

https://dspace.org/

Household size and depressive symptoms during the COVIDF19 pandemic A gendered analysis

Umakrishnan Kollamparambil; Adeola Oyenubi

ROUTLEDGE JOURNALS, TAYLOR & FRANCIS LTD
https://hdl.handle.net/10539/46937
WOS

Downloaded from a DSpace repository. https://dspace.org/



Development Southern Africa

ISSN: 0376-835X (Print) 1470-3637 (Online) Journal homepage: www.tandfonline.com/journals/cdsa20

Household size and depressive symptoms during the COVID-19 pandemic: A gendered analysis

Umakrishnan Kollamparambil & Adeola Oyenubi

To cite this article: Umakrishnan Kollamparambil & Adeola Oyenubi (2025) Household size and depressive symptoms during the COVID-19 pandemic: A gendered analysis, Development Southern Africa, 42:1, 19-35, DOI: 10.1080/0376835X.2024.2408651

To link to this article: https://doi.org/10.1080/0376835X.2024.2408651

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

Published online: 14 Oct 2024.

Submit your article to this journal

Article views: 529

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=cdsa20

DEVELOPMENT SOUTHERN AFRICA
2025, VOL. 42, NO. 1, 19–35
https://doi.org/10.1080/0376835X.2024.2408651

Routledge
Taylor & Francis Group

OPEN ACCESS Check for updates

Household size and depressive symptoms during the COVID-19 pandemic: A gendered analysis

Umakrishnan Kollamparambil and Adeola Oyenubi

School of Economics and Finance, University of Witwatersrand, Johannesburg, South Africa

ABSTRACT

The study explores the nature of the relationship between household size and depressive symptoms under COVID-19 strict lockdown conditions, when a surge in large-size households observed in South Africa. The study used nationally representative data to implement covariate balancing propensity scores within a multivalued treatment framework (by varying household size) to control for observables. While the study found that both solo living and large-sized households are positively associated with depressive symptoms for males, the depressive symptoms for females are not found to be strongly associated with household size. Further, the analysis indicates that the higher average depressive symptoms observed for males compared to females under the COVID-19 pandemic are largely driven by males in large-size households. The gendered effect points to the different roles that men and women continue to play within the household. The need for policy interventions to consider living arrangements is highlighted through this study.

ARTICLE HISTORY
Received 27 February 2023
Accepted 10 September 2024

KEYWORDS
Mental health; depressive symptoms; household size; solo living; COVID-19; multivalued treatment regression

1. Introduction

The adverse effect of the COVID-19 pandemic on mental wellbeing is well-documented with evidence emerging across various countries on a surge in anxiety (Lakhan et al., 2020; Roy et al., 2020), elevated depressive symptoms (Oyenubi & Kollamparambil, 2020; Chen et al., 2021), and an increase in suicide ideation (Gunnell et al., 2020; Banerjee et al., 2021). The literature has identified various drivers of the elevated mental distress observed during the pandemic year,s including perceived health-related risks (Oyenubi et al., 2022), financial distress caused by job losses (McDowell et al., 2021; Posel et al., 2021) and income loss (Ruengorn et al., 2021; Oyenubi & Kollamparambil, 2022), as well as social isolation and loneliness (Killgore et al., 2020; Lee et al., 2020) brought about by the COVID-19 restrictions and self-isolation. A study of the relationship between household size and mental health during COVID-19 restrictions is therefore pertinent.

Prior to the COVID-19 pandemic, larger household sizes were associated with protection against loneliness (Luhmann & Hawkley, 2016; Hawkley et al., 2019), with those

CONTACT Umakrishnan Kollamparambil uma.kollamparambil@wits.ac.za

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (http://creativecommons.org/licenses/by-nc-nd/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

living alone found to be at higher risk of mental distress (Posel, 2021). The relationship between living arrangements and loneliness is expected to have strengthened under strict COVID lockdown conditions that inhibited social interaction outside of the household. The literature has linked predictors of loneliness during the pandemic with measures such as household size (cardinal variable) (Groarke et al., 2020; Towner et al., 2022) and living alone (dichotomous variable) (Bu et al., 2020b; Atzendorf & Gruber, 2022). On the other hand, too many members living in a household is likely to increase overcrowding and also enhance the risk perception of contracting COVID since individuals were restricted from being outdoors. We therefore expect a non-linear relationship between household size and depressive symptoms under strict lockdown conditions.

The findings from studies in a COVID context are, however, mixed. Some studies undertaken on the effects of the COVID-19 pandemic have identified significant negative association between household size and loneliness (Groarke et al., 2020; Towner et al., 2022), others have not identified any protective effect (Polenick et al., 2021). The evidence is similarly mixed amongst studies considering those living alone. While some studies (Noh et al., 2017; Bu et al., 2020b; Atzendorf & Gruber, 2022) find that those living alone had a higher risk of increased loneliness, other studies did not find living alone to be a significant predictor of loneliness (Okabe-Miyamoto et al., 2021; Rumas et al., 2021). The mixed evidence points to a need to reflect deeper on the relationship between living arrangements and mental wellbeing during the COVID-19 pandemic.

This study explores the nonlinear relationship between household size and mental wellbeing in the context of the COVID-19 pandemic in South Africa. The study draws on the pre-COVID-19 literature on loneliness and household size where evidence has been presented on the U-shaped relationship of these variables amongst the elderly population (Sunwoo, 2020; Dahlberg et al., 2022). The argument for the U-shaped relationship (in the context of COVID) relates to the protective effect of larger households against loneliness, versus the enhanced risk that larger households pose in terms of COVID-19 infection as well as overcrowding (Palisi, 1984; Ruiz-Tagle & Urria, 2022). It can be argued that these opposing factors are likely to result in a quadratic relationship between household size and mental wellbeing in the pandemic setting.

Although this study is framed within the context of the COVID-19 lockdown, the need to better understand the relationship between household size and mental health transcends the period of the pandemic. While Posel (2021) initiated the attempt by establishing a positive association between single-member households and mental distress in the pre-pandemic South African context, the study largely misses the argument that overcrowding can also be associated with depressive symptoms. The issue of large-size households was pertinent even prior to the pandemic (Khumalo, 2021), but the proportion of such households drastically increased during the pandemic, along with a decline in the single member households. The pandemic thus offered an appropriate context to study the effects of overcrowded households on the mental health of its members.

2. Context

South Africa offers a good context to study the non-linear effect of household size due to the existence of large proportions of both large-sized households as well as single member households. The estimation from wave 5 of NIDS and wave 1 of

NIDS-CRAM shows that the percentage of households with six or more members increased from 20.8% in 2016 to 41.35% in 2020. The commensurate decline in single member households over the same period was from 21.8% to 6%. While this calculation does not adjust for multiple counts of members from the same household in NIDS-CRAM, the evidence from Posel and Casale (2021), who showed that working age men (who constitute the large proportion of solo member households) are more likely to move residence at the on-set of the pandemic, supports our assertion. The increase in the proportion of larger-size households during the pandemic can been seen as an expected survival strategy under the increased job loss and financial distress experienced during COVID19 lockdown (Posel et al 2021), when those without economic means join the household with income earners or recipients of social grants recipients (Klasen & Woolard, 2009). This study therefore highlights the mental health challenges that can arise from such living arrangements and flags the need for social policy to consider housing and income grants as protection from overcrowded households.

