

BMJ Open Impact of COVID-19 shocks, precarity and mediating resources on the mental health of residents of share housing in Victoria, Australia: an analysis of data from a two-wave survey

Katrina Raynor ¹, Laura Panza,² Rebecca Bentley ³

To cite: Raynor K, Panza L, Bentley R. Impact of COVID-19 shocks, precarity and mediating resources on the mental health of residents of share housing in Victoria, Australia: an analysis of data from a two-wave survey. *BMJ Open* 2022;**12**:e058580. doi:10.1136/bmjopen-2021-058580

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-058580>).

Received 27 October 2021
Accepted 11 March 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Faculty of Architecture Building and Planning, The University of Melbourne, Melbourne, Victoria, Australia

²Faculty of Business and Economics, University of Melbourne, Melbourne, Victoria, Australia

³Melbourne School of Population and Global Health, University of Melbourne, Melbourne, Victoria, Australia

Correspondence to

Katrina Raynor;
katrina.raynor@unimelb.edu.au

ABSTRACT

Objectives COVID-19 lockdown measures have challenged people's mental health, especially among economically vulnerable households. The objective of this study was to investigate the impact of exposure to COVID-19 shocks (defined as job loss, living cost pressures and changing housing conditions throughout the lockdown period) and double precarity (defined as precarity in housing and employment) on mental health outcomes for members of share households as well as the mediating effects of a range of resources.

Design We conducted a two-wave survey of occupants of share housing in June and October 2020 during a prolonged period of population lockdown. Research design involved fixed effects ordered logit regression models to assess the mental health consequences of baseline precarity and COVID-related shocks.

Setting Victoria, Australia.

Participants We surveyed 293 occupants of share houses (mean age 34 SD 11.5, 56% female). Members of share houses (where individuals are unrelated adults and not in a romantic relationship) are more likely to be young, casually employed, visa-holders and low-income.

Outcome measures We measured household composition, housing and employment precarity, access to government support, household crowding, social networks and COVID-19 shocks. We used a self-reported measure of mental health.

Results Those exposed to COVID-19 shocks reported a 2.7 times higher odds of mental health deterioration (OR 2.7, 95% CI 1.53 to 4.85). People exposed to double precarity (precarity in both housing and employment) reported 2.4 times higher odds of mental health deterioration (OR 2.4, 95% CI 0.99 to 5.69). Housing inadequacy and lack of access to sufficient government payments explained 14.7% and 7% of the total effect of double precarity on mental health, respectively.

Conclusions Results indicate that residents of group households characterised by pre-existing precarity were vulnerable to negative mental health effects during lockdown. Access to sufficient government payments and adequate housing buffered this negative effect.

INTRODUCTION

The emergence of the highly infectious COVID-19 has created a global health crisis

Strengths and limitations of this study

- Our use of mediation analysis enables novel examination of the protective role of housing adequacy, government payments and social support for tenant's mental health during COVID-19-related shocks.
- We survey respondents at two time points—allowing examination of change within people in response to economic shocks.
- The small and highly targeted sample (n=293) is not generalisable to the broader population.
- Our observational study describes relationships but does not establish causality.

with significant economic and social repercussions. Australia, like many other countries, responded with social distancing measures including limiting time outside of the home, broad work-from-home rules, temporary or permanent shut down of businesses and closure of schools and childcare.¹ Measures in Australia and internationally effectively locked down households for long periods of time, with well-documented impacts on mental health across populations^{2 3} and broader health, social and economic implications.⁴⁻⁶ The most acute consequences have been felt by households who are vulnerable to both precarious employment (eg, casual employees with no leave entitlements or unemployed people) and housing (eg, people without formal leasing arrangements or living in highly unaffordable housing); that is, households prone to pre-existing double precarity.⁷⁻⁹

The relevance of housing and employment precarity for mental health is evident beyond the impacts of COVID-19 and is well established in extant literature. Access to adequate and secure housing serves a protective

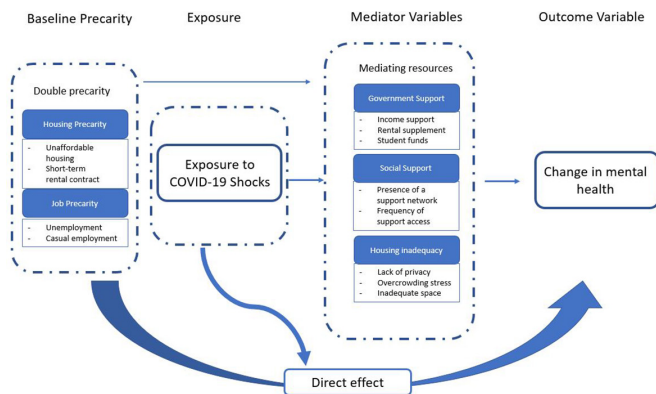


Figure 1 Conceptual framework.

