents; *,**,*** indicates significance at the 10%, 5%, 1%, respectively

Appendix B: Full parameter estimates trivariate model

Homelessness	Males		Females	
	Parameter estimate	Standard error	Parameter estimate	Standard error
Constant	-9.12	0.58 ***	-10.73	0.60 ***
Parents div/sep age 14	0.52	0.15 ***	0.51	0.15 ***
Parents dead age 14	0.48	0.27 *	0.88	0.29 ***
Conflict parents age 14	1.06	0.23 ***	1.50	0.22 ***
Emotional abuse/neglect	0.40	0.19 **	0.58	0.23 **
Physical violence	0.27	0.19	0.47	0.23 **
Sexual violence	0.09	0.19	-0.10	0.16
Male caregiver alcohol/ drug problem	-0.18	0.16	0.05	0.18
Male caregiver time in jail	0.26	0.24	0.47	0.25 *
Male caregiver mental health pbs	0.04	0.35	-0.25	0.31
Male caregiver unemployed	0.45	0.18 ***	0.11	0.20
Male caregiver gambling problem	-0.08	0.25	0.25	0.28
Female caregiver alcohol/ drug problem	0.55	0.21 ***	0.39	0.22 *
Female caregiver mental health pbs	0.43	0.22 **	0.62	0.23 ***
Female caregiver unemployed	0.25	0.15 *	0.34	0.14 **
Female caregiver gambling problem	-0.37	0.24	-0.32	0.26
Missing info violence/abuse	0.33	0.22	0.46	0.22 **
Missing info fathers	0.06	0.23	0.30	0.23
Missing info mothers	-0.05	0.20	0.27	0.24
Female carer's education: Some secondary	0.86	0.31 ***	0.58	0.28 **
Female carer's education: Year 11	1.26	0.48 ***	0.78	0.49
Female carer's education: Year 12	0.95	0.34 ***	0.71	0.32 **
Female carer's education: Tech College	0.36	0.42	0.36	0.42
Female carer's education: University	1.04	0.42 **	1.05	0.39 ***
Female carer's education: Missing	0.68	0.31 **	0.88	0.29 ***
Male carer's education: Some secondary	0.23	0.29	0.03	0.34
Male carer's education: Year 11	0.60	0.60	0.35	0.60
Male carer's education: Year 12	0.41	0.32	0.22	0.36
Male carer's education: Tech College	-0.09	0.38	-0.72	0.40 *
Male carer's education: University	-0.02	0.39	-0.41	0.46
Male carer's education: Missing	0.74	0.28 ***	0.26	0.34
Age 12	1.60	0.34 ***	2.41	0.35 ***
Age 13	1.93	0.31 ***	2.91	0.33 ***
Age 14	2.83	0.25 ***	3.79	0.28 ***
Age 15	3.48	0.24 ***	4.44	0.28 ***
Age 16	4.04	0.23 ***	4.79	0.28 ***
Age 17	4.34	0.26 ***	4.96	0.30 ***
Age 18	4.39	0.30 ***	5.04	0.33 ***
Age 19-21	3.97	0.30 ***	4.43	0.34 ***
Age 22-30	3.80	0.34 ***	4.91	0.35 ***
Second Mass point	1.79	0.28 ***	2.61	0.28 ***
Earlier Depression	**0.62**	**0.27 ****	**0.45**	**0.21 ****
Earlier Anxiety	**-0.17**	**0.34**	**0.02**	**0.26**

Note: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions (1,457 observations). Standard errors in parentheses; *,**,*** indicates significance at the 10%, 5%, 1%, respectively.

Anxiety	Males		Females	
	Parameter estimate	Standard error	Parameter estimate	Standard error
Constant	-9.78	1.05 ***	-9.74	0.72 ***
Parents div/sep age 14	0.46	0.28 *	0.35	0.22
Parents dead age 14	-0.80	0.59	-0.15	0.42
Conflict parents age 14	-0.21	0.51	-0.02	0.35
Emotional abuse/neglect	0.46	0.35	1.91	0.37 ***
Physical violence	0.27	0.37	-0.54	0.36
Sexual violence	2.32	0.45 ***	0.85	0.23 ***
Male caregiver alcohol/ drug problem	0.05	0.29	-0.83	0.26 ***
Male caregiver time in jail	1.35	0.45 ***	-0.54	0.37
Male caregiver mental health pbs	0.37	0.61	0.06	0.40
Male caregiver unemployed	1.06	0.42 **	0.62	0.25 **
Male caregiver gambling problem	-2.02	0.58 ***	0.53	0.31 *
Female caregiver alcohol/ drug problem	0.31	0.37	-0.07	0.26
Female caregiver mental health pbs	0.38	0.42	1.21	0.29 ***
Female caregiver unemployed	-0.17	0.28	0.39	0.20 *
Female caregiver gambling problem	-0.95	0.60	0.55	0.35
Missing info violence/abuse	0.51	0.45	1.33	0.35 ***
Missing info fathers	0.49	0.38	-0.01	0.30
Missing info mothers	-0.30	0.45	-0.63	0.37 *
Female carer's education: Some secondary	2.22	0.80 ***	2.27	0.52 ***
Female carer's education: Year 11	1.66	1.16	2.54	0.67 ***
Female carer's education: Year 12	2.28	0.89 ***	2.53	0.57 ***
Female carer's education: Tech College	0.87	1.02	2.36	0.66 ***
Female carer's education: University	2.62	0.92 ***	2.58	0.61 ***
Female carer's education: Missing	0.90	0.78	2.45	0.54 ***
Male carer's education: Some secondary	0.63	0.88	0.82	0.53
Male carer's education: Year 11	2.17	1.07 **	0.80	0.63
Male carer's education: Year 12	-0.10	0.96	0.44	0.58
Male carer's education: Tech College	-0.48	0.98	-0.39	0.60
Male carer's education: University	0.89	1.06	0.83	0.61
Male carer's education: Missing	0.97	0.85	0.24	0.53
Age 12	1.68	0.85 **	1.31	0.71 *
Age 13	1.07	1.07	2.55	0.51 ***
Age 14	2.80	0.72 ***	2.99	0.51 ***
Age 15	2.98	0.68 ***	3.66	0.51 ***
Age 16	3.67	0.65 ***	3.79	0.48 ***
Age 17	3.70	0.66 ***	3.76	0.52 ***
Age 18	3.46	0.76 ***	4.15	0.57 ***
Age 19-21	3.81	0.66 ***	4.52	0.50 ***
Age 22-30	4.77	0.66 ***	5.16	0.54 ***
Second Mass point	-4.93	0.55 ***	-3.89	0.36 ***
Earlier homelessness	**0.48**	**0.27 ***	**0.21**	**0.21**