While the substantial proportion of single member households observed prior to the pandemic is considered unusual for an African country (Ortiz-Ospina, 2019), it can be explained as the remnants of the apartheid system which restricted the movement of African populations from rural to urban areas except for the purpose of employment (Kollamparambil, 2017). Post democracy in 1994, labour migration without accompanying family members has continued due to the precarious nature of employment and the high cost of urban housing (Posel, 2021). Along with single member households, South Africa also has high prevalence of traditional multigenerational households (Russell, 2003; Amoateng et al., 2007; Posel & Hall, 2021). Multigenerational living arrangements have continued as a survival strategy in a context of high levels of poverty and unemployment, with family members gathering around recipients of state transfers, especially old age pension recipients (Klasen & Woolard, 2009). The South African context is therefore ideal to explore the non-linear effects of household size on mental wellbeing.

The literature notes that women reported higher mental distress than men in the pre-pandemic era (Burger et al., 2017). However, few gendered analyses of the relationship between household size and mental wellbeing have been undertaken. Despite increasing labour force participation of women, the roles of men and women within the family continue to be largely shaped by gender norms. Men are perceived as breadwinners and women the caregivers within the household. This shows the need for a gendered analysis of the relationship between household size and mental health.

A gendered analysis of this relationship under the COVID-19 lockdown restrictions is even more pertinent, considering the increase in depressive symptoms during the pandemic. Notably males were recorded as experiencing a significantly higher increase in mental distress than females during this period (Oyenubi & Kollamparambil, 2020). The differences in gender role identities are likely to result in varied outcomes of pandemic-related confinement for men and women. The incorporation of a gendered analysis therefore is an important contribution of this study.

Further, South Africa offers a context where strict restrictions were imposed that confined individuals to their residence for prolonged periods of time under the COVID19 pandemic. After the first case of COVID19 was reported in South Africa in March 2020, the government instated the strictest COVID alert level (5) during the period of 27 March–20 April 2020. People were confined to their residence during the

period except for essential services. The alert level of the lockdown was brought down to level 4 with all confined to place of residence but with a larger list of exempted industries. A further easing of restrictions was seen under alert level 3 but the restrictions on inter-provincial movement, gathering, use of public transport, and night curfew continued under this period. Subsequently, there was considerable lowering of restriction under alert levels 2 and 1, with only brief period of alert levels 3 and 4 in between (Government of South Africa, 2020).

3. Methods

3.1. Data

Data is sourced from Wave 2 of the National Income Dynamics Study – Coronavirus Rapid Mobile (NIDS-CRAM) Survey, conducted in 2020. NIDS-CRAM is a nationally representative sample of adults interviewed in the fifth wave of the National Income Dynamics Study (NIDS)[1] (conducted in 2017) and then re-interviewed during the Coronavirus pandemic (2020–2021). The sample consists of randomly selected adult respondents from Wave 5 of NIDS. For our analysis we used the survey weights supplied by NIDS-CRAM.

The NIDS-CRAM survey included five survey waves that were conducted between May 2020 and May 2021. Wave 2 was chosen because it represents the time period when the relevant data on depressive symptoms was collected and when the lockdown level was highest. Data for our outcome variable of depressive symptoms was only collected in waves 2, 3, and 5. Lockdown restrictions were at level 3 in wave 2, level 1 in wave 3 and levels 1 and 2 in wave 5.[2]

The outcome variable that captures depressive symptoms was collected in NIDS-CRAM with the 2-question version of the Patient Health Questionnaire (PHQ-2).[3] The two questions administered to derive the PHQ-2 variable are: 'Over the last 2 weeks, have you had little interest or pleasure in doing things?' and 'Over the last 2 weeks, have you been feeling down, depressed or hopeless'. Response options for both questions were 'not at all' 0, 'several days' 1, 'more than half the days' 2 or 'nearly every day' 3. Responses are coded from 0 to 3. The sum of the responses yields the PHQ-2 scale with a range of 0–6, with increasing values indicating higher levels of depressive symptoms. We model the outcome in two ways: firstly, as a continuum of distress (Tomita & Burns, 2013; Burger et al., 2017; Posel et al., 2021) and, secondly, as a dummy variable that is equal to 1 when PHQ-2 $\geq$ 2 and zero otherwise (Manea et al., 2016).

The main independent variable is household size, and we model household size as a multivalued variable with four categories; living alone (households of size 1), household size of 2 or 3, household size of 4 or 5, and household size of 6 or more. Other covariates

[1]NIDS is a longitudinal Nationally representative survey of South African population conducted five times between 2008 and 2017.

[2]Wittenberg and Branson (2021) show that NIDS-CRAM include cases where multiple individuals are interviewed from the same household. This may be a problem if individuals from the same household report different household sizes, however we deem this to be unlikely. The other issue is analysing multiple individuals from the same household, however this is not a problem that could significantly bias our results since the outcome is subjective and measured at individual level.

[3]PHQ-2 is the abbreviated version of the widely used PHQ-9 (Kroenke et al., 2003). It has been validated as a reliable screening method for depressive symptoms in South Africa (Baron et al., 2017).

Table 1. Summary statistics by household size (full sample).

	1	2 or 3	4 or 5	6 or more
Outcome variables: Mental health				
Depressive symptoms (0–6)[#]	1.411	1.18	1.232	1.213
Screen positive for depressive symptoms (0–1)	0.397	0.339	0.345	0.345
Personal characteristics				
Age[#]	39.437	44.029	40.616	40.147
Male	0.669	0.37	0.367	0.309
African	0.844	0.773	0.851	0.92
Living with partner	0.04	0.407	0.433	0.304
Education years[#]	11.53	11.171	10.877	10.046
Unemployed	0.397	0.54	0.565	0.663
Government grant	0.268	0.368	0.396	0.483
Household characteristics				
Experienced hunger	0.195	0.141	0.165	0.217
Income decreased	0.232	0.193	0.208	0.131
Income increased	0.093	0.246	0.276	0.403
Income unchanged	0.675	0.561	0.515	0.467
Location				
Traditional rural	0.228	0.261	0.361	0.537
Informal	0.063	0.045	0.036	0.023
Township	0.43	0.376	0.36	0.276
Formal	0.278	0.318	0.243	0.165
Housing				
House flat	0.755	0.74	0.783	0.744
traditional mud hut	0.063	0.08	0.104	0.192
Informal shack	0.156	0.141	0.094	0.046
Other	0.026	0.038	0.018	0.018
COVID attitudes and behavior				
Risk perception	0.447	0.408	0.454	0.408
Efficacy	0.881	0.827	0.835	0.836
Preventative response[#]	2.66	2.56	2.6	2.56
Number of obs	302	1044	1484	1899

Note characteristics with [#] are averages while the rest are percentage points.

included in the analysis represent demographic and socio-economic characteristics of the household as well as attitudes and behaviour of the respondent concerning the COVID-19 pandemic. Age is included also as a quadratic term informed by the extensive literature on the non-linear relationship of age with depressive symptoms and mental well-being (Newmann et al., 1990; Kessler et al., 1992). The profile that emerges of households with six or more members is that these households typically have a higher proportion of female, African, unemployed, less educated respondents that live in rural areas and are dependent on government social grants (Table 1). Residents of single member households on the other hand are typically male, employed, less dependent on social grants, and located in urban townships. The proportion of household members that screened positive for depressive symptoms is higher amongst single member households.