function for mental health^{10–12} and poor-quality housing and insecure tenancies have a potentially negative impact on a person's health.^{13 14} Similarly, the impact of job loss and job insecurity on mental health outcomes has been well established (see, eg, references^{15 16}). Unemployment is both a consequence of, and risk factor for, reduced mental health.¹⁷ One particular cohort, occupants of share housing (where individuals are unrelated adults and not in a romantic relationship) are particularly likely to fit these demographics and be among the most vulnerable to being both precariously employed and housed during this time.¹ They are, therefore, potentially among the most exposed to financial hardship arising from restrictive public health measures put in place to reduce COVID-19 transmission in communities.

This paper analyses the effects of housing and employment precarity on mental health for this cohort, while investigating the mediating effects of access to social, income and housing resources. Using the experiences of share housing residents during the 115 days of lockdown in 2020 in Victoria Australia, we seek to examine how lockdown restrictions, under the duress of 'double precarity' common among share housing households, impacted mental health and how much support through social connections, sufficient government assistance or housing adequacy offered protection. We propose a conceptual framework (figure 1) for understanding the set of relationships under consideration before presenting findings from two surveys conducted in Victoria, Australia in 2020.

METHODS

Study cohort: members of share households

This study focuses on people living in share houses in Victoria, Australia. We define share houses as households occupied by two or more unrelated adults who are not in a romantic relationship. In Australia, share housing usually takes the form of individual arrangements between a landlord and a group of tenants; occupants may know each other before moving in together or may begin and remain as relative strangers living in informal arrangements. People living in shared housing are a group characterised by high levels of precarity. They are more likely to

be young, casually employed, living in informal arrangements and at risk of homelessness than the broader population.¹⁸ In Victoria, the median share household spends 23% of gross household income on housing costs, compared with 14% across all household types,¹⁹ 17% of temporary visa-holders in Australia were living in a share household at the 2016 census, compared with 4% of the broader population.²⁰ Share housing is often considered as either a transitional housing form on the way to adulthood or a 'coping mechanism' for vulnerable households when other forms of family or state support are unavailable²¹ or where occupants are unable to provide income and rental history documents.²² Recent evidence suggests that these groups are more likely to have lost their jobs or had hours reduced, more likely to be reliant on social welfare payments and more likely to have been born overseas than the general population.¹

Study context

This study was conducted in Victoria, the second most populous State in Australia. The study surveys, occurring in June and October of 2020, coincided with a time of considerable disruption to social, economic and health systems in Victoria. While the first positive case of the novel coronavirus was identified in Australia on 25 January 2020, the large-scale impacts of the pandemic were not substantially felt until mid-March 2020. On 30 March, the Australian Government introduced the 'Job Keeper Payment' that aimed to help employers keep their staff on pay roll and the 'Job Seeker Payment' that served as an emergency CoronaVirus Supplement to existing social welfare payments, immediately doubling the income of many unemployed people.²³ The State of Victoria declared a State of Disaster on 2 August 2020, resulting in a night-time curfew, a 5 km limit on distances residents could travel from their homes, restrictions of gatherings in public and private spaces, office and school closures and limitations on allowable time outside the house.²⁴ These restrictions, occurring in the context of a global health pandemic and large-scale economic crisis, present a case study in the impact of simultaneous imposition of housing and employment stress. Furthermore, the substantial government intervention in support payments offers the lens of a 'natural experiment' to examine their benefits in mediating the impacts of 'double precarity' and exposure to COVID-19.

Conceptual framework

Our conceptual framework is based on the following explanatory variables and mediator variables.

Explanatory variables: the double precarity of housing and employment insecurity and exposure to COVID-19 shocks

Despite the wealth of evidence on the impact of both employment and housing instability on mental health, these two forms of insecurity have largely been studied separately.²⁵ Similarly, evidence is still emerging about the 'shocks' experienced by individuals and households

impacted by COVID-19. This paper addresses this gap, focusing on the following:

- ▶ Housing precarity: defined as living with short-term rental contracts and/or unaffordable housing.
- ▶ Employment precarity: defined as casual employment contracts and unemployment.
- ▶ Double precarity: the combination of both housing and employment precarity
- ▶ Exposure to COVID-19 shocks: defined as job loss, living cost pressures and changing housing conditions throughout the lockdown period.

Mediator variables: resources of social support, government support and housing adequacy

Precarity in housing and employment triggered by pandemic containment measures is known to negatively impact mental health. Importantly, several factors mediate the impact of precariousness on mental health, including social support, government support and access to adequate housing.

