Author/s:
Li, A;Baker, E;Bentley, R

Title:
Understanding the mental health effects of instability in the private rental sector: A longitudinal analysis of a national cohort

Date:
2022-03-01

Citation:
Li, A., Baker, E. & Bentley, R. (2022). Understanding the mental health effects of instability in the private rental sector: A longitudinal analysis of a national cohort. Social Science and Medicine, 296, https://doi.org/10.1016/j.socscimed.2022.114778.

Persistent Link:
https://hdl.handle.net/11343/332783

Title: Understanding the Mental Health effects of Instability in the Private Rental Sector: A Longitudinal Analysis of a National Cohort

Abstract

Using a population-based longitudinal dataset in Australia over nearly 20 years, this study examines the impact of tenure instability on mental health and psychological distress among a low-income working-age population. The analysis compares private renters (who are notable for their relative tenure insecurity in the Australian context) and homeowners with similar sociodemographic characteristics. To enhance group comparability and address the presence of time-varying covariates that confound and mediate the relationship between tenure exposure and mental health, marginal structural models were used applying weights estimated cumulatively over time. The results show that while private rental tenants report worse mental health than homeowners initially (mental health difference: Beta= -5.29, 95%CI -7.61 to -2.97; psychological distress difference: Beta= 1.77, 95%CI 0.55 to 2.99), this difference diminishes to become statistically indistinguishable by 5-6 years of occupancy (mental health difference at year 6: Beta= -2.09, 95%CI -4.31 to 0.13, predicted mental health increases: from 65.06 to 69.83 for private renters and from 70.46 to 72.02 for homeowners; psychological distress difference at year 5: Beta= 0.81, 95%CI -0.09 to 1.71, predicted psychological distress decreases: from 19.85 to 18.04 for private renters and from 17.95 to 17.10 for homeowners). Residential stability is particularly beneficial for private renters in early middle adulthood (35 to 44 years), with an additional year of stable occupancy for private renters correlated with a 0.99 (95%CI 0.46 to 1.53) increase in mental health and a -0.47 (95%CI -0.69 to -0.24) decrease in psychological distress. The findings provide evidence that stable and secure rental tenure is protective of mental health, and the mental health of stable renters becomes comparable to that of homeowners over time. This adds support for housing policies that promote and improve the stability and security of rental tenure.

Keywords: Australia; Housing instability; Housing tenure; Private rental; Homeowner; Mental health; Psychological distress; Marginal Structural Model (MSM)

Introduction

Renting privately from a landlord was once considered by most Australians as a transitional step towards homeownership. Australians are both more likely to rent, and also spend more of their lives renting from landlords (Rowley & James, 2018; Stone, Burke, Hulse, & Ralston, 2013). During the last two decades, the proportion of households renting from private landlords in Australia has increased by 6% whilst homeownership has fallen by 4% (Australian Institute of Health and Welfare, 2020), and at the last Australian Census of Population and Housing, renters outnumbered outright homeowners for the first time since WWII (Australian Bureau of Statistics, 2019).

This change in tenure occupancy patterns has been fuelled by rapidly rising housing prices, limited housing supply in cities and a taxation system in Australia that favours investment in housing for rent through negative gearing and other tax benefits. The growth of the private rental sector is expected to continue into the foreseeable future, particularly among young and middle-age groups (Burke, Nygaard, & Ralston, 2020).

The problem for many is that private rental is less secure than other tenure types in Australia, with residents of this sector moving more often than homeowners or social housing tenants (Baker, Bentley, Lester, & Beer, 2016; Stone et al., 2013). The instability of private rental can be attributed to the short average lease lengths offered by landlords (typically 1 year), as well as the profile of households who reside in the sector with many facing financial insecurity, difficulties finding affordable accommodation in a competitive market, and weak legislative protection (Australian Government Productivity Commission, 2019). Low-income households are increasingly residing in private rental accommodation (rather than more secure social housing tenure), and spending a greater proportion of their income on housing costs (Australian Government Productivity Commission, 2019).

Housing instability negatively affects health (Swope & Hernández, 2019). Housing is a known determinant of mental health (Baker, Bentley, & Mason, 2013), and housing instability has been linked to risky behaviours, and stress and stress-related responses that in turn increase the risk for mental illness (Compton & Shim, 2015),

anxiety (Burgard, Seefeldt, & Zelner, 2012), and poorer mental health (Kang, 2021). Disrupted social networks (Suglia, Duarte, & Sandel, 2011), insecure employment (Desmond & Gershenson, 2016), and poorer health care access (Reid, Vittinghoff, & Kushel, 2008) also partially explain this negative mental health effect.

While research on housing instability and mental health has largely focused on vulnerable populations including children (Baker, Pham, Daniel, & Bentley, 2019), disadvantaged mothers (Suglia et al., 2011), and post natural and social disasters (Burgard et al., 2012; Woodhall-Melnik & Grogan, 2019), emerging literature has examined the role of tenure types in the relationship between housing instability and mental health (Acolin, 2020; Bentley, Baker, Simons, Simpson, & Blakely, 2018; Park & Seo, 2020). These studies show that severe depression is associated with instability among renters (Park & Seo, 2020) and that while homeowners exhibit better mental health than private renters, the disparity is smaller in countries with smaller differences in average tenure length between owners and renters (Acolin, 2020).

However, there remains a paucity of studies that examine relationships between tenure, stability and health, taking into account the complex causal pathways comparatively over time. An examination of the short-run effects of housing tenure on mental health provides little support for a causal effect of tenure type on mental health, suggesting instead that differences in mental health observed by tenure are driven by the differential composition of people in private rental and ownership (Baker et al., 2013). This study aims to add more complexity to our understanding of this relationship by adding the dimension of time and consideration of the pattern of tenure occupancy.

Using a population-based longitudinal dataset in Australia that follows participants for nearly 20 years, this study examines the cumulative impact of being in private rental housing on mental health and psychological distress, and how much housing stability influences the mental health effect of continuous exposure to private rental housing among a low-income working-age population. This extends previous work by Bentley et al. (2018)

comparing the mental health effects of instability between cohorts of low-income private and social renters in Australia. To account for covariates that both confound and mediate the relationship between housing and mental health at different time points, marginal structural models (MSM) were used. Inverse probability of treatment weights (IPTW) were estimated cumulatively over time to enable comparison of similar people in rental and ownership so as to improve causal inference (Robins, Hernan, & Brumback, 2000).

Materials and Methods

Data

We used the Household, Income and Labour Dynamics in Australia (HILDA) survey, a longitudinal study of a nationally representative sample of Australian households, between 2001 and 2019. Within it, household members aged 15 years and over were interviewed and followed up annually. The survey was administered to 13,969 participant households in the first wave.

Analytical sample

The analytical sample was comprised of working-age (25-65 years) people who were in the lowest 40% of the national income distribution in the first year of their tenure. The restriction of the sample to low-income groups increased the probability that residential mobility reflected involuntary constraints. The sample consists of 24,904 person-year observations for homeowners and 17,163 for private renters. Of these, 3,481 homeowners were observed over 8.1 years (on average) and 3,579 private renters were observed over 6.0 years. Because homeownership is the dominant housing tenure in Australia (66% of Australian households were homeowners in the last Census of Population and Housing (Australian Bureau of Statistics, 2019)), this tenure type was used as the comparator. To test the hypothesis that the mental health effect of private rental tenure varies by stability of occupancy, we include a statistical interaction between tenure and housing instability in our models.