3.2. Estimation

The differences in the observed profiles of households by size point to the need to control for selection bias when estimating the relationship between household size and mental health. We therefore control for selection on observables using Covariate Balancing Propensity Scores (CBPS) (Imai and Ratkovic, 2014). This is important because there can be observable differences for individuals in different-sized households. The CBPS approach

is an improvement on the popular Propensity Score Method (PSM) as it has been shown to improve efficiency of the treatment effect estimate estimated under the conditional independence assumption.[4] Further, under PSM the researcher has to try a number of propensity score specifications to arrive at one that balances the distribution of covariates across treatment arms. This process is not always guaranteed to yield acceptable levels of balance in the covariates (Oyenubi, 2020). The CBPS sets up covariate balance as an optimisation problem. Specifically, CBPS can be interpreted as optimising the likelihood function (for a logit model) with the constraint that balance is achieved across treatment arms for each covariate. The CBPS approach outputs a set of weights that achieves this balance, these weights are then used in a weighted regression to estimate the relationship of interest. In theory, propensity score has two purposes which are to determine treatment assignment and to calculate weights that balance the distribution of covariates. However, PSM as conventionally applied focuses on treatment assignment and the issue of balance is addressed by manually tweaking the PSM specification until the one that balances the distribution of covariates is found. By combining covariate balancing condition as well as the first order conditions from the propensity score likelihood function, CBPS achieves the dual purpose in one estimation framework.

The multivalued treatment approach used in this study to control for selection on observables is similar to the popular binary treatment approach. However, it allows for more than two levels of treatment. In our case, households are in four categories, as mentioned. The CBPS therefore estimates weights that balance the distribution of covariates in other categories (household size of 2 or 3, household size of 4 or 5, and household size of 6 or more) with the distribution of covariates in the base category (living alone). The weights therefore equalise the distribution of covariates with respect to the base category. Our parameters then reveal the difference between depressive symptoms (net of the influence of other observed covariates) in the different household categorizations, relative to living alone.

We present results for males and females separately, following the literature that has identified the gendered effect of household size on mental health. All results presented include both the survey weights and the CBPS weights (Lenis et al., 2019).

4. Results

4.1. Descriptive analysis

Table 2 disaggregates the summary statistics shown in Table 1 by the gender of the respondent to explore possible gender differences. There is a difference related to gender in the distribution of outcome variables across household size. While both sexes have high levels of depressive symptoms in the single member household category, there are significant differences by sex in other household size categories. Depressive symptoms (and incidence) are more or less stable across various household sizes (except single member households) for women, with the largest household size category showing the marginally lowest level of depressive symptoms (Table 2). There is significant variation in male depressive symptoms (and incidence) across household sizes,

[4]Even though our result can be interpreted as a causal effect under the conditional independence assumption, we recognize the limits of the CBPS approach, whereby the results may be influenced by unobserved factors not controlled for in the estimation.

Table 2. Summary statistics by household size and gender.

	Female				Male			
	1	2 or 3	4 or 5	6 or more	1	2 or 3	4 or 5	6 or more
Outcome variables: Mental health								
Depressive symptoms (0–6)#	1.43	1.216	1.276	1.178	1.401	1.119	1.158	1.291
Screen positive for depressive symptoms (0–1)	0.39	0.35	0.353	0.333	0.401	0.321	0.331	0.373
Personal characteristics								
Age#	44.64	44.842	41.351	40.522	36.861	42.642	39.346	39.31
African	0.7	0.775	0.877	0.925	0.916	0.769	0.807	0.908
With partner	0.04	0.35	0.371	0.266	0.04	0.505	0.539	0.388
Education#	11.85	10.967	10.664	10.046	11.3	11.5	11.2	10
Unemployed	0.48	0.568	0.634	0.708	0.356	0.492	0.445	0.562
Government grant	0.36	0.439	0.468	0.548	0.223	0.246	0.27	0.337
Household characteristics								
Experienced hunger	0.18	0.14	0.177	0.233	0.203	0.142	0.145	0.182
Income decreased	0.24	0.172	0.191	0.114	0.228	0.228	0.237	0.167
Income increased	0.13	0.284	0.319	0.449	0.074	0.181	0.202	0.3
Income unchanged	0.63	0.544	0.489	0.437	0.698	0.591	0.561	0.533
Location								
Traditional rural	0.17	0.287	0.371	0.547	0.257	0.215	0.344	0.513
Informal	0.08	0.046	0.034	0.022	0.054	0.044	0.039	0.024
Township	0.37	0.359	0.359	0.27	0.46	0.407	0.362	0.29
Formal	0.38	0.309	0.236	0.161	0.228	0.334	0.256	0.174
Housing								
House/Flat	0.76	0.74	0.764	0.738	0.752	0.741	0.816	0.758
traditional mud hut	0.06	0.087	0.113	0.198	0.064	0.07	0.09	0.177
informal shack	0.15	0.138	0.102	0.046	0.158	0.145	0.081	0.046
Other	0.03	0.035	0.021	0.018	0.025	0.044	0.013	0.019
COVID attitudes and behaviour								
Risk of Infection	0.42	0.407	0.423	0.419	0.46	0.409	0.506	0.383
Efficacy	0.85	0.827	0.83	0.841	0.896	0.826	0.844	0.823
Preventative behaviour#	2.85	2.635	2.61	2.587	2.574	2.456	2.585	2.503
Number of obs	100	658	940	1312	202	386	544	587

Note characteristics with # are averages while the rest are percentage points.

with mid-sized households having significantly lower average levels of depressive symptoms compared to single member households and households with six or more members (Table 3).

Women are also more likely to be unemployed and dependent on social grants than men, across all categories of household sizes. The finding on grants is expected as child support grants are received overwhelmingly by women caregivers.

4.2. Multivalued treatment results

Before presenting the results of multivalued treatment, Figures 1–3 present the balance statistics for the full sample, female sample, and male sample, respectively. The figures show that CBPS is successful in reducing imbalance across the categories of the independent variable (household size). Specifically, the standardised difference in means after applying the balancing weights (unshaded dots) are all below the recommended 0.1 or 0.2 cut-off (Austin, 2009; Stuart et al., 2013), while this is not the case without the balancing weights (shaded dots).