- ▶ Social support: defined as the presence of social ties and frequency of access to emotional and pragmatic support. Social support is often associated with improved mental and physical health, especially as a resource that buffers the harmful impacts of stress exposure.^{26 27} For example, social support has been shown to mitigate financial hardship via monetary transfers and interpersonal loans in some cases.²⁸
- ▶ Government support: while research has documented the ability of government-provided payments to build the resilience of poor and vulnerable households to economic shocks,²⁹ the connection to mental health outcomes is more tenuous. Previous research suggests that social welfare payments need to provide sufficient economic provisions while also alleviating the stigma and psychological impacts associated with receiving benefits to have a protective effect on mental health.³⁰
- ▶ Housing adequacy: access to sufficient space and autonomy in a home is important for mental health as non-functioning or inadequate housing is associated with depressive mood.³¹ Overcrowding in homes can lead to cognitive overload from excess sensory stimuli, a lack of opportunities for retreat and feelings of being surveilled.³² Similarly, previous research has found associations between overcrowding and depression, withdrawal, aggression and psychological distress.³³ Living in share housing has been associated with depressive disorders and anxiety, especially for unemployed people.³⁴

Drawing on this literature from health, housing and economics, we hypothesise several channels through which precarity and access to mediating resources impact on each other and on mental health, as illustrated in [figure 1](#).

Survey design and data collection

Data were collected through two waves of an online longitudinal survey, yielding 1052 valid responses in June and

293 valid responses in October. The purpose of a longitudinal design was to test changes in mental health over time, in a period characterised by high levels of COVID-19 shock for many. The survey was open to anyone who had lived in a share household in Victoria at any point between June 2020 and October 2020 and screening questions were used to exclude those who did not meet these criteria. The first page of the online survey contained an informed consent statement and participants acknowledged consent by clicking ‘start’ on the survey. The survey instrument was designed using a variety of standardised demographic, housing, health and financial resilience questions derived from large Australian surveys such as the Household, Income, Labour Dynamics in Australia survey and the Australian Bureau of Statistics Census. See online appendix table A1 for the full survey.

Respondent recruitment occurred through multiple channels. For wave 1 of the surveys, most responses (n=670) were derived from an online survey panel service that targeted a representative selection of share housing respondents currently living in Victoria. The remaining responses (n=382) were targeted through targeted Facebook and Instagram advertisements, Twitter and Facebook messages posted by the University of Melbourne, Tenants Union of Victoria and Victorian Legal Aid and posts on Facebook groups aimed at international students and share houses across Victoria. Wave 2 resurveyed the original respondents, either via an anonymised process managed by the online panel company or through follow-up emails to wave 1 participants automated using the survey programme Qualtrics. In the empirical analysis, we only keep responses for people who appear in both survey waves, which allows us to have a panel of 293 individuals in two time periods. Respondents of the survey are not directly representative of occupants of share houses across all metrics. Compared with share household occupants across Australia, respondents are less likely to report year 12 as their highest level of education than (16% vs 39%), are more likely to be female (55% vs 45%) but are of similar age (median age 35). Despite the relatively high attrition rate, a comparison of means between the included and the excluded participants did not point to any statistically significant difference between the two waves, based on most observable characteristics.

Unlike cross-sectional surveys, this panel survey set-up enables the analysis of individual-level dynamics that are not biased by self-selection, by observing the same individuals repeatedly at two different times of the COVID-19 pandemic. Self-selection would arise due to potential unobservable confounders correlated with both outcomes (mental health) and explanatory variables (double precarity), such as lower motivation or worse work-performance.

Patient and public involvement

Neither patients nor the public were involved in the design, or conduct, or reporting or dissemination of our research. Survey respondents were emailed a copy

of research findings if they indicated a desire to receive findings when completing the survey.

Empirical strategy

To investigate the relationship between vulnerability, exposure to COVID-19 and mental health, we proceed in two steps.

We start by analysing the relationship between precarity and respondents' socioeconomic characteristics using the following regression setup:

$$Precarity_i = \alpha + \gamma X_i + \partial_c + \theta_s + u_i \quad (1)$$

We define double precarity ($Precarity_i$) as a two-dimensional index reflecting its interaction between employment and housing dimensions for respondent i . This is computed as the summary of the probability of the following conditions, and ranges between 0 and 2:

1. Probability of housing precarity: defined as living in unaffordable housing (paying more than 30% of income on housing costs) and/or renting with a lease of 6 months or shorter.
2. Probability of employment precarity: defined as being casually employed or unemployed.

