



# Living alone and depression in a developing country context: Longitudinal evidence from South Africa

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## ABSTRACT

In South Africa, single-person households were a household type enforced by apartheid legislation, designed to restrict the “influx” of Africans into “white” and typically urban areas of the country. Yet the increase in living alone has been one of the most marked demographic trends of the post-apartheid period. The trend, which has occurred alongside the persistence in individual labor migration patterns and a decline in rates of union formation, has been driven by changes among working-age adults, rather than among older adults. This is the first empirical study to investigate the mental health implications of living alone among all adults in South Africa using national longitudinal data. The data come from five waves of the panel household survey, the National Income Dynamics Study (NIDS), conducted from 2008 to 2017. Information on depressive symptoms was collected from all adults (15 years and older), who were asked the ten questions which make up the Center for Epidemiologic Studies Short Depression Scale (CES-D 10). Adults who lived alone reported significantly higher depression scores than other adults, in the pooled ordinary least squares models, and in the fixed effects model, which controlled for any unobservable, time-invariant differences between the two groups of adults. Vulnerability to depression was moderated by adults’ preferences to continue living in their area of residence (as a measure of their social integration), but the positive relationship remained sizeable and significant across all models. The findings shed light on a further dimension of the migrant labor system in South Africa, which has not received adequate attention in the empirical literature, viz. the mental health implications for adults of solo migration, and they provide further motivation for the provision of affordable and safe family housing in local areas of employment.

## 1. Introduction

The vulnerability to depression of people who live alone has been documented and analyzed particularly among older adults in developed countries, where life expectancy is high, and the elderly can better afford to live alone (Demey et al., 2013; Honje et al., 2018; Zhang et al., 2019). Single-person households are far less common in developing countries partly because life expectancy is lower, and also because when resources are scarce, living together offers considerable economies of scale in the consumption of goods and services (Lanjouw & Ravallion, 1995; Fafchamps & Quisumbing, 2007; Posel et al., 2020).

For a developing country, and particularly within sub-Saharan Africa, the incidence of solo-living in South Africa is unusual (Ortiz-Ospina, 2019). Although multigenerational living arrangements are deeply rooted in traditional kinship idioms and they have remained a common household form in the post-apartheid period (Russell, 2003; Amoateng et al., 2007; Posel & Hall, 2021), single-person households

were also a feature of apartheid South Africa, and they have become even more common in recent decades.

During the years of apartheid and “influx control”, single-person households attested to deliberate attempts by the state to prevent the urbanization of African families (Bekker & Humphries, 1985). Africans, and mostly men, would migrate from rural areas (in the former “bantustans”) where there were few employment opportunities, to the mines and the cities in South Africa (Mayer & Mayer, 1974; Spiegel et al., 1996; Bank et al., 2020). These labor migrants were often housed in accommodation for solo (and single sex) living, ensuring that the migrant’s family would remain behind in the household of origin.

The persistence of single-person households after the removal of all apartheid legislation partly reflects the sustained absence of adequate or affordable family accommodation in urban areas. Urbanization in post-apartheid South Africa has been accompanied by the large growth in informal settlements close to centers of employment (Huchzermeyer, 2003; Hunter & Posel, 2012). These settlements comprise small shacks

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typically made of corrugated iron, with only a very limited provision of basic services, conditions which are not conducive to family living (Huchzermeyer & Karam, 2006; Richardson et al., 2006).

Insecurity in employment, together with very high unemployment rates, has also inhibited family migration and encouraged migrants to remain connected to the household from which they migrated. In addition to providing insurance against economic shocks, areas of origin have retained considerable cultural significance for migrants, as places where important rituals are observed and where some migrants may expect to spend their life after retirement (Posel & Marx, 2013; Bank et al., 2020).

The fall in household size also reflects changes in rates of union formation. In recent decades, marriage rates have fallen considerably and the extent of union formation in South Africa is among the lowest in the world, and particularly among Africans (Hosegood et al., 2009; Posel & Casale, 2013; Posel & Rudwick, 2013; United Nations 2019). By 2010, for example, there was a forty percentage-point differential between rates of ever-marriage among African women and white women (41% of African women aged 20 years and older were ever-married, compared to 81% of white women) (Posel & Rudwick, 2013). Rising rates of cohabitation have not significantly narrowed this differential, or offset the decline in marriage, at least partly because cohabitation (without marriage intentions in particular) is widely viewed as unacceptable in certain cultures (Posel & Rudwick, 2014).