Figures 4–6 present the results of the multivalued treatment in graphical form (see the Appendix for the full regression results in Tables A1–A3). As noted, we present the result

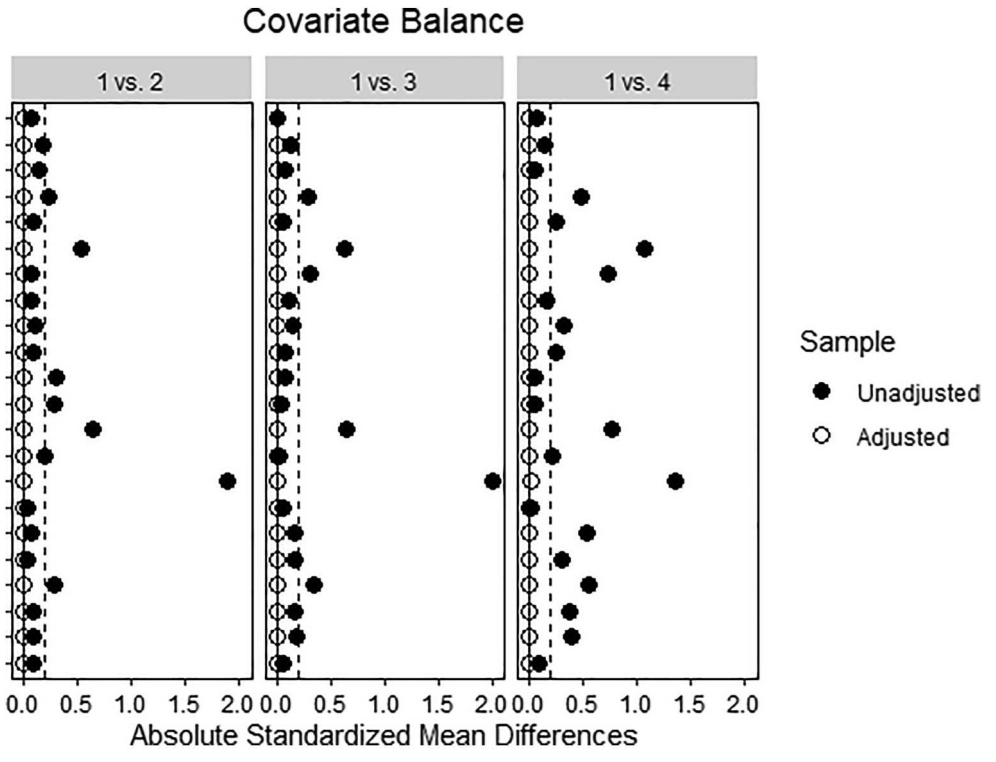


Figure 1. Standardised difference in means (Full sample).

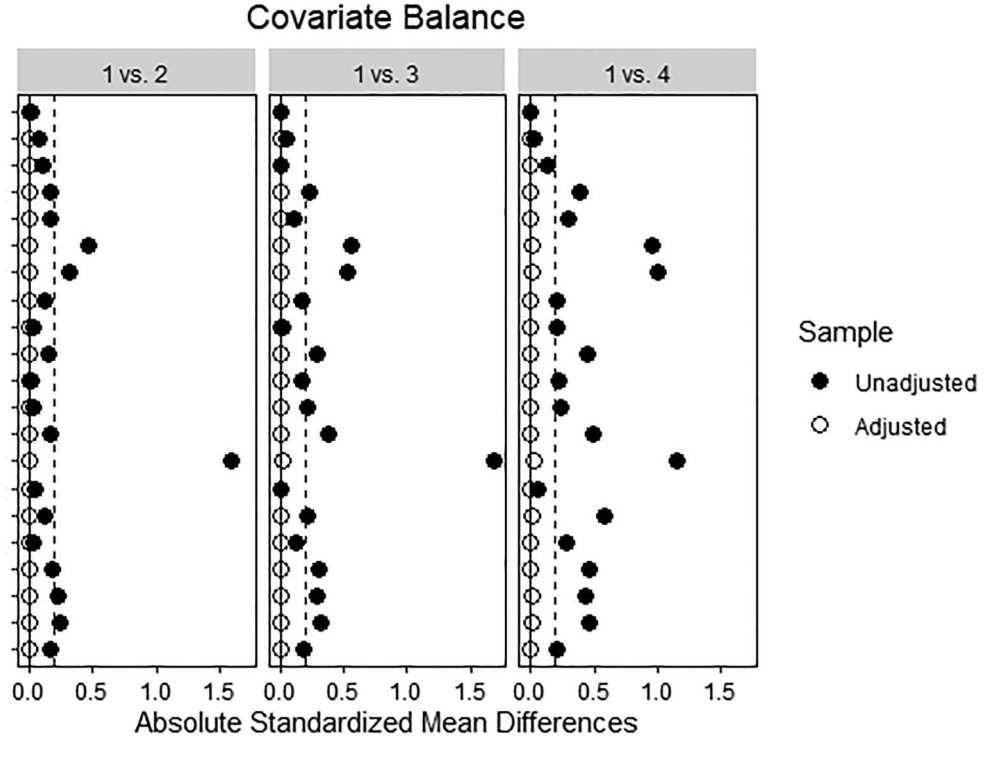


Figure 2. Standardised difference in means (Female).

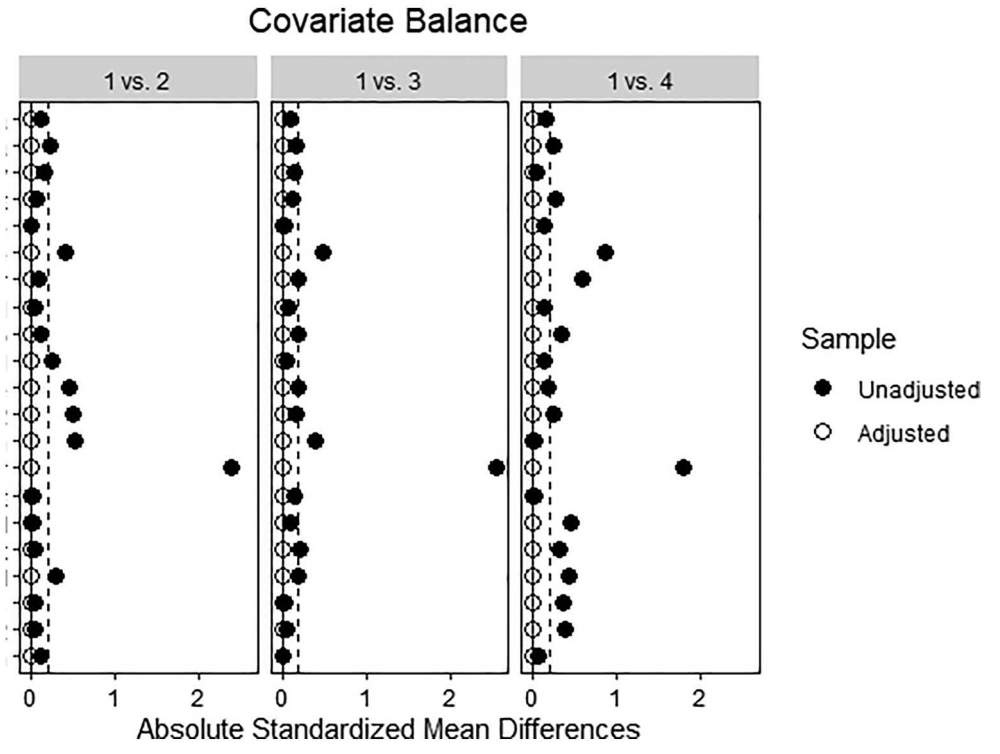


Figure 3. Standardised difference in means (Male).

modelling PHQ2 as a dichotomous and continuous variable for the full sample, female sample and male sample. The general pattern, as shown in Figure 4 (full sample) indicates the protection offered by mid-sized households. To see this, note that the reference category (living alone) is represented by the horizontal line at zero. On average the report of depressive symptoms is generally below the reference category for those who live in a '2 or 3' and '4 or 5' person household for both PHQ2 scale and PHQ2 dummy variable measures. The '4 or 5' person household relationship is statistically significant for PHQ2 scale, while both the mid-sized households (with '2 or 3' and '4 or 5' members) are significantly lower for the PHQ2 dummy variable measure of mental distress. For individuals who live in households with size '6 and more' the average depressive symptoms are above the reference category even though the relationship is not statistically significant. This indicates that the extent (and incidence) of depressive symptoms of respondents in large-sized households are comparable to those of single-member households.