Measures of mental health

Mental health was measured using two self-reported validated scales. First, we generated the mental health summary score (MH) (on a scale 0-100 [better mental health]) from the 36-item Short Form Survey (SF-36), available annually from 2001 to 2019. Second, we generated the psychological distress score (on a scale 10-50 [higher psychological distress]) from the Kessler Psychological Distress scale questionnaire (K10), available in every second wave from 2007 to 2019. K10 was also rescaled from 0 to 100 and converted to the same direction as MH in the analysis. Both variables were treated as continuous.

Measures of housing exposure

Private rental status was measured as a binary variable equal to 1 if a person was in private rental housing in the year and 0 if in homeownership (outright or with a mortgage). Housing instability was measured using two continuous variables: the number of years in the current dwelling and the average number of transitions every 5 years in the current tenure (constructed as a running sum of moves divided by a running sum of years in the current tenure). Similar measures have been used in previous studies of tenure security and stability (Bentley et al., 2018). The five-year window was chosen to minimise loss from the analytical sample to tenure changes (which increases the more consecutive years that are considered) while providing enough of a time frame to assess stability.

Confounders

A number of time-invariant and time-varying covariates were included in the logistic regression model to generate the IPTWs. Time-invariant confounders included age group (25-34, 35-44, 45-54, and 55-65 years) at the beginning of the current tenure, gender (male or female), country of birth (Australia born not identified as Aboriginal or Torres Strait Islander [ATSI], Australia born identified as ATSI, overseas born from an English-speaking country, and overseas born from a non-English speaking country), highest education attainment

(graduate/postgraduate, high school/certificate, and below high school), and number of children aged 14 or less in the household (0, 1, 2, and ≥3).

In addition to baseline confounders, we controlled for time-varying confounders, including equivalised household income (in Australian dollars), employment status (full-time, part-time, unemployment, and not in the labour force), household structure (couple without children, couple with children, lone parent, lone person, and other), long-term health condition (yes/no), number of children aged 14 or under in the household (0, 1, 2, and ≥3), and government payment recipient status (yes/no). Time-varying covariates at the current and previous year were included for generating IPTWs. Individuals who were only observed for one wave were excluded from the analyses due to missing lagged values.

Given mental health can be associated with housing tenure and mobility patterns and subsequently affect future mental health, mental health at baseline and at previous year were included in the logistic regression model used to generate IPTWs. The logistic model additionally included year, age, ever previously in private rental tenure (yes/no), occupancy length, total number of transitions, and transition frequency.

Statistical methods

Figure 1 presents the Directed Acyclic Graph. This provides a visual representation of our assumptions about the causal relationships between exposures, outcomes, and confounders (Robins et al., 2000). It illustrates the time-varying confounding of the association between housing exposure and mental health. Since time-varying private rental exposure affects subsequent time-varying covariates that lie in the causal pathway between private rental exposure and mental health, standard regression adjustment methods will produce biased estimates (Robins et al., 2000). Hence, to appropriately adjust for the confounding and mediating effect of time-varying covariates and to derive the causal effect of time-dependent housing exposure, a MSM approach was applied. MSM models

adopt a counterfactual framework (Fewell et al., 2004) where the causal effect of exposure to private rental housing is determined by comparing the mental health of private renters if they were continuously exposed with their mental health if they were never exposed. Since we cannot observe the private rental housing exposure histories that did not occur (counterfactuals), the causal effect was derived by comparing exposed and unexposed groups that were identical in every (measured) way except for one group being in private rental and the other not. Therefore, by appropriately adjusting for complex confounding by time-variant and time-invariant factors, MSM models simulate randomisation of private rental exposure and achieve balance across groups to elicit causal inference (Atkinson & Therneau, 2013).

FIGURE 1 HERE

MSM models produce the unbiased average causal effect of exposure under the following assumptions: exchangeability that requires no unmeasured confounding; positivity that requires nonzero probabilities of exposure for all strata of confounders; consistency stating that the observed outcome for each individual is the counterfactual outcome under their observed exposure history; and no model misspecification (Cole & Hernán, 2008). While most of the assumptions cannot be tested, we included main confounders that were previously identified as theoretically important for the relationship between housing exposure and mental health to maximise our ability to meet the exchangeability assumption. Restricting the sample to a low-income working-aged group would help protect against the violation of the positivity assumption so that all individuals had non-zero probabilities of being in private rental. Truncating weights at p and (1-p) percentiles was used to eliminate extreme outliers as a means to trade off bias and variance (Cole & Hernán, 2008). Alternative model specifications were tested in the sensitivity analyses.

The MSM approach estimates the exposure-outcome association in a regression model that is weighted using the stabilised weights (SW) derived from the IPTWs (Fewell et al., 2004). The IPTWs are based on the inverse of

each respondent's probability of exposure at each time point, given their tenure history and confounding factors such as household income, employment status, household structure, and health condition. The weighting yields a pseudo-population in which the exposure is independent of measured confounders (Cole & Hernán, 2008). For each individual i, the IPTWs were constructed as the inverse product of the estimated probability of being exposed to private rental housing A_{it} cumulatively up to time t, conditional on past exposure history $\bar{A}_{it-1}$ and confounder history $\bar{L}_{it}$ including baseline covariates. The denominator was supplemented with a numerator that is the estimated probability of exposure to private rental housing A_{it} cumulatively up to time t, conditional on past exposure history $\bar{A}_{it-1}$ and baseline covariates V_i (V_i=L_{i0}), to reduce variability. The final weights SW_{it} took the following form:

$$SW_{it} = \prod_{t=0}^{K} \frac{p(A_{it} = a_{it} | \bar{A}_{it-1} = \bar{a}_{it-1}, V_i)}{p(A_{it} = a_{it} | \bar{A}_{it-1} = \bar{a}_{it-1}, \bar{L}_{it} = \bar{l}_{it})}$$

Weights were trimmed at the 0.5th and 99.5th percentile of the weight distribution to obviate the effect of extreme values (Cole & Hernán, 2008). Absolute standardised mean differences were calculated to assess the balance of each confounding covariates between the exposed and unexposed in the weighted and unweighted samples (Austin & Stuart, 2015) (see Appendix Figure 1 for the standardised mean differences of covariates in weighted and unweighted samples, which suggest that weighting by IPTWs achieved an effective balance between exposed and unexposed individuals).

The MSM model of cumulative effects of private rental housing on mental health or psychological distress took the following form:

$$MH_{it} = \beta_0 + \beta_1 A_{it} + \beta_2 HI_{it} + \beta_3 A_{it} \times HI_{it} + \gamma V_i + u_{it}$$

where A_{it} is an indicator for exposure to private rental housing, HI_{it} is a measure of housing instability (i.e. number of years in the current dwelling and transition frequency every 5 years in the current tenure), $A_{it} \times HI_{it}$ measures the differential effect of housing instability between housing tenures, and V_i is the set of baseline

covariates. A double robust estimation that adjusted for baseline covariates in the regression with weights SW_{it}, was used to address any remaining imbalance (Van der Laan, Laan, & Robins, 2003). Clustering adjusted standard errors were applied to account for correlations of observations within individuals.