Trends in labor migration and marriage rates help to account for why the frequency of single-person households in South Africa has more than doubled over recent decades, rising from 12% of all households in 1995 to almost 26% in 2018 (Posel & Hall, 2021).

The association between mental health disorders and living alone has been explored quite extensively in countries in Asia and Europe, as well as the UK and the USA, and most commonly amongst the elderly (Demey et al., 2013; Stahl et al., 2017; Honje et al., 2018; Taylor et al., 2018; Zhang et al., 2019). However, this is the first study which investigates the mental health implications of solo-living, among both working age and elderly adults, in the developing country context of South Africa. In so doing, the study sheds light on a further dimension of the migrant labor system, which has not received attention in the empirical literature, viz. how migration affects the mental health of adults who migrate alone. The study adds to the literature further by analyzing longitudinal micro-data, which make it possible to control for various sources of endogeneity that could bias estimated relationships between solo-living and mental health (Burger et al., 2017).

The primary explanation for why solo dwellers would experience more vulnerability to depression is that they suffer more from social isolation than individuals who live with others. Where solo dwellers have strong social networks or are socially integrated, their vulnerability to depression has been found to be substantially reduced if not eliminated (Taylor, 2014; Stahl et al., 2017; Honja et al., 2018).

This study highlights a particular aspect of social integration in the context of labor migration patterns and the *trans*-locality of migrants in South Africa: the extent to which adults wish to remain living in their current area of residence in the future. The expectation is that controlling for these preferences would significantly moderate the relationship between living alone and poor mental health.

## 2. Data and methods

### 2.1. Data

The data analyzed in the study were collected in five waves of the South African National Income Dynamics Study (NIDS), undertaken from 2008 to 2017. NIDS is a national longitudinal survey, conducted by the Southern Africa Labour and Development Research Unit at the University of Cape Town (UCT), with ethical clearance for the study given by the Commerce Faculty Ethics Committee at UCT. All the datasets are available in the public domain, and all information about respondent identities, used to track participants over time, has been

excluded from the public release data (Woolard et al., 2010).

In the first wave of NIDS, the sample was selected through a stratified two-stage cluster design, where 401 primary sampling units (PSUs) were originally drawn from the national master sample of about 3000 PSUs, and then dwellings within each PSU were selected (Woolard et al., 2010). NIDS followed individuals who were resident household members in the first wave, even if the individual moved into a different household in a different area. Over the course of the panel, 73% of the original sample was re-interviewed (Brophy et al., 2018). The sampling weights, which are provided with the data, adjust for attrition by calculating the probability that an individual is interviewed in wave  $n+1$ , given the individual's characteristics in wave  $n$  (Burger et al., 2017). Following the approach of Fitzgerald et al., 1998, a series of probit regressions estimated for this study showed that with the sampling weights, there was no evidence of selective attrition between the waves based on mental health.

### 2.2. Variables

The study analyzed depression scores calculated from the responses of adults (15 years and older) to ten questions which make up the Center for Epidemiologic Studies Short Depression Scale (CES-D 10). The scale was derived by scoring the responses to generate a total depression score ranging from 0 (no symptoms) to 30 (maximum symptoms). The scale has been validated as a reliable screening measure of depression, including for South Africa (Baron et al., 2017), and it has been widely used in studies that investigate variation in depressive symptomology using survey data. The scale was applied as a continuous measure (see also e.g. Ardington & Case, 2010; Tomita & Burns, 2013; Meffert et al., 2015; Burger et al., 2017), rather than specifying a threshold to identify depression, because the appropriate cut-off has been found to vary across different language groups in South Africa (Baron et al., 2017).