As shown in Figure 5, the values are not statistically different for the female sample to suggest that depressive symptoms vary by household size for both the PHQ2 scale and the PHQ2 dummy measures.

Results for the male sample (Figure 6) are distinctly different from those for the female sample, with the large-size households having higher depressive symptoms for males using both the PHQ2 scale and incidence measures. The mid-size households, especially those with 4–5 members, have significantly lower average scores for both measures of

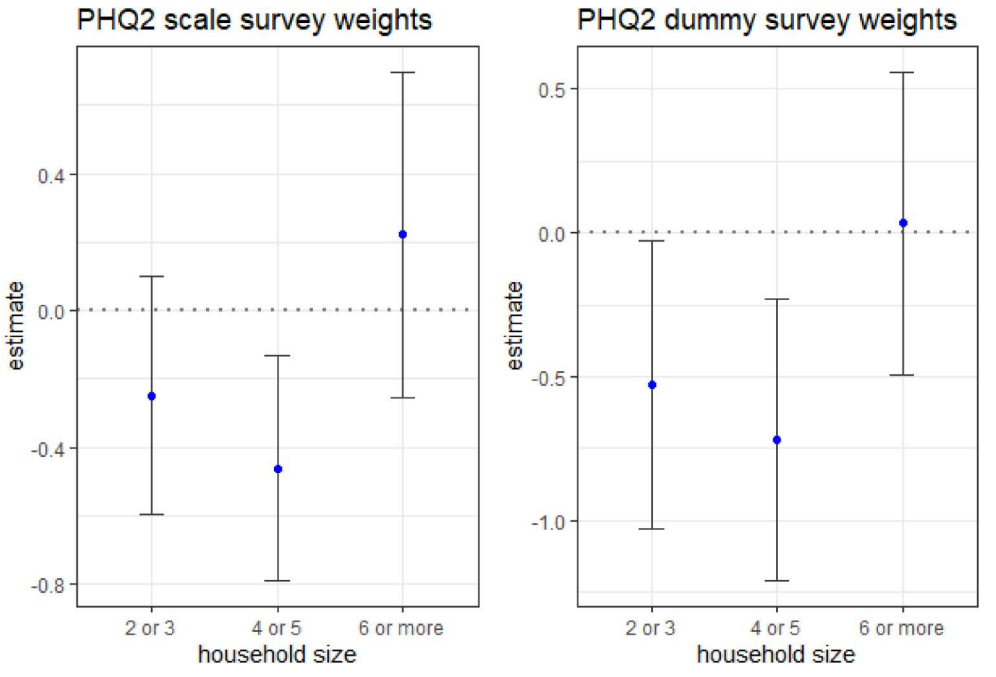


Figure 4. Relationship between household size and depressive symptoms (Full sample).

Note: (1) The reference category (represented by the horizontal line at zero) is those who live alone. Confidence intervals are at the 95% level. See the Appendix Table A1, columns 1 and 2 for full results. (2) The left panel is the depression score as a continuous variable while the right panel is the dichotomous depression score based on PHQ $-$ 2 $\geq$ 2.

mental distress. It is clear that the negative relationship between large-size households and mental health depicted in the full sample (Figure 4) is driven by the scores of the male sub-group rather than the female sub-group.

5. Discussion

Using a nationally representative general population sample, this study analysed the relationship between household size and depressive symptoms in the context of South Africa during the COVID-19 pandemic. The study was motivated by the lack of conclusive findings in literature on the relationship between household size and mental health during the COVID-19 pandemic. The existing studies are also limited by considering household size either as a cardinal variable or living alone as a dichotomous variable, assuming linearity in the relationship. Moreover, the absence of gendered analysis in literature under COVID-19 was another important motivation for this study.

This study found that only mid-sized households offered protection from depressive symptoms during the strict lockdown conditions enforced during the COVID-19 pandemic, when individuals had little opportunity for social engagement outside the confines of the household. The findings can be explained by the loneliness experienced in single member households and possibly the overcrowding experienced in households with six or more members. Our result that solo living is positively associated with depressive symptoms aligns with findings in the literature on the relationship between

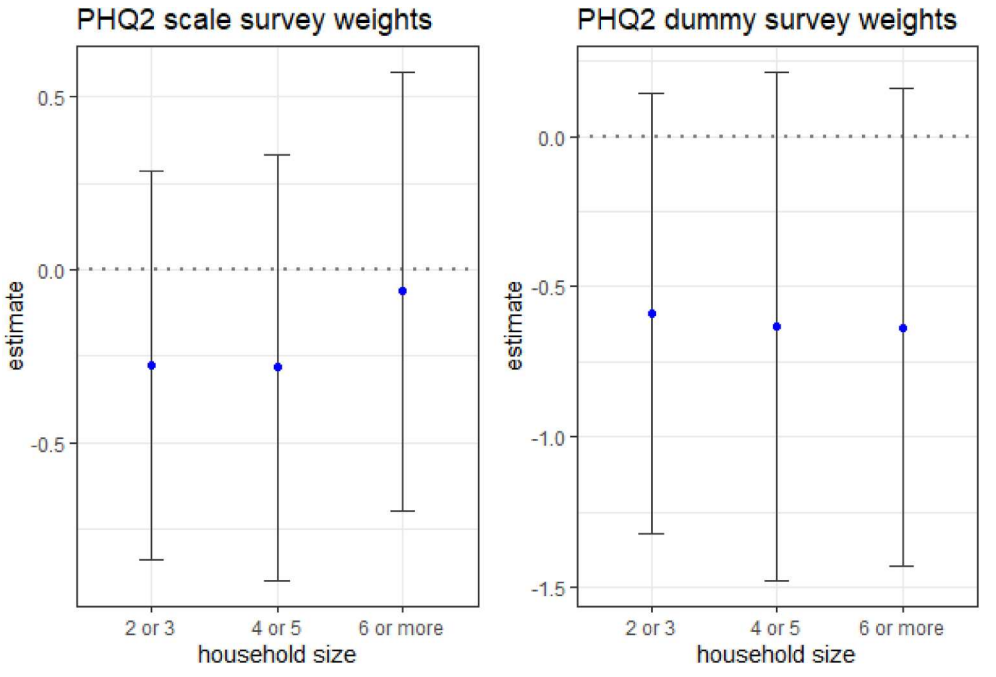


Figure 5. Relationship between household size and depressive symptoms (Female).

Note: (1) The reference category (represented by the horizontal line at zero) is those who live alone. Confidence intervals are at the 95% level. See the Appendix Table A1, columns 3 and 4 for full results. (2) The left panel is the depression score as a continuous variable while the right panel is the dichotomous depression score based on PHQ $-$ 2 $\geq$ 2.

loneliness and depression (Erzen and Çikrikci, 2018) and the way the pandemic enhanced this relationship (Bu et al., 2020a; Latikka et al., 2022).

Further, our analysis clearly points to the gendered nature of the relationship between household size and mental distress. The negative effect of large-sized household size on mental distress is driven exclusively by the male sample. The scores for depressive symptoms of males living in households with four to five members are significantly lower than those for males living in single member households. However, males living in households with six or more members do not have protection against depressive symptoms. On the other hand, there is no significant association between household size and depressive symptoms for females.