While the general level of non-response rates was relatively low at 2% (Summerfield et al., 2020), there was at least one missing observation for some variables, about 6% for the mental health outcome and around or less than 1% for tenure, country of birth, employment status, long-term health condition and government payment recipient status. To minimise potential nonresponse bias and adjust for missing mechanisms that might depend on measured covariates, multiple imputation using chained equations with 50 imputations was conducted under the assumption that the data were missing at random. The univariate imputation models included all covariates at the preceding, current, and subsequent waves. The analysis was performed on each of the 50 imputed datasets and the estimates were combined using Rubin's combination rules (Rubin, 1987).

Given that the effect of private rental exposure and the role of residential instability can vary by life course stages, we explore the potential heterogenous mental health effect by baseline age groups. Associated with mental health outcomes and housing tenure status, age reflects the stage of people's life cycles and their likely needs and capacities to attain stability. The effect heterogeneity related to age has implications for family life course decisions.

Sensitivity analysis

The sensitivity of the estimates to model specification were examined using 1) polytomised housing instability measures; 2) quadratic terms for continuous housing instability measures with a statistical interaction with the private rental indicator; 3) complete case analyses without multiple imputation; and 4) fixed effects models for private renters and homeowners separately, to account for correlation between unmeasured heterogeneity and

covariates, and remove omitted variable bias associated with any time-invariant individual heterogeneity effects.

Results

Descriptive summary

Table 1 shows the descriptive statistics of the pooled observations separately for homeowners and private tenants. On average, private tenants (MH: 67.4; original K10: 18.9; rescaled K10: 77.7) had worse mental health than homeowners (MH: 71.8; original K10: 16.8; rescaled K10: 80.3); and they were more likely to be younger, single, have had shorter occupancy, and have moved more frequently.

TABLE 1 HERE

Figure 2 visually describes tenure transitions made by the respondents between 2001 and 2018. Private rental tenants moved most often, and usually to another private rental property. Moves from social housing were generally into another social housing property or into private rental. Residential mobility was least common amongst homeowners. This visualisation also puts into perspective the small size of the social housing sector compared to the private rental sector in terms of occupancy, underlying the importance of understanding how the private rental sector can best support the health of tenants in Australia.

FIGURE 2 HERE

Cumulative effect of years in private rental dwelling

Table 2 reports the results from marginal structural models that estimated the effect of each additional year in rental tenure on respondents' self-reported mental health. Figure 3 plots predicted trends in mental health over time for private renters and homeowners.

The mental health of private rental tenants at baseline was poorer than that of owners (MH: $\hat{\beta}_1$= -5.29, 95%CI -7.61 to -2.97; rescaled K10: $\hat{\beta}_1$= -4.43, 95%CI -7.48 to -1.38; original K10: $\hat{\beta}_1$= 1.77, 95%CI 0.55 to 2.99 and longer occupancy was associated with higher mental health for both tenures (as indicated by positive and significant $\hat{\beta}_2$ for homeowners and $\hat{\beta}_2 + \hat{\beta}_3$ for private renters) (Table 2 top panel). Furthermore, the interaction term between private rental status and years of occupancy was positive and significant, indicating that the mental health of private renters had a larger improvement compared to homeowners as the number of years in the current dwelling increased. The estimated increases in MH and rescaled K10 with one additional year of stable occupancy in private rental are 0.53 (95%CI 0.12 to 0.95) and 0.48 (95%CI 0.02 to 0.94) higher than the increases among homeowners. Cumulatively over a stable 5-years of tenure occupancy, the increases in MH and K10 respectively from baseline are 3.97 (from 65.06 to 69.03) and 4.54 (from 75.37 to 79.90) for private renters, compared to 1.30 (from 70.46 to 71.76) and 2.14 (from 80.12 to 82.26) for homeowners. That is, the improvement adds up to being 2.67 (95%CI 0.61 to 4.72) higher in MH and 2.40 (95%CI 0.12 to 4.68) higher in K10 for private rental than for homeownership. Put simply, residential stability appears to affect people's mental health differentially, such that renters who start with much lower mental health on average, benefit more.

TABLE 2 HERE

The advantageous effect of residential stability for private rental is also demonstrated in Figure 3 panel (a), which shows that the difference in mental health between private rental and homeownership decreased as the occupancy became more stable, reaching a similar level at 5-6 years. In fact, the longer residents spent in either tenure, the closer their mental health, such that by 5-6 years in the same dwelling (MH at year 6: $\hat{\beta}_3$= -2.09, 95%CI -4.31 to 0.13, predicted MH increases from 70.46 at baseline to 72.02 for homeowners and from 65.06 at baseline to 69.83 for private renters; rescaled K10 at year 5: $\hat{\beta}_3$= -2.03, 95%CI -4.28 to 0.23, predicted rescaled K10 increases from 80.12 at baseline to 82.26 for homeowners and from 75.37 at baseline to 79.90 for private renters; original K10 at year 5: $\hat{\beta}_3$= 0.81, 95%CI -0.09 to 1.71, predicted original K10 decreases from 17.95 at

baseline to 17.10 for homeowners and from 19.85 at baseline to 18.04 for private renters), the mental health of owners and private rental tenants was comparable and the tenure-based difference in mental health became statistically insignificant.

FIGURE 3 HERE

Cumulative effects of transitions in private rental tenure

More frequent transitions were associated with lower levels of mental health for all respondents (for homeowners, HM: $\hat{\beta}_2$= -0.91, 95%CI -1.56 to -0.25; rescaled K10: $\hat{\beta}_2$= -1.48, 95%CI -2.40 to -0.56; original K10: $\hat{\beta}_2$= 0.59, 95%CI 0.22 to 0.96, for private renters, MH: $\hat{\beta}_2$= -1.26, 95%CI -2.00 to -0.51; rescaled K10: $\hat{\beta}_2$= -0.92, 95%CI -1.84 to -0.003; original K10: $\hat{\beta}_2$= 0.37, 95%CI 0.001 to 0.73) (Table 2 bottom panel). While the effect of frequent transitions is greater for private renters than for homeowners, there was no statistically significant difference in the association between transition frequency and mental health across housing tenure types (Figure 3 panel (b)).

Effect heterogeneity by life course stages

The estimates of the mental health effects across age groups reveal that the importance of residential stability associated with housing tenure varies by age, with residential stability being particularly beneficial for private renters between 35 and 44 years of age. The improvements in mental health with one additional year of stable occupancy for private renters in this group are 0.99 (95%CI 0.46 to 1.53) in MH, 1.16 (95%CI 0.59 to 1.73) in rescaled K10, and -0.47 (95%CI -0.69 to -0.24) in original K10. These improvements were above any increases in mental health observed for a comparable cohort of homeowners, by approximately one unit (difference in MH: $\hat{\beta}_3$= 0.89, 95%CI 0.31 to 1.47; difference in rescaled K10: $\hat{\beta}_3$= 1.03, 95%CI 0.40 to 1.65; difference in original K10: $\hat{\beta}_3$= -0.41, 95%CI -0.66 to -0.16).

TABLE 3 HERE

Sensitivity analyses

Models allowing for nonlinear trends in housing instability measures over time indicate that the mental health of private renters improved at an increasing rate with stabler occupancy (Appendix Table A1 panel (a)). Specifications treating housing instability measures as categorical produced similar results (Appendix Table A1 panel (b)). Estimates using complete cases were broadly consistent with those obtained from those using multiple imputation, with additional significance observed in the interaction term between private rental and transition frequency (Appendix Table A1 panel(c)). The within estimator results from fixed effects models that removed bias from time-invariant individual heterogeneity confirm a larger improvement of mental health for private renters with stable occupancy when compared to owners (Appendix Table A1 panel(d)).