To investigate the relationship between living alone and vulnerability to depression, the analysis also controlled for a range of observable characteristics that have been found to influence mental health and that may also be correlated with the nature of household formation. These include: a quadratic in age (to capture possible non-linearity in the relationship between age and mental health); gender (female); population group (using the four categories specified in household surveys in South Africa, African, Colored (of mixed race), Indian (of Asian descent) and white (as the omitted group)); marital status (currently married); years of education; employment status (employed); area of residence (urban formal area, urban informal area (shack settlements), rural formal area (commercial farms) and rural tribal area (the omitted category, which represents rural areas in the former bantustans); and whether adults had experienced a health condition (such as chest pain, fever, a persistent cough or severe weight loss) in the previous 30 days.

The estimations also included the economic status of adults as a covariate, measured by where adults thought their household ranked on a six-step ladder, ranging from the poorest to the richest households in South Africa. A subjective assessment of economic status was used rather than a money-metric measure based on per capita income or expenditure. This is because there can be considerable cost-savings when people live together, including in the consumption of non-rival goods and services, which per capita measures do not recognize (Lanjouw & Ravallion, 1995; Fafchamps & Quisumbing, 2007; Posel et al., 2020). The omission of economies of scale in the calculation of individual economic status helps to explain why, although people living in single-person households are significantly less likely to be measured as poor than people living in larger households, the association between household size and subjective poverty is far less evident (Posel & Rogan, 2016).

Using the NIDS data, it was not possible to identify adults who were labor migrants living in their destination household. Although NIDS adopted a broad definition of household membership and allowed households to identify household members even if they did not live in

the household for much of the year, this information was collected only from the perspective of the household of origin. Very few subsequent questions were then asked about non-resident household members, who were also not tracked over the waves. However, NIDS did collect information on inter-household transfers (both sent and received), and two variables, capturing whether resources had been transferred to another household, or received from another household, were included in the estimations. Although all labor migrants do not send remittances to their household of origin, it would be expected that labor migrants would be far more likely than non-migrants to send remittances (and correspondingly, be less likely to receive remittances) (Bowles & Posel, 2005; Posel, 2010).

To capture the social integration of adults in their community, the analysis used information on adults' preferences to continue living in the area (village or suburb) where they were currently resident. Five response options were provided, ranging from a strong preference to stay, to a strong preference to leave, from which a binary variable was derived, identifying if adults expressed a strong preference to stay. A distinguishing feature of 'classic' labor migration is that migrants retain a 'duality of residence and social attachment to more than one location' (Falkingham et al., 2012: 341). In the context of labor migration, therefore, whether or not adults had a strong preference to continue staying in their area of residence likely describes their relationship to the destination area relative to the area of origin. To investigate whether this 'social embeddedness' moderated the relationship between living alone and mental health, all regressions were run first without, and then with, this covariate.

### 2.3. Econometric analysis

As the CES-D 10 score ranged from 0 to 30, the analysis followed other studies in treating the scale as a cardinal (rather than ordinal) measure, and ordinary least squares (OLS) regressions were estimated for the cross-sectional data (Burger et al., 2017). The first model was a pooled OLS model, which used all five waves of NIDS but did not incorporate the panel structure of the data, and which served as the base-line estimation:

$$D_{in} = \alpha + \gamma S_{in} + \beta X_{in} + \delta W_n + \varepsilon_i + \nu_{in} \tag{1}$$

where  $D_{in}$  represents the CES-D 10 score of individual  $i$  in wave  $n$ ;  $S_{in}$  is a binary variable equal to 1 if the adult lived alone;  $X_{in}$  is a vector of observable characteristics (detailed above),  $W_n$  is a wave dummy variable;  $\varepsilon_i$  is the error term that does not vary over time and that captures unobservable characteristics of individuals, and  $\nu_{in}$  is the time-varying error term.

The second model incorporated the adult's lagged depression score ( $D_{in-1}$ ) as a covariate in the OLS regression, thereby offering some control for individual variation in the propensity to report depressive symptoms (Burger et al., 2017; Posel et al., 2021):

$$D_{in} = \alpha + \gamma S_{in} + \theta D_{in-1} + \beta X_{in} + \delta W_n + \varepsilon_i + \nu_{in} \tag{2}$$

Model (2) was therefore only estimated for adults who appeared in waves 2 to 5 of NIDS.