The gender-based difference in our results does not align with the pre-COVID19 study by Noh et al. (2017), who find a positive association between household size and mental distress for unmarried women compared to men. Our findings did not indicate any significant association between household size and mental distress for women. On the other hand, only mid-sized households offer protection against mental distress for males.

The results of this study provide further insights to other studies such as that by Oyenubi and Kollamparambil (2020) which found that the significant increase in depressive symptoms in South Africa during COVID-19 was primarily led by the male population. This study indicates that the higher depressive symptoms observed amongst males in South Africa during COVID-19 is primarily led by those living in overcrowded households. The depressive symptoms are observed to be higher for women in mid-sized households and

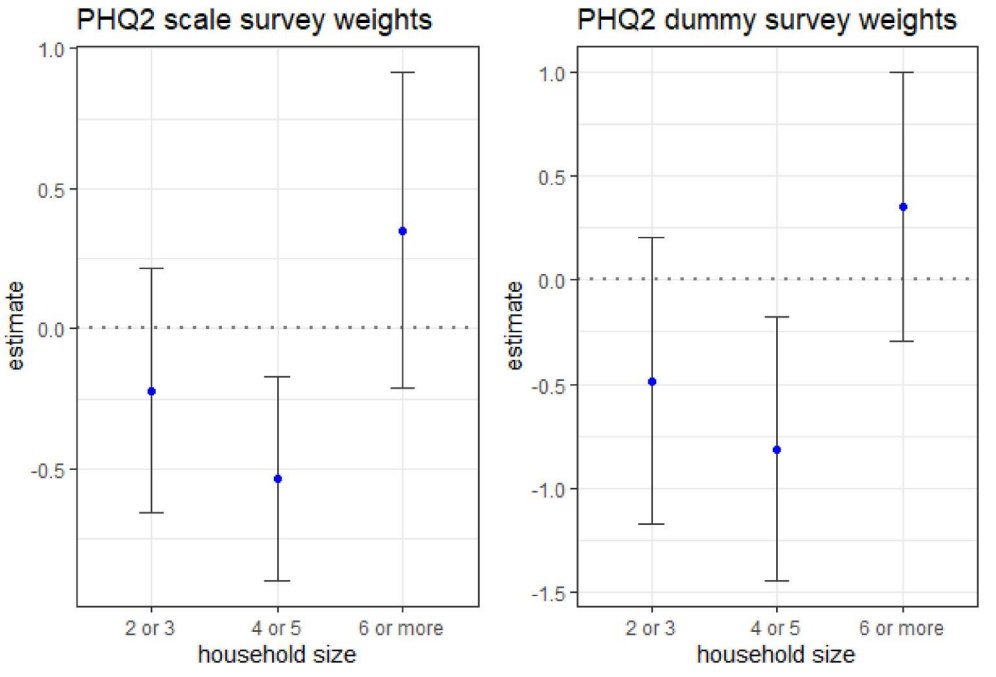


Figure 6. Relationship between household size and depressive symptoms (Male).

Note: (1) The reference category (represented by the horizontal line at zero) is those who live alone. Confidence intervals are at the 95% level. See the Appendix Table A1, columns 5 and 6 for full results. (2) The left panel is the depression score as a continuous variable while the right panel is the dichotomous depression score based on PHQ $-$ 2 $\geq$ 2.

align with existing literature which has found females to report on average higher depressive symptoms (Burger et al., 2017). It is therefore clear that there is a gendered difference in the experience of COVID-19 lockdowns based on household size.

A possible explanation as to why women were less affected by overcrowding compared to men is offered by gender role theory (Gutek et al., 1991; Bem, 1993) and social role theory (Eagly, 1997) which is that women are more strongly associated with a family role and could adapt better to the lockdown restrictions than men. The gender role orientation of females as caregivers makes them more amenable to fostering relationships within the household, irrespective of household size. Men, on the other hand, are expected to be aligned towards task-oriented roles external to the household in the work and public domain. This gender role segregation results in different dynamics of interrelationships among members of the household. Evidence to this effect in a South African context is the benefit that other household members, especially children, enjoy from female (but not male) recipients of old age grants (Duflo, 2003). There is also empirical evidence indicating that gender roles are stronger in larger and multi-generational households (Flagg et al., 2014). This could explain why males in larger households experience more mental distress during the pandemic restrictions than those in mid-sized households.

6. Conclusion

There has been an increase in the proportion of large-sized households commensurate with a fall in single-member households during COVID-19 in South Africa. Within

this context, the study explored the relationship between household size and depressive symptoms under COVID-19 strict lockdown conditions in South Africa using nationally representative data. While living in single member and larger size households are associated with depressive symptoms for the full sample, the pattern is largely driven by the male sample. The negative effect of solo living and co-habiting in large-sized households on mental health are observed for males but not females. The study thus found that only mid-sized households offered protection against mental distress for males. The additional insight offered by this study is that the surge in depressive symptoms reported by males during COVID-19 (Oyenubi & Kollamparambil, 2020) is primarily driven by males in large-sized households.

The significant negative effect of overcrowded households on the mental health of men during the lockdown period is indicative of the different roles that men and women continue to play within the household in South Africa. In times of normalcy women have borne the mental burden of the segregated roles, but this seems to have enabled them to adapt more easily to confinement during the pandemic, irrespective of the size of their household. The results flag the need to foster egalitarian gender roles. The findings also point to the need for social policy to consider interventions such as housing provision and basic income grants, so as to avoid overcrowding of households which occur as part of the survival strategy adopted by individuals without other recourse.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Adeola Oyenubi http://orcid.org/0000-0001-6068-1723

References

Amoateng, AY, Heaton, TB & Kalule-Sabiti, I, 2007. Living arrangements in South Africa. In Amoateng, AY & Heaton, TB (Eds.), Families and households in post-apartheid South Africa: socio-demographic perspectives, 43–59. HSRC Press, Cape Town.

Atzendorf, J & Gruber, S, 2022. Depression and loneliness of older adults in Europe and Israel after the first wave of COVID-19. European Journal of Ageing 19(4), 849–61.

Austin, PC, 2009. Using the standardized difference to compare the prevalence of a binary variable between two groups in observational research. Communications in Statistics-Simulation and Computation 38(6), 1228–34.

Banerjee, D, Kosagisharaf, JR & Rao, TS, 2021. 'The dual pandemic'of suicide and COVID-19: a biopsychosocial narrative of risks and prevention. Psychiatry Research 295, 113577.

Baron, EC, Davies, T & Lund, C, 2017. Validation of the 10-item centre for epidemiological studies depression scale (CES-D-10) in Zulu, Xhosa and Afrikaans populations in South Africa. BMC Psychiatry 17(1), 1–14.

Bem, SL, 1993. The lenses of gender: transforming the debate on sexual inequality. Yale University Press, Connecticut.

Bu, F, Steptoe, A & Fancourt, D, 2020a. Loneliness during a strict lockdown: trajectories and predictors during the COVID-19 pandemic in 38,217 United Kingdom adults. Social Science & Medicine 265, 113521.