Discussion

This is the first study to use a population-based longitudinal dataset that spans nearly two decades to examine the cumulative mental health effects of residential instability of private rental housing for a low-income working-age population. We find that while private rental tenants report worse mental health than homeowners initially, the longer they remain in their homes (the more stable their tenure), the smaller the tenure-based health differential. Building on previous research examining the short-run effect of changes in tenure on mental health (Baker et al., 2013), the study takes a dynamic approach to measuring housing occupancy over time. To improve causal inference, we use marginal models to control for the confounding and mediating effect of time-varying covariates.

The study suggests that the greater instability of households in the private rental sectors contributes to poorer mental health. Sensitivity analyses to reduce residual confounding support this conclusion. Our analysis of this

working-age, low-income cohort provides evidence that stable and secure rental tenure is protective of mental health and the mental health of stable rental tenants becomes comparable to that of homeowners over time. This supports the development of housing policies that promote and improve the stability and security of rental tenure.

Residential stability is particularly beneficial to private renters who are between 35 and 44 years of age – notably the age when many people have young children and stability is likely to be more important. The improvement in mental health provided by stability for this age group is sizable, suggesting stable and secure tenure as a potential policy lever for improving their wellbeing and life chances and those of their families. They are likely to have commitments to work and childcare, which makes residential instability particularly disruptive. This is consistent with the higher mental health effect of residential instability observed for people with children than for those without in the current sample.

The results suggest that although homeownership is associated with better mental health, a housing system that supports stable and secure rental tenancy can protect the mental wellbeing of private renters and reduce mental health inequality across housing tenure types. While the instability of private renters is undoubtedly related to the types of households and their life stages, many private renters may be making forced and frequent transitions due to financial insecurity, unhealthy housing conditions, and weak legislative protection (Australian Government Productivity Commission, 2019). Combined with the evidence that countries with smaller gaps in tenure length between private renters and homeowners had smaller differences in their health outcomes (Acolin, 2020), housing systems that provide protection and support for tenure security in the rental sector appear beneficial to the mental health of residents. This is of particular importance for the mental health of private renters in their early middle adulthood (35-44 years). Beyond housing tenure and socioeconomic status, residential stability and tenancy security can also play a protective role in improving the wellbeing of tenants.

The study contributes to the growing literature on the interrelation between housing tenure, housing instability, and wellbeing and health by causally examining the differential mental health effects of housing instability between private rental and homeownership. It uses a nationally representative longitudinal dataset spanning nearly 20 years and rigorous statistical methods including MSMs with IPTWs and double robust adjustment to account for time-varying confounders affected by prior housing exposure. The marginal approach enhances exchangeability and comparability of people across tenures and provides more robust evidence on the effect of housing instability related to tenure types on residents' mental health.

The study has acknowledged limitations. First, although not available in the current analysis, housing conditions could partially confound the relationship between housing tenure, residential instability, and mental health. Residential instability can be related to worse or improved housing quality and this is unaccounted for in the current analyses. Second, while we measured housing instability according to occupancy length and transition count, it should be acknowledged that housing instability is a multi-dimensional concept that can also be assessed through measures such as being behind on rent or mortgage payments (Burgard et al., 2012). Third, the strength of causal inference is proportionate to the extent that model assumptions are met. As with most observational studies, there were likely confounders associated with housing instability and mental health that were unmeasured in the analysis. While we thoroughly address measured time-varying and time-invariant confounders both through the IPTWs and doubly robust adjustment in the MSM, residual confounding remains a concern. Finally, we focused on stability and security over time and so were not able to capture the nature of each move. We note that some moves are likely to be positive, some neutral and some negative. Further research is required to differentiate between types of moves and their impact on mental health.

Conclusions

The study is the first to use nearly two decades of longitudinal data and causally robust modelling to investigate the relationship between housing tenure, residential instability, and psychological wellbeing over time, and the role of residential instability in generating tenure-based mental health differentials. We find that after five to six years in the same residence, the mental health of owner occupiers and private rental tenants is nearly indistinguishable (a convergence of the mental health gap between private renters and homeowners from -5.29 in MH and 1.77 in K10 at baseline to -2.09 in MH and 0.81 in K10 at 5-6 years), following a period of marked divergence during which private rental tenants fare worse in terms of their mental health. Regulatory systems that provide better protection and support for housing stability and security can have a positive public health impact for private rental in the short to medium term. In the longer term, our study provides evidence that once people find the right home, their tenure type becomes less of a significant factor in determining their mental health and wellbeing.

References

Acolin, A. (2020). Owning vs. Renting: the benefits of residential stability? Housing Studies, 1-24.

Atkinson, E. J., & Therneau, T. M. (2013). The Basics of Propensity Scoring and Marginal Structural Models Cynthia S. Crowson, Louis A. Schenck, Abigail B. Green.

Austin, P. C., & Stuart, E. A. (2015). Moving towards best practice when using inverse probability of treatment weighting (IPTW) using the propensity score to estimate causal treatment effects in observational studies. Statistics in medicine, 34(28), 3661-3679.

Australian Bureau of Statistics. (2019). Census of Population and Housing 2017-18. cat no 4130.0. Australian Bureau of Statistics.

Australian Government Productivity Commission. (2019). Vulnerable private renters: Evidence and options: Productivity Commission Research Paper.

Australian Institute of Health and Welfare. (2020). Home ownership and housing tenure. Australian Institute of Health and Welfare, Australian Government.

Baker, E., Bentley, R., Lester, L., & Beer, A. (2016). Housing affordability and residential mobility as drivers of locational inequality. Applied Geography, 72, 65-75.

Baker, E., Bentley, R., & Mason, K. (2013). The mental health effects of housing tenure: causal or compositional? Urban Studies, 50(2), 426-442.

Baker, E., Pham, N. T. A., Daniel, L., & Bentley, R. (2019). How does household residential instability influence child health outcomes? A quantile analysis. International Journal of Environmental Research and Public Health, 16(21), 4189.

Bentley, R., Baker, E., Simons, K., Simpson, J. A., & Blakely, T. (2018). The impact of social housing on mental health: longitudinal analyses using marginal structural models and machine learning-generated weights. International journal of epidemiology, 47(5), 1414-1422.

Burgard, S. A., Seefeldt, K. S., & Zelner, S. (2012). Housing instability and health: findings from the Michigan Recession and Recovery Study. Social science & medicine, 75(12), 2215-2224.

Burke, T., Nygaard, C. A., & Ralston, L. (2020). Australian home ownership: past reflections, future directions. AHURI Final Report.

Cole, S. R., & Hernán, M. A. (2008). Constructing inverse probability weights for marginal structural models. American journal of epidemiology, 168(6), 656-664.

Compton, M. T., & Shim, R. S. (2015). The social determinants of mental health. Focus, 13(4), 419-425.

Desmond, M., & Gershenson, C. (2016). Housing and employment insecurity among the working poor. Social Problems, 63(1), 46-67.

Fewell, Z., Hernán, M. A., Wolfe, F., Tilling, K., Choi, H., & Sterne, J. A. (2004). Controlling for time-dependent confounding using marginal structural models. The Stata Journal, 4(4), 402-420.

Kang, S. (2021). The Cumulative Relationship between Housing Instability and Mental Health: Findings from the Panel Study of Income Dynamics. Journal of Social Distress and Homelessness, 1-13.