X_i includes a vector of individual characteristics including gender, age, being low income (weekly income lower than AUD\$650), having low education (having completed year 12 or below), being a migrant (namely a temporary visa holder or refugee); ∂_c represents country of birth fixed effects and θ_s denotes sector of employment fixed effects. Given that $Precarity_i$ is an ordinal variable, we estimate this regression's coefficients using an ordered logit model.

Next, we investigate the effect of $Precarity_i$, combined with exposure to COVID-19 shocks, to calculate whether either or both affected mental health. Exposure to COVID-19 shocks (COVID-19 shock _{i}) is measured by a respondent i 's reported impact of COVID-19 in the form of: (i) changing housing conditions (people moving in or out); (ii) decreased earnings; (iii) financial hardship (inability to cover housing and other living costs). We code COVID-19 shock _{i} as a dummy variable equal to one if an individual had experienced at least one of the above-mentioned shocks. Therefore, the coefficient of COVID-19 shock _{i} captures the effect of being exposed to COVID-19 shocks (relative to not having experienced any).

We investigate the relationship between mental health, precarity and COVID-19 shocks, using the following regression:

$$Mental\ health\ worse_i = \alpha + \beta_1 Precarity_i + \beta_2 Covid\ shock_i + \gamma X_i + \partial_c + \theta_s + u_i \quad (2)$$

The dependent variable $Mental\ health\ worse_i$ is computed as the summary of the probability of a worsening in mental health in wave 1 and/or wave 2 of the survey. Our measure of mental health was self-reported. Respondents were asked in both waves of the survey 'Since COVID-19 isolation rules were introduced, would you say that your

mental health became: much better, better, did not change, worse, much worse'. We generated a dummy variable equal to 1 if respondents answered worse or much worse in each wave. Given that $Mental\ health\ worse_i$ is an ordinal variable, we estimate this regression's coefficients using an ordered logit model. Regressions (1) and (2) cannot establish a causal relationship between outcomes and explanatory variables, and should be interpreted as correlations.

Finally, to provide insights on plausible mediating factors that may mediate the negative relationship between precarity and health outcomes, we assess the role played by:

1. Sufficient government support ($Gov\ support_i$) targeted to mitigate negative COVID-19 effects, measured as respondents' self-evaluated sufficiency of support derived from accessing the packages offered by the government to assist financially those affected by COVID-19. Specifically, we assign a dummy variable equal to 1 for each respondent answering 'somewhat agree' or 'strongly agree' to the question 'The resources I have accessed in response to COVID-19 are sufficient to make a substantial difference to my financial security over the next 3 months'.
2. Social support ($Social\ support_i$), measured as the presence of community or family networks used as risk-coping mechanisms and their frequency of access during the pandemic, modified from.³⁵
3. Housing inadequacy ($Housing\ inadequacy_i$), computed as a multidimensional index drawing on perceptions of privacy, use of space and overcrowding, modified from Campagna.³⁶

We undertake a mediation analysis to examine the extent to which the association between precarity and a worsening in mental health occurs directly, and the extent to which it occurs through housing inadequacy and lack of social support.

Following VanderWeele,³⁷ we utilise the following regression setup:

$$E(M | Precarity_i = a, X_i = c) = \beta_0 + \beta_1 a + \beta_2' c \quad (3)$$

$$E(Mental\ health\ worse_i | Precarity_i = a, M = m, X_i = c) = \theta_0 + \theta_1 a + \theta_2 m + \theta_3' c$$

where M represents either $Social\ support_i$, $Gov\ support_i$, $Housing\ inadequacy_i$ or $COVID-19\ shock_i$, and X_i is a vector including the above-mentioned set of controls as well as an indicator of exposure to COVID-19 shocks (when M is not $COVID-19\ shock_i$).

This approach allows us to compute: (i) the natural direct effect (NDE), capturing how much precarity would affect mental health if we were to disable the relationship between precarity and the mediators; (ii) the natural indirect effect (NIE), which can be conceived as the effect on mental health of the mediator, keeping $Precarity_i$ fixed; (iii) the total effect (TE) representing the summary of

NIE and NDE, which can be defined as how much mental health would change overall for a change in precarity, accounting for the mediators' effect.

RESULTS

Our sample of members of group households predominantly comprised young people. The average age was 34 years with 55% being female, and one-fifth being temporary visa-holders. The majority (65%) experienced pre-existing housing precarity, 35.5% experienced pre-existing employment precarity and 28.5% experienced both—confirming that this cohort of group housing residents is precariously placed.

In terms of experience of 'COVID-19 shocks', three quarters reported a shock, and this decreased slightly by the second wave of data collection; 18.3% of group housing residents reported a worsening of their mental health with COVID-19, with this rising by 2 percentage points in wave 2.