Bu, F, Steptoe, A & Fancourt, D, 2020b. Who is lonely in lockdown? Cross-cohort analyses of predictors of loneliness before and during the COVID-19 pandemic. Public Health 186, 31–4.
Burger, R, Posel, D & von Fintel, M, 2017. The relationship between negative household events and depressive symptoms: evidence from South African longitudinal data. Journal of Affective Disorders 218, 170–5.
Chen, SX, Ng, JC, Hui, BP, Au, AK, Wu, WC, Lam, BC, Mak, WW & Liu, JH, 2021. Dual impacts of coronavirus anxiety on mental health in 35 societies. Scientific Reports 11(1), 1–11.
Dahlberg, L, McKee, KJ, Lennartsson, C & Rehnberg, J, 2022. A social exclusion perspective on loneliness in older adults in the Nordic countries. European Journal of Ageing 19(2), 175–88.
Duflo, E, 2003. Grandmothers and granddaughters: old-age pensions and intrahousehold allocation in South Africa. The World Bank Economic Review 17(1), 1–25.
Eagly, AH, 1997. Sex differences in social behavior: comparing social role theory and evolutionary psychology. American Psychologist 52(12), 1380–83.
Erzen, E & Çikrikci, Ö, 2018. The effect of loneliness on depression: a meta-analysis. International Journal of Social Psychiatry 64(5), Article 5.
Flagg, LA, Sen, B, Kilgore, M & Locher, JL, 2014. The influence of gender, age, education and household size on meal preparation and food shopping responsibilities. Public Health Nutrition 17(9), 2061–70.
Government of South Africa, 2020. Government Notices, Government Gazette, No. 43599.
Groarke, JM, Berry, E, Graham-Wisener, L, McKenna-Plumley, PE, McGlinchey, E & Armour, C, 2020. Loneliness in the UK during the COVID-19 pandemic: cross-sectional results from the COVID-19 psychological wellbeing study. PLoS ONE 15(9), e0239698.
Gunnell, D, Appleby, L, Arensman, E, Hawton, K, John, A, Kapur, N, Khan, M, O'Connor, RC, Pirkis, J & Caine, ED, 2020. Suicide risk and prevention during the COVID-19 pandemic. The Lancet Psychiatry 7(6), 468–71.
Gutek, BA, Searle, S & Klepa, L, 1991. Rational versus gender role explanations for work-family conflict. Journal of Applied Psychology 76(4), 560.
Hawkley, LC, Wroblewski, K, Kaiser, T, Luhmann, M & Schumm, LP, 2019. Are US older adults getting lonelier? Age, period, and cohort differences. Psychology and Aging 34(8), 1144.
Imai, K & Ratkovic, M, 2014. Covariate balancing propensity score. Journal of the Royal Statistical Society: Series B: Statistical Methodology 76(1), 243–63.
Kessler, RC, Foster, C, Webster, PS & House, JS, 1992. The relationship between age and depressive symptoms in two national surveys. Psychology and Aging 7(1), 119.
Khumalo, R, 2021. Subjective poverty in South Africa: findings from general household survey, 2019/Statistics South Africa.
Killgore, WD, Cloonan, SA, Taylor, EC & Dailey, NS, 2020. Loneliness: a signature mental health concern in the era of COVID-19. Psychiatry Research 290, 113117.
Klasen, S & Woolard, I, 2009. Surviving unemployment without state support: unemployment and household formation in South Africa. Journal of African Economies 18(1), 1–51.
Kollamparambil, U, 2017. Impact of internal in-migration on income inequality in receiving areas: a district level study of South Africa. The Journal of Development Studies 53(12), 2145–63.
Kroenke, K, Spitzer, RL & Williams, JB, 2003. The patient health questionnaire-2: validity of a two-item depression screener. Medical Care 41(11), 1284–92.
Lakhan, R, Agrawal, A & Sharma, M, 2020. Prevalence of depression, anxiety, and stress during COVID-19 pandemic. Journal of Neurosciences in Rural Practice 11(04), 519–25.
Latikka, R, Koivula, A, Oksa, R, Savela, N & Oksanen, A, 2022. Loneliness and psychological distress before and during the COVID-19 pandemic: relationships with social media identity bubbles. Social Science & Medicine 293, 114674.
Lee, CM, Cadigan, JM & Rhew, IC, 2020. Increases in loneliness among young adults during the COVID-19 pandemic and association with increases in mental health problems. Journal of Adolescent Health 67(5), 714–7.
Lenis, D, Nguyen, TQ, Dong, N & Stuart, EA, 2019. It's all about balance: propensity score matching in the context of complex survey data. Biostatistics 20(1), 147–63.

Luhmann, M & Hawkley, LC, 2016. Age differences in loneliness from late adolescence to oldest old age. Developmental Psychology 52(6), 943.
Manea, L, Gilbody, S, Hewitt, C, North, A, Plummer, F, Richardson, R, Thombs, BD, Williams, B & McMillan, D, 2016. Identifying depression with the PHQ-2: a diagnostic meta-analysis. Journal of Affective Disorders 203, 382–95.
McDowell, CP, Herring, MP, Lansing, J, Brower, CS & Meyer, JD, 2021. Associations between employment changes and mental health: US data from during the COVID-19 pandemic. Frontiers in Psychology 12, 631510.
Newmann, JP, Engel, RJ & Jensen, J, 1990. Depressive symptom patterns among older women. Psychology and Aging 5(1), 101.
Noh, J-W, Kim, K-B, Park, J, Hong, J & Kwon, YD, 2017. Relationship between the number of family members and stress by gender: cross-sectional analysis of the fifth Korea National Health and Nutrition Examination Survey. PLoS ONE 12(9), e0184235.
Okabe-Miyamoto, K, Folk, D, Lyubomirsky, S & Dunn, EW, 2021. Changes in social connection during COVID-19 social distancing: it's not (household) size that matters, it's who you're with. PLoS ONE 16(1), e0245009.
Ortiz-Ospina, E, 2019. The rise of living alone: how one-person households are becoming increasingly common around the world. Our World in Data. https://ourworldindata.org/social-connections-and-loneliness
Oyenubi, A, 2020. Optimising balance using covariate balancing propensity score: the case of South African child support grant. Development Southern Africa 37(4), Article 4.
Oyenubi, A, Kim, AW & Kollamparambil, U, 2022. COVID-19 risk perceptions and depressive symptoms in South Africa: causal evidence in a longitudinal and nationally representative sample. Journal of Affective Disorders 308, 616–22.
Oyenubi, A & Kollamparambil, U, 2020. COVID-19 and depressive symptoms in South Africa. NIDS-CRAM Policy Report, Wave, 2.
Oyenubi, A & Kollamparambil, U, 2022. Does socioeconomic status mediate the relationship between income loss and depression scores? Evidence from South Africa. Current Psychology 42(20), 17062–73.
Palisi, BJ, 1984. Household crowding and well-being: a cross-cultural analysis. International Journal of Sociology of the Family 14(1), 17–31.
Polenick, CA, Perbix, EA, Salwi, SM, Maust, DT, Birditt, KS & Brooks, JM, 2021. Loneliness during the COVID-19 pandemic among older adults with chronic conditions. Journal of Applied Gerontology 40(8), 804–13.
Posel, D, 2021. Living alone and depression in a developing country context: longitudinal evidence from South Africa. SSM-Population Health 14, 100800.
Posel, D & Casale, D, 2021. Moving during times of crisis: migration, living arrangements and COVID-19 in South Africa. Scientific African 13, e00926.
Posel, D & Hall, K, 2021. Families and household formation in South Africa. Oqubay, A, Tregenna F and Valodia I.
Posel, D, Oyenubi, A & Kollamparambil, U, 2021. Job loss and mental health during the COVID-19 lockdown: evidence from South Africa. PLoS ONE 16(3), e0249352.
Roy, D, Tripathy, S, Kar, SK, Sharma, N, Verma, SK & Kaushal, V, 2020. Study of knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during COVID-19 pandemic. Asian Journal of Psychiatry 51, 102083.
Ruengorn, C, Awiphan, R, Wongpakaran, N, Wongpakaran, T & Nochaiwong, S, 2021. Health Outcomes and Mental Health Care Evaluation Survey Research Group (HOME-Survey). Association of job loss, income loss, and financial burden with adverse mental health outcomes during coronavirus disease 2019 pandemic in Thailand: a nationwide cross-sectional study. Depression and Anxiety 38, 648–60.
Ruiz-Tagle, J & Urria, I, 2022. Household overcrowding trajectories and mental well-being. Social Science & Medicine 296, 114051.
Rumas, R, Shamblaw, AL, Jagtap, S & Best, MW, 2021. Predictors and consequences of loneliness during the COVID-19 pandemic. Psychiatry Research 300, 113934.