Park, K., & Seo, W. (2020). Effects of Residential Instability of Renters on Their Perceived Health Status: Findings from the Korean Welfare Panel Study. International Journal of Environmental Research and Public Health, 17(19), 7125.

Reid, K. W., Vittinghoff, E., & Kushel, M. B. (2008). Association between the level of housing instability, economic standing and health care access: a meta-regression. Journal of health care for the poor and underserved, 19(4), 1212-1228.

Robins, J. M., Hernan, M. A., & Brumback, B. (2000). Marginal structural models and causal inference in epidemiology. Epidemiology, 11(5), 550-560.

Rowley, S., & James, A. (2018). The private rental sector in Australia. Bankwest Curtin Economics Centre. Perth.

Rubin, D. B. (1987). Multiple imputation for survey nonresponse. In: New York: Wiley.

Stone, W., Burke, T., Hulse, K., & Ralston, L. (2013). Long-term private rental in a changing Australian private rental sector.

Suglia, S. F., Duarte, C. S., & Sandel, M. T. (2011). Housing quality, housing instability, and maternal mental health. Journal of Urban Health, 88(6), 1105-1116.

Summerfield, M., Garrard, B., Hahn, M., Jin, Y., Kamath, R., Macalalad, N., . . . Wooden, M. (2020). HILDA User Manual – Release 19. Melbourne Institute: Applied Economic and Social Research, University of Melbourne.

Swope, C. B., & Hernández, D. (2019). Housing as a determinant of health equity: A conceptual model. Social science & medicine, 243, 112571.

Van der Laan, M. J., Laan, M., & Robins, J. M. (2003). Unified methods for censored longitudinal data and causality: Springer Science & Business Media.

Woodhall-Melnik, J., & Grogan, C. (2019). Perceptions of mental health and wellbeing following residential displacement and damage from the 2018 St. John River Flood. International Journal of Environmental Research and Public Health, 16(21), 4174.

Figure captions

Figure 1. Directed acyclic graph of the association between housing exposure and mental health

Notes: Directed acyclic graph demonstrates causal pathways between baseline confounders, time-varying confounders, private rental status, housing stability measures and mental health outcomes. This highlights the potential for prior private rental status to influence time-varying confounders, and that housing stability could operate as a moderator of the relationship between private rental exposure and mental health outcomes.

Figure 2. Tenure transitions across a representative sample of low-income households in the HILDA survey

Notes: A sequence is defined as an ordered list of tenure status for an individual, which is represented as a horizonal line. Tenure status (owners, private renters, and social renters) is designated by colour. Sequences of tenure occupancy are plotted as stacked horizontal bars. Sequences with the same order of tenure transitions were stacked, regardless of the length of occupancy. If a move is made within a tenure type (e.g., a private renter moves to a different dwelling location and remains in private rental) or between tenure types (e.g., a private renter moves to a different dwelling location and becomes a homeowner), they are separated with a grey bar.

Figure 3. Changes in mental health over time for private renters and homeowners

Notes: Navy markers represent homeowners and maroon markers represent private renters. Diamond markers indicate SF-36 MH and rectangle markers indicate private renters. MSM models were applied with stabilised weights and cluster-adjusted standard errors, controlling for baseline covariates. Predictive margins and 95%CI are presented.

Tables and figures

Table 1. Summary statistics for pooled sample

	Owner (outright and mortgaged) N=24,904 (3,481 people)		Private renter N=17,163 (3,579 people)	
Gender (%, n)				
Female	56.5	14071	54.5	9354
Male	43.5	10833	45.5	7809
Age group (%, n)				
Age 25-34	14.4	3586	47.7	8187
Age 35-44	24.9	6201	23.9	4102
Age 45-54	29.2	7272	17.0	2918
Age 55-65	31.5	7845	11.5	1974
Country of birth/Ethnicity (%, n)				
Australia, not ATSI	72.1	17954	72.4	12414
Australia, ATSI	1.5	374	5.5	943
Main English-speaking	8.2	2042	7.3	1252
Other	18.2	4532	14.8	2538
Household structure (%, n)				
Couple without children	23.5	5852	15.8	2712
Couple with children	51.0	12701	36.4	6247
Lone parent	10.1	2515	17.7	3038
Lone person	11.3	2814	24.1	4136
Other	4.1	1021	6.0	1030
Education (%, n)				
Graduate/postgraduate	13.3	3312	13.2	2266
High school/advanced certificate	45.7	11381	48.3	8290
Year 11 or below	41.0	10211	38.6	6625
Employment (%, n)				
Full-time	37.3	9278	36.4	6239
Part-time	22.2	5522	21.6	3702
Unemployed	3.7	920	8.4	1440
Not in labour force	36.9	9179	33.6	5759
long term health condition (%, n)				
Yes	34.0	8465	33.4	5731
Government payment (%, n)				
Yes	30.3	7536	43.1	7394
Previous stay in private rental				
Yes	2.0	498	17.4	2986
Equivalised household income (mean, SD)				
CPI-adjusted, weekly, $AU	689.1	360.9	681.3	329.9
Total children in the household (mean, SD)	0.9	1.2	1.0	1.2
SF-36 Mental health (mean, SD)	71.8	18.5	67.4	19.9
Original K10 (mean, SD)	16.8	7.3	18.9	8.2
Rescaled K10 (mean, SD)	83.0	18.2	77.7	20.6
No. years in current dwelling (mean, SD)	5.2	4.2	2.5	2.2
No. moves/5 years in current tenure (mean, SD)	0.8	1.3	2.5	1.7

Notes: SF-36 was available annually from 2001 to 2019, and K10 was available in every second wave from 2007 to 2019.

Table 2. MSM results on effects of exposure to private rental on mental health and psychological distress

	MH	K10 (rescaled)
Occupancy length		
Private renter	-5.291***	-4.426***
	[-7.612 -2.971]	[-7.475 -1.378]
Years in current dwelling	0.261***	0.427***
	[0.098 0.423]	[0.224 0.631]
Private renter x Years in current dwelling	0.534**	0.480**
	[0.122 0.945]	[0.023 0.937]
Transition frequency		
Private renter	-2.558**	-3.098**
	[-5.082 -0.034]	[-6.094 -0.103]
Moves/5 years in current tenure	-0.907***	-1.478***
	[-1.561 -0.253]	[-2.401 -0.556]
Private renter x Moves/5 years in current tenure	-0.350	0.561
	[-1.331 0.631]	[-0.673 1.796]

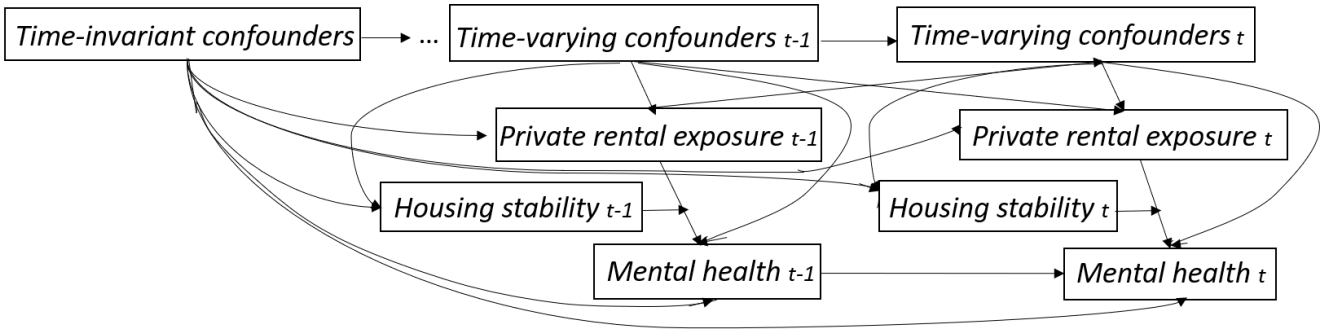
Notes: MSM models were applied with stabilised weights and cluster-adjusted standard errors, controlling for baseline covariates including age, gender, country of birth, education, and number of children. K10 has been rescaled from 0 to 100 and converted to the same direction as MH. Coefficients and 95%CI are presented. *p < 0.1, **p < 0.05, ***p < 0.01.