38% of survey respondents indicated that they had received sufficient government supports to make a substantial difference to their financial security. This decreased in the second wave of the survey by 9.3%. Most people (65%) reported adequate social support, and this increased slightly over time. 31% of the respondents reported living in inadequate housing conditions. See online appendix table A2 for expanded summary statistics.

The odds of experiencing double precarity were strongly patterned by sociodemographic characteristics. Notably, residents of group housing who were temporary visa-holders in Australia reported three times greater odds of double precarity (3.2 95% CI 0.95 to 10.70) than those who were not temporary visa-holders. The odds of reporting worse mental health decreased with age (OR 0.97 95% CI 0.94 to 1.00) and were greater for low income earners (OR 7.42 95% CI 4.74 to 11.63). The results of the Brant test (reported in online appendix table A3) confirm that the proportional odds and parallel lines assumption of the ordered logit model predicting double precarity are met.

The results in [table 1](#) indicate that exposure to COVID-19 shocks was strongly correlated with worsening mental health, with residents exposed to COVID-19 shocks reporting a 2.7-fold higher odds of deteriorating mental health (OR 2.7, 95% CI 1.53 to 4.85) than those who did not experience COVID-19 shocks. Experiencing double precarity was also associated with 2.4 times higher odds of reporting worsening mental health (OR 2.4 95% CI 0.99 to 5.69) than those who did not experience double precarity. This relationship is largely driven by housing precarity (OR 2.4 95% CI 0.98 to 5.69) while employment precarity is not significantly related to reporting a deterioration in mental health.

When analysing the plausible channels underlying our results in [table 2](#), we find that precarity is positively associated with worsening mental health, as shown by the

Table 1 The relationship between mental health, precarity and COVID-19 exposure

	OR*	Lower CI	Upper CI	P value
COVID-19-related shocks (b)	2.732	1.538	4.850	0.001
Double precarity (a)	2.385	0.987	5.687	0.050
Housing precarity (a)	2.358	0.978	5.688	0.050
Employment precarity (a)	0.441	0.111	1.759	0.246

(a) Adjusted for age, sex, migrant status, education level, COVID-19 shock. (b) Adjusted for age, sex, migrant status, education level, double precarity.

*ORs of regression equation (2), calculated as $\exp(\beta)$. Full results are reported in online appendix table A4.

total causal effect (TCE) estimates. The NDE coefficients, capturing how much precarity would affect mental health if we were to nullify the relationship between precarity and the mediators, confirm that precarity has a direct effect on worsening mental health when testing for any mediator (columns I–IV). Turning to the NIE, we find that much of the precarity-mental health association is mediated by inadequate housing, access to government support and exposure to COVID-19 shocks, all of which affect the relationship significantly. Specifically, inadequate housing explains 14.7% of the TCE, and access to government support 7.8% of the TCE, thus reducing the effect of precarity on mental health, and COVID-19 shocks 27.78% of the TCE. Social support mitigates the negative relationship between precarity and mental health (has a negative sign), but the indirect effect is not statistically significant. Hence, these results indicate that housing inadequacy and exposure to COVID-19 shocks have a negative mediating effect on mental health, exacerbating the effect of precarity, while access to government support played a positive mediating role, thus weakening the effect of precarity on mental health.

DISCUSSION

There is a strong association between experiencing precarity, exposure to COVID-19 shocks and deterioration of mental health during COVID-19 lockdowns in 2020 for members of share households. Specifically, experiencing a COVID-19 shock, such as moving homes or changing household occupants, losing income or experiencing financial hardship, is associated with a 2.7-fold increase in the odds of deteriorating mental health. Similarly, experiencing double precarity is associated with 2.4 times higher odds of reporting worsening mental health, compared with those without this experience. Occupants of share housing are highly likely to have experienced pre-existing employment and housing precarity, as well as COVID-19-induced shocks.

Table 2 The effect of mediating factors and exposure to COVID-19 shocks on the relation between double precarity and mental health decline

	Inadequate housing	Social support	Government support	COVID-19 shock
Total causal effect	0.075** (0.027)	0.074** (0.027)	0.078*** (0.032)	0.090*** (0.029)
Natural direct effect	0.064** (0.027)	0.073*** (0.027)	0.084*** (0.027)	0.065** (0.316)
Natural indirect effect	0.011** (0.005)	-0.003 (0.003)	-0.006* (0.003)	0.025*** (0.089)
Estimated proportion of effect explained (%)	14.76	4.05	7.84	27.78