Note: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions (1,457 observations). Standard errors in parentheses; *,**,*** indicates significance at the 10%, 5%, 1%, respectively.

Depression	Males		Females	
	Par. Est.	St. Error	Par. Est.	St. Error
Constant	-8.81	0.94 ***	-8.04	0.64 ***
Parents div/sep age 14	0.55	0.26 **	0.32	0.18 *
Parents dead age 14	0.10	0.50	-0.03	0.31
Conflict parents age 14	0.41	0.41	0.29	0.27
Emotional abuse/neglect	0.47	0.31	0.84	0.25 ***
Physical violence	0.13	0.33	0.17	0.24
Sexual violence	1.76	0.39 ***	0.80	0.19 ***
Male caregiver alcohol/ drug problem	-0.08	0.24	-0.06	0.19
Male caregiver time in jail	0.59	0.41	-0.51	0.27 *
Male caregiver mental health pbs	0.53	0.56	-0.03	0.35
Male caregiver unemployed	0.56	0.38	0.27	0.20
Male caregiver gambling problem	-1.30	0.48 ***	0.36	0.29
Female caregiver alcohol/ drug problem	-0.42	0.33	0.24	0.21
Female caregiver mental health pbs	0.67	0.34 **	0.97	0.23 ***
Female caregiver unemployed	0.34	0.25	0.01	0.17
Female caregiver gambling problem	-0.24	0.46	-0.27	0.28
Missing info violence/abuse	0.61	0.36	0.77	0.28 ***
Missing info fathers	0.30	0.38	-0.46	0.27 *
Missing info mothers	-0.10	0.37	-0.30	0.33
Female carer's education: Some secondary	1.49	0.63 **	1.55	0.44 ***
Female carer's education: Year 11	0.89	0.88	1.79	0.59 ***
Female carer's education: Year 12	1.50	0.64 **	1.81	0.49 ***
Female carer's education: Tech College	0.98	0.77	1.13	0.55 **
Female carer's education: University	2.01	0.73 ***	2.13	0.51 ***
Female carer's education: Missing	0.71	0.59	1.80	0.45 ***
Male carer's education: Some secondary	0.34	0.74	0.22	0.44
Male carer's education: Year 11	2.03	1.00 **	0.41	0.63
Male carer's education: Year 12	0.26	0.76	-0.04	0.50
Male carer's education: Tech College	0.02	0.80	-0.03	0.49
Male carer's education: University	0.87	0.85	1.26	0.50 **
Male carer's education: Missing	0.69	0.70	0.15	0.44
Age 12	2.03	0.67 ***	1.89	0.58 ***
Age 13	2.28	0.68 ***	2.69	0.44 ***
Age 14	3.14	0.56 ***	3.29	0.44 ***
Age 15	3.27	0.58 ***	3.69	0.45 ***
Age 16	3.92	0.54 ***	4.24	0.44 ***
Age 17	3.69	0.58 ***	4.45	0.45 ***
Age 18	3.64	0.56 ***	4.24	0.51 ***
Age 19-21	3.39	0.56 ***	4.13	0.46 ***
Age 22-30	4.37	0.53 ***	4.28	0.47 ***
Second Mass point	-3.66	0.45 ***	-2.91	0.27 ***
Earlier homelessness	**0.34**	**0.24**	**0.24**	**0.17**
Parameters probability distribution				
α1 (males)/ α8 (females)	-1.14	0.49 **	3.03	0.56 ***
α2	-0.20	0.25	2.60	0.57 ***
α3	-3.27	1.91 *		
α4	-1.66	0.56 ***		
α7	0.35	0.39	2.66	0.54 ***

Note: Wave 1 respondents with information on homelessness and the diagnosis of mental health conditions (1,457 observations). Standard errors in parentheses; *,**,*** indicates significance at the 10%, 5%, 1%, respectively.