Table 3. MSM results on effects of exposure to private rental on mental health and psychological distress by baseline age

	MH			
	Age 25-34	Age 35-44	Age 45-54	Age 55-64
(a) Occupancy length				
Private renter	-5.418***	-5.786**	-5.941**	-3.870
	[-8.811 -2.024]	[-10.226 -1.346]	[-11.648 -0.234]	[-9.467 1.726]
Years in current dwelling	0.130	0.102	0.471***	0.700***
	[-0.206 0.466]	[-0.146 0.349]	[0.188 0.754]	[0.207 1.193]
Private renter x Years in current dwelling	0.363	0.892***	0.373	0.565
	[-0.394 1.120]	[0.310 1.474]	[-0.584 1.330]	[-0.350 1.481]
(b) Transition frequency				
Private renter	-3.326	0.791	-4.446	-3.045
	[-7.298 0.647]	[-3.331 4.913]	[-11.343 2.452]	[-7.347 1.256]
Moves/5 years in current tenure	-0.520	0.001	-1.666**	-2.396***
	[-1.634 0.594]	[-1.084 1.086]	[-3.041 -0.291]	[-3.901 -0.891]
Private renter x Moves/5 years in current tenure	-0.514	-2.031**	0.521	1.954*
	[-2.103 1.075]	[-3.763 -0.300]	[-2.080 3.122]	[-0.090 3.998]
	K10 (rescaled)			
	Age 25-34	Age 35-44	Age 45-54	Age 55-64
(a) Occupancy length				
Private renter	-4.210**	-6.232**	-8.570***	8.715
	[-8.149 -0.272]	[-11.751 -0.713]	[-15.062 -2.079]	[-2.715 20.145]
Years in current dwelling	0.406**	0.137	0.501***	2.064***
	[0.060 0.752]	[-0.148 0.422]	[0.169 0.834]	[0.834 3.295]
Private renter x Years in current dwelling	0.087	1.025***	0.789*	-0.918
	[-0.778 0.953]	[0.397 1.654]	[-0.090 1.668]	[-2.711 0.875]
(b) Transition frequency				
Private renter	-5.161**	1.159	-4.706	0.701
	[-9.990 -0.331]	[-3.534 5.852]	[-11.585 2.174]	[-5.521 6.922]
Moves/5 years in current tenure	-1.021	-0.211	-1.651**	-4.770***
	[-2.393 0.350]	[-1.521 1.099]	[-2.956 -0.345]	[-7.374 -2.166]
Private renter x Moves/5 years in current tenure	0.661	-1.701*	0.504	2.931*
	[-1.075 2.397]	[-3.684 0.281]	[-2.241 3.249]	[-0.557 6.419]

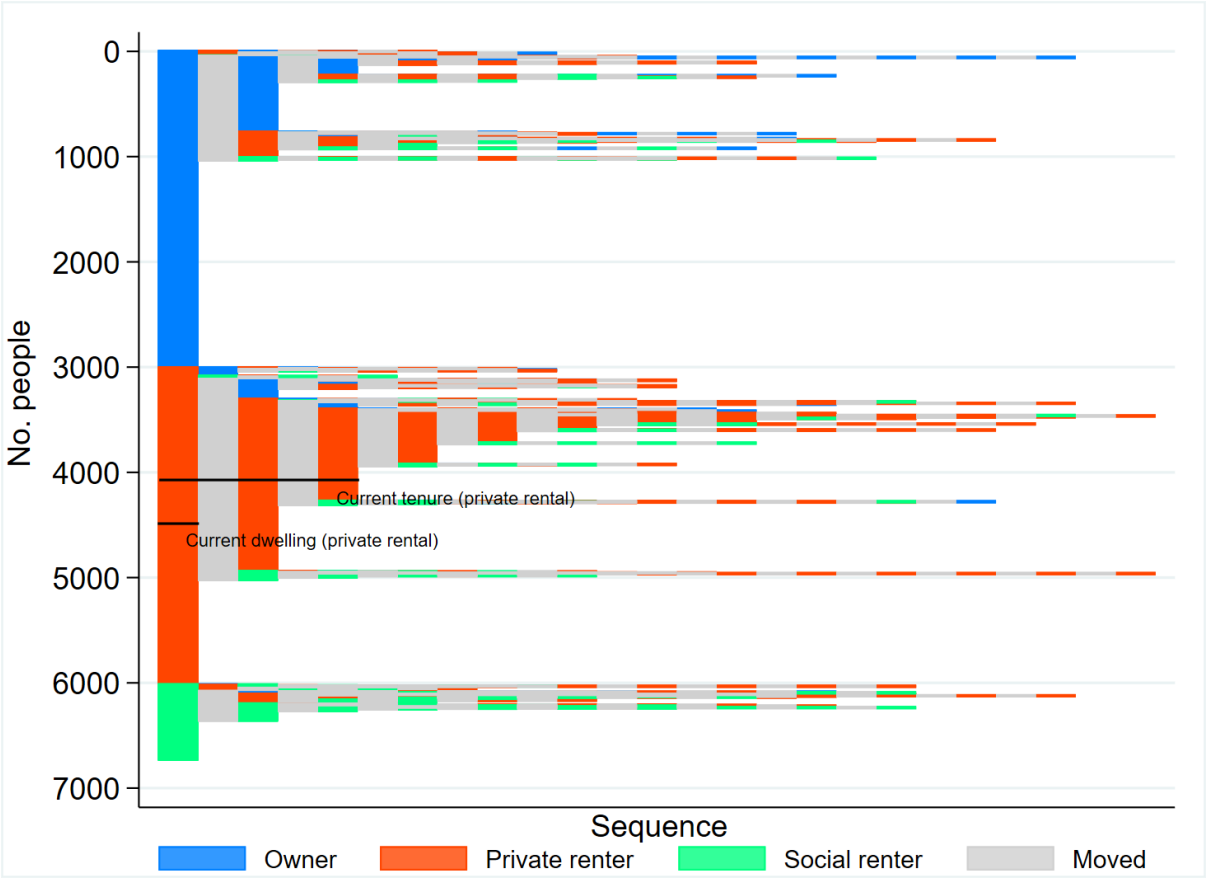
Notes: MSM models were applied with stabilised weights and cluster-adjusted standard errors, controlling for baseline covariates including age, gender, country of birth, education, and number of children. K10 has been rescaled from 0 to 100 and converted to the same direction as MH. Coefficients and 95%CI are presented. *p < 0.1, **p < 0.05, ***p < 0.01.

Figure 1. Directed Acyclic Graph of the association between housing exposure and mental health



Notes: Directed acyclic graph demonstrates causal pathways between baseline confounders, time-varying confounders, private rental status, housing stability measures and mental health outcomes. This highlights the potential for prior private rental status to influence time varying confounders and that housing stability could operate as a moderator of the relationship between private rental exposure and mental health outcomes.