Notes: This table shows the total causal effect (TCE), natural direct effect (NDE) and natural indirect effect (NIE) of precarity on change in mental health with mediation through inadequate housing, social support, government support and exposure to COVID-19 shocks (n=586). *** p<0.01, ** p<0.05, * p<0.1

A novel contribution of this paper relates to our examination of the mediating impacts of housing adequacy, sufficient government support and social support. The finding that much of the precarity-mental health association is mediated by inadequate housing is significant. It correlates with existing findings that link overcrowding with depression and heightened stress levels³⁶ and longitudinal analysis that has found that changes in severe overcrowding and individual deprivation may reduce distress irrespective of other factors.³⁸ It also highlights the intersecting role of mental health and housing in the context of pandemic-induced stay-at-home rules. Particularly within share households, where occupant relationships range from close friendships to being strangers, access to adequate housing space and quality has a direct mental health impact. This has implications for public health policy that seeks to address both increased risk of viral spread in overcrowded housing and increased stress associated with an inability to experience privacy and retreat from others.

We find that accessing government support payments had a protective impact on mental health, but only if respondents indicated that this support was 'sufficient to make a substantial difference to my financial security over the next 3 months'. While 62.7% of respondents indicated that they had accessed some form of government assistance, only 38% indicated that it was sufficient to impact their financial security. This finding aligns with prior research that found that unreliable or insufficient welfare payments have little impact on mental health³⁰ while suggesting that substantial increases to unemployment welfare payments (JobSeeker) and the employee support payment (JobKeeper) had a significant impact on mental health for some. This finding is particularly important given the substantially higher rates of pre-existing precarity experienced by visa-holders, a group that was excluded from JobKeeper and JobSeeker payments. While research has often identified the protective impact of welfare payments on financial resilience following a disaster,^{39 40} this finding is a rare contribution

to the literature on the impact of welfare payments on mental health. In contrast, we find that social networks do mediate the relationship between precarity and mental health reduction, but not to a statistically significant degree. This may be partially explained by the reduced capacity for physical contact between social networks during lock-down conditions. It may also reflect the fact that those experiencing significant mental health decreases were more likely to reach out to their social support networks to access support.

Our study has several important strengths. It is one of the first studies to examine the mediating role of housing, government support and social conditions in ameliorating the negative mental health effects of a shock, such as COVID-19 lockdowns, on members of group households. These economically vulnerable cohorts characterised by less secure housing tenure are often under-represented in national surveys and overlooked in research. Our paper offers a custom-designed survey of this small and highly targeted sample at two time points. We have reduced the impact of self-selection bias by using multiple dissemination channels and commissioning an online panel with a broad audience of panel members. Our study has several important limitations that should be noted. First, due to its targeted nature, our sample size is small and is not representative of share housing occupants across Australia. Similarly, there was a high level of attrition between waves 1 and 2. This is partially a reflection of the cohort and time period. Higher stress levels, high mobility, a migration background, unemployment or poor health status are all attributes associated with higher likelihoods of attrition;^{41 42} all elements present in the current study. Similarly, we draw on self-reported mental health assessments rather than using a validated instrument. However, we have repeated measures for 293 respondents which allows us to examine change in economic circumstances and mental health over time. The timing of survey waves, at 5 months apart, is short and does not capture longer-term mental health impacts. This time frame was targeted to gather insights within

the context of rapidly changing pandemic conditions. Finally, while this study provides insights into correlations between various elements, it does not establish causal links.

This research advances our understanding of the relationship between mental health, COVID-19 shocks and the double precarity of housing and employment insecurity. It also highlights the intersecting mediating effects of housing adequacy, receipt of adequate government payments and social support. Given that COVID-19 lockdowns, with associated economic insecurity and increased time spent under stay-at-home rules, appear likely to be an on-going experience for many, it is essential that we understand how vulnerability and supporting resources interact with mental health. In this context, access to adequate and affordable housing are likely to become more constrained and more important than ever. Our analysis points to the importance of employment and housing security for mental health and also highlights the psychological impacts of overcrowded housing in the context of a pandemic. Future research should continue to track this vulnerable group, especially as mental health challenges and economic insecurity, particularly for visa-holders and young people, continues to be exacerbated by the pandemic.

Twitter Katrina Raynor @katrinaeve

Acknowledgements We acknowledge the Hallmark Research Initiative for Affordable Housing at the University of Melbourne for funding and supporting this project. We also thank the reviewers of this paper for their insightful feedback.

Contributors KR obtained grant funding for this project. KR, LP and RB were responsible for the design and concept of this project and KR provided oversight for the study. LP was responsible for the analysis of the study data and KR, LP and RB provided interpretation of data. All authors were responsible for the writing and revision of the manuscript. All authors are study guarantors. All authors reviewed and agreed the final manuscript. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Funding University of Melbourne, Hallmark Research Initiative for Affordable Housing (HRIA); Award/Grant number not applicable).