The third model estimated changes in depression scores across the waves, in response to changes in whether adults lived alone (together with changes in other time-varying observable characteristics). In contrast to models (1) and (2), therefore, the fixed effects model excluded all variables that did not change over the waves:

$$D_{in} = D_i = \gamma^{FE}(S_{in} - S_i) + \beta^{FE}(X_{in} - X_i) + \nu_{in} - \nu_i \tag{3}$$

where for any variable  $Z$ ,  $Z_i$  represents the average value for individual  $i$  over the  $n$  waves. This fixed effects (or within-transformation) model eliminated the time-invariant error term  $\varepsilon_i$ . In so doing, the model controlled for the possibility that people have a biological predisposition to experience or report depressive symptoms, which is "unobservable",

and which may vary non-randomly across sub-groups of the population. For example, if people who live alone have personality traits which make them less prone to depression, then a positive relationship between living alone and depression will be under-estimated unless these unmeasured traits are accounted for.

The fixed effects model also addressed the possibility of "anchoring" in individual responses to the questions that make up the CES\_D 10 scale. Different people may anchor their subjective reports of mental health at different points of the response scale (Winkelmann and Winkelmann 1998), and if this anchoring is constant over time, then the effect will be removed through the within-transformation of the data.

The total sample for which there were no missing data for any of the variables included in the analysis was 94,555 adults (15 years and older) across the five waves. All statistics were weighted using the post-stratification weights released with the data, both to make the findings generalizable to the adult population in South Africa and to adjust for sample attrition across the waves (De Villiers et al., 2015; Burger et al., 2017).

## 3. Results

### 3.1. Descriptive findings

Over the course of the NIDS panel, the share of adults (15 years and older) who lived alone increased from approximately 11% in 2008, to almost 19% in 2017 (Table 1). Most of the elderly in South Africa did not live alone, and overall, working-age adults (aged 15 to 59) were as likely as older adults to be solo-dwellers. Moreover, the increase in solo-living was driven particularly by changes among working-age adults. The upper threshold of 59 years for the working-age population was chosen because adults become age-eligible to receive the social pension (or the older persons grant) at 60 years, but the findings remained robust if the upper threshold was increased to 64 years.

There was considerable persistence in living alone from wave to wave, which is described in Table 2. Between 80 and 90 percent of adults who were solo dwellers in wave  $n$  remained solo dwellers in wave  $n+1$ .

On average, adults who lived alone reported significantly lower CES\_D 10 scores (by 0.24 points of the scale) than adults who lived with others (Table 3). However, these two groups of adults also differed across a range of observable characteristics that are likely to be correlated (some positively and others negatively) with a vulnerability to depression.

Although living alone was not confined to the elderly in South Africa, adults in single-person households were more than two years older on average than adults who lived with others, and depression scores have typically been found to increase (non-linearly) with age (Burger et al., 2017). Earlier empirical studies have also estimated a greater

**Table 1**  
Adults who lived alone, South Africa 2008–2017.

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Overall
% share who lived alone	2008	2010/11	2012	2014/15	2017	
All adults	11.25 (0.01)	11.19 (0.01)	14.10 (0.01)	16.07 (0.01)	18.91 (0.01)	14.57 (0.00)
Working-age adults	10.99 (0.00)	10.97 (0.01)	14.20 (0.01)	16.23 (0.01)	19.70 (0.01)	14.71 (0.00)
Older adults (>59)	13.33 (0.01)	12.99 (0.02)	13.32 (0.02)	14.85 (0.02)	12.63 (0.01)	13.47 (0.01)

Source: Southern African Labour and Development Research Unit (2018a - 2018e).

Note: The data are weighted to represent population estimates. Standard errors are in parentheses. The upper threshold for the working-age population is taken to be 59 years because adults become age-eligible for the social pension from 60 years.

**Table 2**  
Persistence in living alone, 2008–2017.

Lived alone in wave n	Living arrangements in wave n+1	
	Lived alone	Lived with others
Wave 1	89.02 (0.01)	10.98 (0.01)
Wave 2	87.06 (0.01)	12.94 (0.01)
Wave 3	79.60 (0.02)	20.40 (0.02)
Wave 4	82.55 (0.01)	17.45 (0.01)

Note: The data are weighted to represent population estimates. Standard errors are in parentheses.