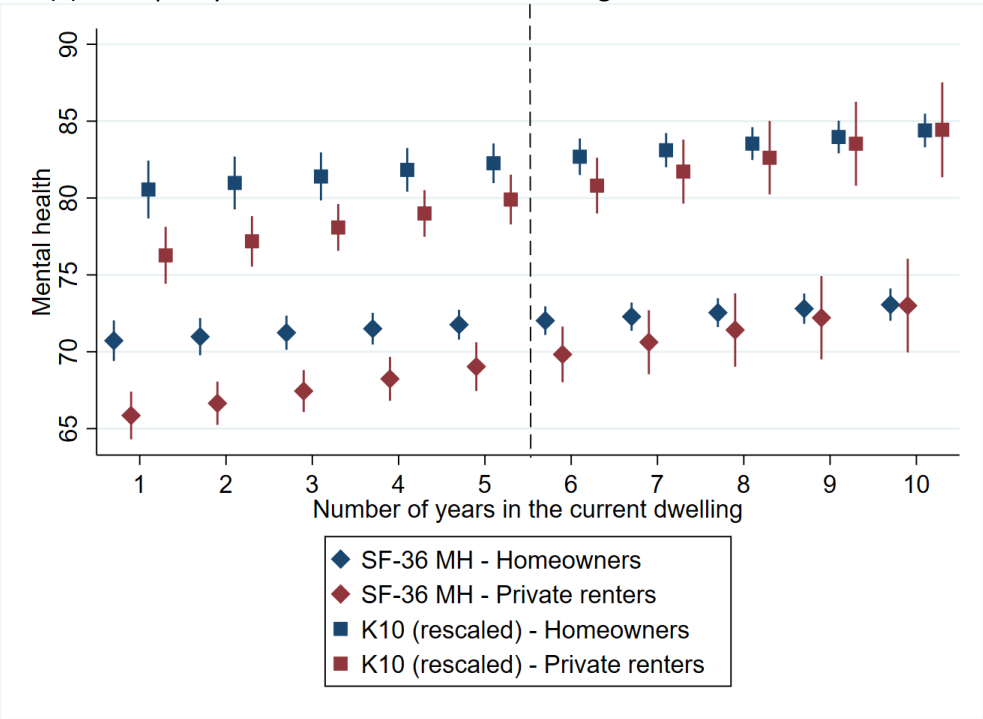
Figure 2. Tenure transitions across a representative sample of low-income households in the HILDA survey



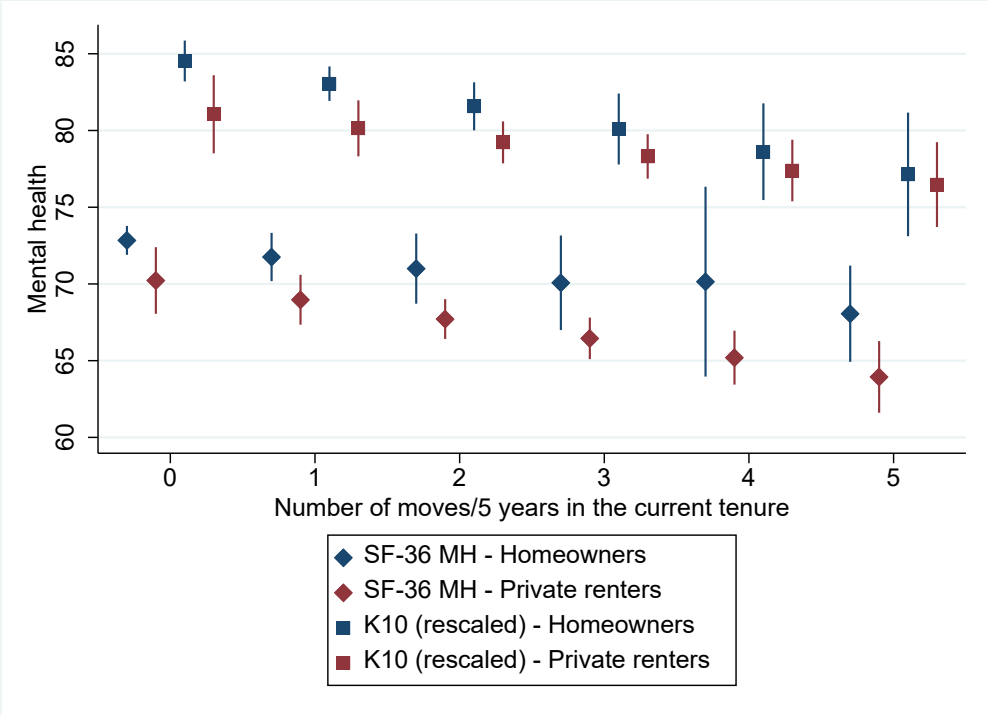
Notes: A sequence is defined as an ordered list of tenure status for an individual, which is represented as a horizonal line. Tenure status (owners, private renters, and social renters) is designated by colour. Sequences of tenure occupancy are plotted as stacked horizontal bars. Sequences with the same order of tenure transitions were stacked, regardless of the length of occupancy. If a move is made within a tenure type (e.g., a private renter moves to a different dwelling location and remains in private rental) or between tenure types (e.g., a private renter moves to a different dwelling location and becomes a homeowner), they are separated with a grey bar.

Figure 3. Changes in mental health over time for private renters and homeowners

(a) Occupancy duration in the current dwelling



(b) Transition frequency in the current tenure



Notes: Navy markers represent homeowners and maroon markers represent private renters. Diamond markers indicate SF-36 MH and rectangle markers indicate private renters. MSM models were applied with stabilised weights and cluster-adjusted standard errors, controlling for baseline covariates. Predictive margins and 95%CI are presented.