Competing interests All authors have completed the ICMJE uniform disclosure form at www.icmje.org/disclosure-of-interest/ and declare: support from the University of Melbourne's Hallmark Research Initiative for Affordable Housing; no other relationships or activities that could appear to have influenced the submitted work.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

Patient consent for publication Not required.

Ethics approval This study involves human participants. This research project has been approved by the Human Research Ethics Committee of The University of Melbourne. The Ethics ID Number is 2056957.1. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines,

terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Katrina Raynor <http://orcid.org/0000-0002-6926-0025>

Rebecca Bentley <http://orcid.org/0000-0003-3334-7353>

REFERENCES

- 1 Raynor K, Panza L. Tracking the impact of COVID-19 in Victoria, Australia: shocks, vulnerability and insurances among residents of share houses. *Cities* 2021;117:103332.
- 2 Mechili EA, Saliq A, Kamberi F, *et al*. Is the mental health of young students and their family members affected during the quarantine period? Evidence from the COVID-19 pandemic in Albania. *J Psychiatr Ment Health Nurs* 2021;28:317–25.
- 3 Boden M, Zimmerman L, Azevedo KJ, *et al*. Addressing the mental health impact of COVID-19 through population health. *Clin Psychol Rev* 2021;85:102006.
- 4 Brodeur A, Clark AE, Fleche S, *et al*. COVID-19, lockdowns and well-being: evidence from Google trends. *J Public Econ* 2021;193:104346.
- 5 Hoebel J, Grabka MM, Schröder C, *et al*. Socioeconomic position and SARS-CoV-2 infections: seroepidemiological findings from a German nationwide dynamic cohort. *J Epidemiol Community Health* 2022;76:350–3.
- 6 Cerbara L, Ciancimino G, Crescimbeni M, *et al*. A nation-wide survey on emotional and psychological impacts of COVID-19 social distancing. *Eur Rev Med Pharmacol Sci* 2020;24:7155–63.
- 7 Kikuchi S, Kitao S, Mikoshiba M. Who suffers from the COVID-19 shocks? Labor market heterogeneity and welfare consequences in Japan. *COVID Econ Vetted Real Time Pap* 2020;40:77–114.
- 8 Ferreira RJ, Buttell F, Cannon C. COVID-19: immediate predictors of individual resilience. *Sustainability* 2020;12:6495.
- 9 Bernardini F, Attademo L, Rotter M, *et al*. Social determinants of mental health as mediators and Moderators of the mental health impacts of the COVID-19 pandemic. *Psychiatr Serv* 2021;72:598–601.
- 10 Bentley R, Baker E, Mason K. Cumulative exposure to poor housing affordability and its association with mental health in men and women. *J Epidemiol Community Health* 2012;66:761–6.
- 11 Curl A, Kearns A, Mason P, *et al*. Physical and mental health outcomes following housing improvements: evidence from the GoWell study. *J Epidemiol Community Health* 2015;69:12–19.
- 12 Thomson H, Thomas S. Developing empirically supported theories of change for housing investment and health. *Soc Sci Med* 2015;124:205–14.
- 13 Barnes M, Cullinane C, Scott S. *People living in bad housing: numbers and health impacts*. London, United Kingdom: NatCen Social Research, 2013. https://england.shelter.org.uk/professional_resources/policy_and_research/policy_library/people_living_in_bad_housing_-_numbers_and_health_impacts
- 14 Gibson M, Petticrew M, Bamba C, *et al*. Housing and health inequalities: a synthesis of systematic reviews of interventions aimed at different pathways linking housing and health. *Health Place* 2011;17:175–84.
- 15 Benach J, Vives A, Amable M, *et al*. Precarious employment: understanding an emerging social determinant of health. *Annu Rev Public Health* 2014;35:229–53.
- 16 De Witte H, Pienaar J, De Cuyper N. Review of 30 years of longitudinal studies on the association between job insecurity and health and well-being: is there causal evidence?: review of longitudinal studies on job insecurity. *Aust Psychol* 2016;51:18–31.
- 17 Olesen SC, Butterworth P, Leach LS, *et al*. Mental health affects future employment as job loss affects mental health: findings from a longitudinal population study. *BMC Psychiatry* 2013;13:144.
- 18 Australian Institute of Health and Welfare. Housing affordability. *Hous Affordabil* 2019 <https://www.aihw.gov.au/reports/australias-welfare/housing-affordability>
- 19 Australian Bureau of Statistics. Housing occupancy and costs, Australia, 2017–18. ABS 2019 <https://www.abs.gov.au/statistics/>