**Table 3**  
Characteristics of adults who lived alone or with others.

	Lived alone	Lived with others
Mean:		
CES_D 10	7.128 (0.081)**	6.888 (0.025)
Age (years)	38.821 (0.263)**	36.621 (0.090)
<b>Proportion of adults:</b>		
Female	0.256 (0.008)**	0.590 (0.003)
Married	0.158 (0.007)**	0.309 (0.003)
African	0.856 (0.009)**	0.786 (0.003)
Colored	0.040 (0.004)**	0.095 (0.002)
Indian	0.009 (0.003)	0.027 (0.001)
White	0.094 (0.008)	0.092 (0.003)
Years of education	10.044 (0.069)**	9.303 (0.020)
Urban formal area	0.621 (0.009)**	0.511 (0.003)
Urban informal area	0.104 (0.005)**	0.089 (0.002)
Rural formal area	0.093 (0.005)**	0.072 (0.001)
Rural tribal area	0.182 (0.006)**	0.328 (0.002)
Employed	0.718 (0.008)**	0.387 (0.003)
Has a health condition	0.211 (0.008)**	0.244 (0.002)
Poor (headcount ratio)	0.118 (0.006)**	0.472 (0.003)
Perceived economic status: Poorest third	0.435 (0.009)	0.440 (0.003)
Perceived economic status: Middle third	0.525 (0.009)	0.523 (0.003)
Perceived economic status: Richest third	0.040 (0.005)	0.037 (0.001)
Sent remittances/private transfers	0.281 (0.009)**	0.134 (0.002)
Received remittances/private transfers	0.131 (0.006)**	0.184 (0.002)
Strong preference to stay in the area	0.516 (0.009)**	0.618 (0.003)
Number of adults (unweighted)	7553	87002

Note: The data are weighted to represent population estimates. Standard errors are in parentheses.

\*\* Means or proportions between adults who live alone and those who live with others are significantly different at the 95% level.

vulnerability to depression in South Africa among Africans, adults who are not partnered and those who live in urban areas (Ardington & Case, 2010; Tomita & Burns, 2013; Burger et al., 2017), which were three further distinguishing characteristics of adults who lived alone.

However, people who lived alone also had higher levels of education, a far larger share had employment (72% compared to 39%), and they were significantly less likely to report a health condition, characteristics which are associated with lower depression scores (Tomlinson et al., 2007; Burger et al., 2017; Posel et al., 2021).

Over the course of the panel, a substantially smaller share of adults who lived alone reported an income below the national poverty line (841 Rands in 2012 prices): 12% compared to 47% of adults who lived with others. Yet, there were no differences in perceptions of economic status between the two groups of adults: 44% of both solo-dwellers and adults who lived with others perceived their household to be ranked in the bottom third of households in South Africa.

As expected, if solo-dwellers include labor migrants, adults who lived alone were more than twice as likely as other adults to send remittances to another household (28% compared to 13%), and significantly less likely to receive remittances. Adults who lived alone were further distinguished by a significantly lower preference to continue living in their current area of residence: 52% of these adults expressed a “strong

preference to stay”, compared to 62% of adults who lived with others.

### 3.2. Regression analysis: living alone and vulnerability to depression

In the multivariate context, the relationship between living alone and higher depression scores remained robust and significant (Table 4). Across all three models (regressions 1 to 6), adults who lived alone reported significantly higher depression scores than adults who lived with others.

The relationship between living alone and depressive symptoms was larger when the regressions modelled the longitudinal nature of the data, and particularly in the fixed effects regressions. For example, the estimated coefficient for living alone increased from 0.254 ( $p < 0.001$ ) in the pooled OLS regression 1 to 0.435 ( $p < 0.001$ ) in the fixed effects regression 5. This could indicate that adults who lived alone were less predisposed to depressive symptoms, and when the estimations controlled for this unobservable characteristic, the relationship between living alone and higher depression scores was strengthened.

Adults who were more socially embedded in their area of residence reported significantly lower depression scores in all three models ( $p < 0.0001$ ). When the estimations controlled for the preference to continue living in the current suburb or village, the relationship between solo-living and depression was considerably reduced. In the pooled OLS model (regressions 1 and 2), for example, the coefficient on living alone fell by 29%. Nonetheless, the coefficient remained positive and significant in all three models (regressions 2, 4 and 6).