Appendix

Figure A1. Standardised mean difference in unweighted and weighted samples

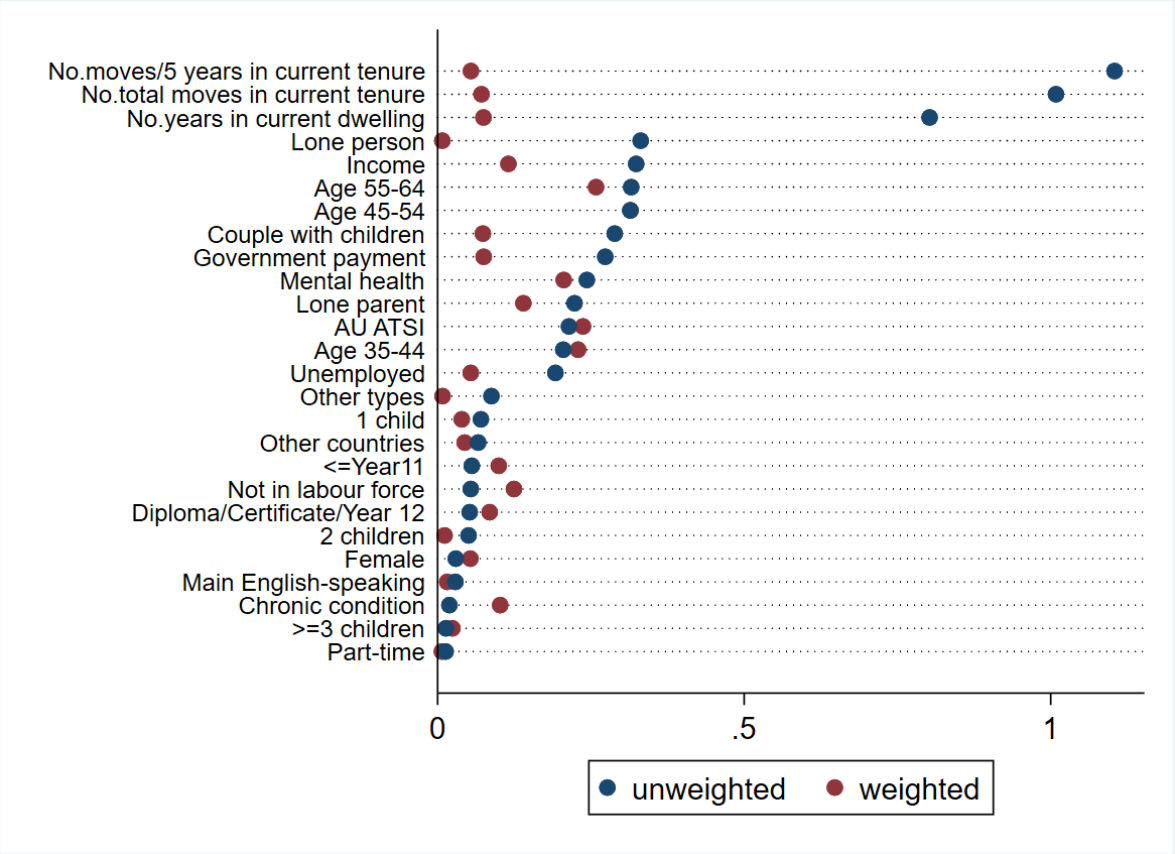


Table A1. Sensitivity analyses

(a) Linear and quadratic housing instability measures

	MH	Kessler (rescaled)
Occupancy length		
Private renter	-3.815***	-0.329
	[-6.584 -1.046]	[-4.138 3.481]
Years in current dwelling	0.493**	1.245***
	[0.051 0.934]	[0.613 1.877]
Private renter x Years in current dwelling	-0.134	-1.304**
	[-1.192 0.924]	[-2.537 -0.072]
Years in current place^2	-0.015	-0.052***
	[-0.039 0.009]	[-0.085 -0.019]
Private renter x Years in current place^2	0.050	0.127***
	[-0.025 0.125]	[0.048 0.207]
Transition frequency		
Private renter	-2.363*	-2.321
	[-5.262 0.536]	[-5.817 1.175]
Moves/5 years in current tenure	-2.177*	-0.847
	[-4.524 0.171]	[-3.551 1.858]
Private renter x Moves/5 years in current tenure	0.830	-0.141
	[-2.796 4.455]	[-4.377 4.095]
Moves/5 years in current tenure^2	0.355	-0.271
	[-0.255 0.964]	[-1.091 0.549]
Private renter x Moves/5 years in current tenure^2	-0.447	0.223
	[-1.366 0.472]	[-0.833 1.278]

Notes: MSM models were applied with stabilised weights and cluster-adjusted standard errors, controlling for baseline covariates including age, gender, country of birth, education, and number of children. K10 has been rescaled from 0 to 100 and converted to the same direction as MH. Coefficients and 95%CI are presented. *p < 0.1, **p < 0.05, ***p < 0.01.

(b) Categorical housing instability measures

	MH	Kessler (rescaled)
Occupancy length		
Private renter	-4.568***	-2.270
	[-6.553 -2.583]	[-5.181 0.640]
Base: 1-2 years in current dwelling		
3-4 years in current dwelling	0.294	3.070**
	[-1.072 1.660]	[0.511 5.628]
5-7 years in current dwelling	1.763**	4.368***
	[0.341 3.185]	[1.875 6.861]
≥8 years in current dwelling	2.412***	4.840***
	[0.746 4.078]	[2.469 7.210]
Private renter x 2-5 years in current dwelling	1.387	-0.647
	[-1.045 3.818]	[-4.173 2.878]
Private renter x 6-9 years in current dwelling	2.368*	-1.332
	[-0.437 5.174]	[-5.140 2.476]
Private renter x ≥10 years in current dwelling	3.754*	2.918
	[-0.289 7.797]	[-1.638 7.473]
Transition frequency		
Private renter	-2.716*	-3.313*
	[-5.472 0.040]	[-6.969 0.344]
Base: 0 move/5 years in current tenure		
1 move/5 years in current tenure	-1.925*	-2.252*
	[-3.934 0.084]	[-4.693 0.189]
2-3 moves/5 years in current tenure	-2.015	-2.894
	[-4.901 0.870]	[-6.425 0.637]
4-5 moves/5 years in current tenure	-4.385	-10.709*
	[-11.666 2.896]	[-21.920 0.502]
Private renter x 1 move/5 years in current tenure	0.717	2.956
	[-2.919 4.353]	[-1.622 7.533]
Private renter x 2-3 moves/5 years in current tenure	-2.137	-1.074
	[-6.087 1.813]	[-6.142 3.995]
Private renter x 4-5 moves/5 years in current tenure	-3.477	6.637
	[-12.699 5.744]	[-5.069 18.343]

Notes: MSM models were applied with stabilised weights and cluster-adjusted standard errors, controlling for baseline covariates including age, gender, country of birth, education, and number of children. K10 has been rescaled from 0 to 100 and converted to the same direction as MH. Coefficients and 95%CI are presented. *p < 0.1, **p < 0.05, ***p < 0.01.

(c) Available cases

	MH	K10 (rescaled)
Occupancy length		
Private renter	-3.939***	-3.935***
	[-5.144 -2.735]	[-5.493 -2.378]
Years in current dwelling	0.145***	0.236***
	[0.038 0.251]	[0.103 0.369]
Private renter x Years in current dwelling	-0.009	0.016
	[-0.332 0.313]	[-0.334 0.367]
Transition frequency		
Private renter	-4.634***	-5.761***
	[-6.111 -3.158]	[-7.522 -4.000]
Moves/5 years in current tenure	-0.706***	-1.092***
	[-1.063 -0.349]	[-1.535 -0.649]
Private renter x Moves/5 years in current tenure	0.551**	1.056***
	[0.057 1.045]	[0.446 1.667]

Notes: MSM models were applied with stabilised weights and cluster-adjusted standard errors, controlling for baseline covariates including age, gender, country of birth, education, and number of children. K10 has been rescaled from 0 to 100 and converted to the same direction as MH. Coefficients and 95%CI are presented. *p < 0.1, **p < 0.05, ***p < 0.01.

(d) Fixed effects models

	MH	K10 (rescaled)
Homeowners		
Years in current dwelling	-0.056	0.071
	[-0.165 0.054]	[-0.097 0.240]
Moves/5 years in current tenure	0.114	0.189
	[-0.101 0.329]	[-0.161 0.538]
Private renters		
Years in current dwelling	0.172**	0.216*
	[0.007 0.337]	[-0.037 0.468]
Moves/5 years in current tenure	0.021	0.093
	[-0.219 0.260]	[-0.336 0.523]

Notes: Fixed effects models were applied for homeowners and private renters separately controlling for time-varying sociodemographic variables. K10 has been rescaled from 0 to 100 and converted to the same direction as MH. Coefficients and 95%CI are presented. *p < 0.1, **p < 0.05, ***p < 0.01.