- people/housing/housing-occupancy-and-costs/latest-release#data-download
- 20 Australian Bureau of Statistics. *TableBuilder - Australian Bureau of statistics*. Canberra: ABS, 2016. <https://www.abs.gov.au/websitedbs/censushome.nsf/home/tablebuilder>
 - 21 Arundel R, Ronald R. Parental co-residence, shared living and emerging adulthood in Europe: semi-dependent housing across welfare regime and housing system contexts. *J Youth Stud* 2016;19:885–905.
 - 22 Nasreen Z, Kristian J R. Shared room housing and home: unpacking the Home-making practices of shared room Tenants in Sydney, Australia. *Hous Theory Soc* 2020:1–21.
 - 23 Woods J. Timeline of key social & economic COVID-19 events affecting Australia. BRI Ferrier News, 2020. Available: http://briferrier.com.au/news/timeline-of-key-social-economic-covid-19-events-affecting-australia?utm_source=Mondaq&utm_medium=syndication&utm_campaign=LinkedIn-integration [Accessed 15 Jun 2020].
 - 24 Murray-Atfield Y. Victoria has enacted a state of disaster to enforce coronavirus restrictions. Here's what that means. ABC News 2020 <https://www.abc.net.au/news/2020-08-02/victoria-coronavirus-state-of-disaster-explained/12516570>
 - 25 Bentley R, Baker E, Aitken Z. The 'double precarity' of employment insecurity and unaffordable housing and its impact on mental health. *Soc Sci Med* 2019;225:9–16.
 - 26 Ertel KA, Glymour MM, Berkman LF. Social networks and health: a life course perspective integrating observational and experimental evidence. *J Soc Pers Relat* 2009;26:73–92.
 - 27 Thoits PA. Mechanisms linking social ties and support to physical and mental health. *J Health Soc Behav* 2011;52:145–61.
 - 28 Lucas R, Stark O. Motivations to remit: evidence from Botswana. *J Polit Econ* 1985;93:901–18 www.jstor.org/stable/1833062
 - 29 Bowen T, del Ninno C, Andrews C. Adaptive social protection: building resilience to shocks. *The World Bank* 2020.
 - 30 Rodriguez E, Frongillo EA, Chandra P. Do social programmes contribute to mental well-being? the long-term impact of unemployment on depression in the United States. *Int J Epidemiol* 2001;30:163–70.
 - 31 Rautio N, Filatova S, Lehtiniemi H, *et al*. Living environment and its relationship to depressive mood: a systematic review. *Int J Soc Psychiatry* 2018;64:92–103.
 - 32 Hartig T, Johansson G, Kylin C. Residence in the social ecology of stress and restoration: stress and restoration. *J Soc Issues* 2003;59:611–36.
 - 33 Mangrio E, Zdravkovic S. Crowded living and its association with mental ill-health among recently-arrived migrants in Sweden: a quantitative study. *BMC Res Notes* 2018;11:609.
 - 34 Joutsenniemi K, Martelin T, Martikainen P, *et al*. Living arrangements and mental health in Finland. *J Epidemiol Community Health* 2006;60:468–75.
 - 35 Stewart A, Ware J. *Measuring functioning and well-being: the medical outcomes study approach*. Duke University Press, 1992.
 - 36 Campagna G. Linking crowding, housing inadequacy, and perceived housing stress. *J Environ Psychol* 2016;45:252–66.
 - 37 VanderWeele TJ. *Explanation in causal inference: methods for mediation and interaction*. New York: Oxford University Press, 2015.
 - 38 Pierse N, Carter K, Bierre S, *et al*. Examining the role of tenure, household crowding and housing affordability on psychological distress, using longitudinal data. *J Epidemiol Community Health* 2016;70:961–6.
 - 39 Hallegatte S, Vogt-Schilb A, Bangalore M. *Unbreakable: building the resilience of the poor in the face of natural disasters*. Washington, DC, USA: World Bank Group, 2017.
 - 40 Martorano B. *The Australian household stimulus package*. Florence: UNICEF Research Office, 2013.
 - 41 Rothenbühler M, Voorpostel M. Attrition in the swiss household panel: are vulnerable groups more affected than others? In: Oris M, Roberts C, Joye D, *et al*, eds. *Surveying human vulnerabilities across the life course*. Cham: Springer International Publishing, 2016: 223–44.
 - 42 RübSamen N, Akmatov MK, Castell S, *et al*. Factors associated with attrition in a longitudinal online study: results from the HaBIDS panel. *BMC Med Res Methodol* 2017;17:132.