Russell, M, 2003. Understanding black households: the problem. Social Dynamics 29(2), 5–47.
Stuart, EA, Lee, BK & Leacy, FP, 2013. Prognostic score–based balance measures can be a useful diagnostic for propensity score methods in comparative effectiveness research. Journal of Clinical Epidemiology 66(8), Article 8.
Sunwoo, L, 2020. Loneliness among older adults in the Czech Republic: a socio-demographic, health, and psychosocial profile. Archives of Gerontology and Geriatrics 90, 104068.
Tomita, A & Burns, JK, 2013. A multilevel analysis of association between neighborhood social capital and depression: evidence from the first South African national income dynamics study. Journal of Affective Disorders 144(1–2), 101–5.
Towner, E, Tomova, L, Ladensack, D, Chu, K & Callaghan, B, 2022. Virtual social interaction and loneliness among emerging adults amid the COVID-19 pandemic. Current Research in Ecological and Social Psychology 3, 100058.
Wittenberg, M & Branson, N, 2021. Creating household weights for NIDS-CRAM. Southern Africa Labour and Development Research Unit, Cape Town.

Appendix

Table A1. CBPS weighted multivalued treatment regression results.

	Full sample		*Female*		*Male*	
Dependant variable	(PHQ2 score)	(PHQ2 dummy)	(PHQ2 score)	(PHQ2 dummy)	(PHQ2 score)	(PHQ2 dummy)
size (2 or 3)	−0.25	−0.53**	−0.28	−0.59	−0.22	−0.48
	(0.18)	(0.26)	(0.29)	(0.37)	(0.22)	(0.35)
size (3 or 4)	−0.46***	−0.72***	−0.29	−0.63	−0.54***	−0.81**
	(0.17)	(0.25)	(0.32)	(0.43)	(0.19)	(0.32)
size (6 or more)	0.22	0.03	−0.06	−0.64	0.35	0.35
	(0.24)	(0.27)	(0.32)	(0.40)	(0.29)	(0.33)
Risk perception	0.24	0.32	−0.07	0.04	0.43**	0.65***
	(0.16)	(0.20)	(0.23)	(0.32)	(0.17)	(0.25)
Able to avoid COVID	−0.44*	−0.42	−0.99***	−1.04***	−0.33	−0.26
	(0.24)	(0.28)	(0.37)	(0.40)	(0.25)	(0.35)
Household hunger	0.36*	0.68***	0.66***	0.69**	0.34	0.82**
	(0.20)	(0.25)	(0.24)	(0.30)	(0.27)	(0.33)
Receive Govt grant	−0.06	−0.10	−0.26	−0.29	0.12	0.10
	(0.17)	(0.23)	(0.30)	(0.41)	(0.22)	(0.32)
HH income decreased	0.33	0.34	−0.11	0.09	0.46*	0.45
	(0.20)	(0.23)	(0.25)	(0.32)	(0.26)	(0.31)
HH income increased	0.04	−0.07	−0.40	−0.34	0.32	0.15
	(0.27)	(0.32)	(0.36)	(0.46)	(0.35)	(0.43)
Traditional (Area)	−0.09	−0.17	0.55*	0.32	−0.25	−0.30
	(0.18)	(0.27)	(0.31)	(0.42)	(0.20)	(0.34)
Informal (Area)	−0.67**	−0.61	0.12	0.76	−1.01***	−1.24*
	(0.27)	(0.47)	(0.39)	(0.68)	(0.35)	(0.72)
Township (Area)	0.05	0.11	0.74**	0.76*	−0.07	0.03
	(0.19)	(0.26)	(0.35)	(0.44)	(0.19)	(0.30)
age	0.04*	0.04	0.04	0.06	0.06*	0.04
	(0.03)	(0.04)	(0.03)	(0.05)	(0.04)	(0.05)
age squared	−0.001**	−0.0005	−0.0004	−0.001	−0.001**	−0.001
	(0.0003)	(0.0004)	(0.0003)	(0.001)	(0.0004)	(0.001)
male	−0.13	−0.10				
	(0.17)	(0.23)				
African	−0.60*	−0.57*	−1.08***	−1.02**	−0.50	−0.34
	(0.31)	(0.34)	(0.35)	(0.43)	(0.39)	(0.48)
Has Partner	0.31	0.40	−0.27	−0.19	0.38	0.52
	(0.31)	(0.37)	(0.27)	(0.34)	(0.39)	(0.50)
Flat (Dwelling)	−0.36	0.004	−0.72	−0.83	−0.39	0.14
	(0.35)	(0.40)	(0.62)	(0.72)	(0.41)	(0.53)
Traditional (Dwelling)	−0.32	0.12	−0.72	−0.64	−0.21	0.43
	(0.40)	(0.52)	(0.64)	(0.82)	(0.47)	(0.66)
Informal (Dwelling)	−0.32	−0.52	0.06	−0.88	−0.41	−0.48
	(0.44)	(0.49)	(0.73)	(0.79)	(0.48)	(0.63)
unemployed	0.59***	0.86***	0.64***	1.01***	0.67***	1.10***
	(0.17)	(0.22)	(0.20)	(0.29)	(0.20)	(0.29)
Years of schooling	0.06	0.10	0.12	0.17	0.01	0.08
	(0.06)	(0.10)	(0.10)	(0.17)	(0.06)	(0.13)
Years of Schooling Squared	−0.13	−0.27	−0.31	−0.46	0.06	−0.19
	(0.32)	(0.47)	(0.46)	(0.77)	(0.32)	(0.59)
No of preventative measures	−0.03	−0.01	0.12	0.13	−0.03	0.04
	(0.06)	(0.08)	(0.09)	(0.12)	(0.06)	(0.10)
Constant	1.13	−1.29	1.04	−1.57	0.77	−2.01
	(0.85)	(1.16)	(1.09)	(1.61)	(1.05)	(1.48)
Observations	4729	4729	3010	3010	1719	1719

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Note: The PHQ2 score ranges from 0 to 6. The PHQ2 dummy takes value 1 for PHQ-2 ≥2, and 0 otherwise.