Depressive symptoms were also significantly correlated with many of the demographic and socio-economic controls that were included in the estimations. The CES-D 10 score increased non-linearly with age and on average, was significantly larger among women than men, African and Colored adults compared to white adults, adults who had a health condition, and among adults who lived in an urban area, and particularly in an urban informal settlement, compared to adults who lived in a rural area.

In contrast, marriage and higher socio-economic status (having more years of education and being employed) were significantly protective of depressive symptoms. Relative to adults who perceived the economic status of their household as ranking among the richest third of households in South Africa, those who viewed their household in the poorest third reported higher depression scores, although this relationship was not significant in the fixed effects model. Sending remittances (and therefore having the means to do so) was also associated with significantly lower depression scores, although there was no relationship between the receipt of remittances and depression.

## 4. Discussion

An increase in living alone has been documented in many countries, particularly in North America, Europe and Asia (Kobrin, 1974; Michael et al., 1980; United Nations 2019), where solo-living reflects greater opportunities for young adults to live independently before union formation, and for older adults to maintain households in the event of union dissolution or the death of a partner. As a mental health concern, the focus of research on living alone has been on depression among the elderly, perhaps because living alone for this cohort is most likely to be associated with personal loss.

The rise in solo-living has also been a marked demographic trend in South Africa over recent decades (Amoateng et al., 2007; Wittenberg et al., 2017; Mutanda & Odimegwu, 2019; Posel & Hall, 2021), setting South Africa apart from many other developing countries, and in sub-Saharan Africa in particular (Ortiz-Ospina, 2019). This trend derives mostly from the growth in single person households among working-age adults (15–59 years) rather than among older adults (60 years and older).

Mental health disorders have been identified as the third largest contributor to the burden of disease in South Africa (Bradshaw et al.,



**Table 4**  
Estimating the correlates of depression scores (CES-D 10) in South Africa.

	Pooled OLS		Lagged OLS		Individual fixed effects	
	(1)	(2)	(3)	(4)	(5)	(6)
Lived alone	0.254 (0.086) ***	0.180 (0.085) **	0.295 (0.109) **	0.218 (0.108) ***	0.435 (0.146) ***	0.367 (0.145) **
CES-D 10 score (n - 1)	–	–	0.049 (0.008) ***	0.048 (0.008) ***	–	–
Age	0.135 (0.008) ***	0.138 (0.008) ***	0.100 (0.011) ***	0.107 (0.011) ***	–	–
Age <sup>2</sup>	–0.001 (0.000) ***	–0.001 (0.000) ***	–0.001 (0.000) ***	–0.001 (0.000) ***	–0.001 (0.000) ***	–0.001(0.000) ***
Female	0.270 (0.048) ***	0.271 (0.048) ***	0.215 (0.067) ***	0.219 (0.066) ***	–	–
Married	–0.779 (0.063) ***	–0.764 (0.063) ***	–0.668 (0.083) ***	–0.655 (0.082) ***	–0.268 (0.146) *	–0.239 (0.146)
African	1.486 (0.138) ***	1.386 (0.136) ***	1.155 (0.235) ***	1.074 (0.231) ***	–	–
Colored	0.488 (0.154) ***	0.431 (0.153) ***	0.105 (0.254)	0.073 (0.250)	–	–
Indian	0.443 (0.248) ***	0.407 (0.245) *	0.043 (0.378)	0.097 (0.370)	–	–
Years of education	–0.097 (0.008) ***	–0.102 (0.008) ***	–0.094 (0.011) ***	–0.098 (0.011) ***	0.036 (0.036)	0.027 (0.035)
Urban formal	0.425 (0.052) ***	0.355 (0.051) ***	0.570 (0.068) ***	0.505 (0.068) ***	0.211 (0.174)	0.105 (0.173)
Urban informal	0.893 (0.086) ***	0.789 (0.085) ***	0.910 (0.113) ***	0.826 (0.113) ***	1.070 (0.274) ***	0.898 (0.270) ***
Rural formal	0.115 (0.082)	0.024 (0.081)	0.162 (0.109)	0.064 (0.107)	0.569 (0.271) **	0.452 (0.267)
Employed	–0.490 (0.058) ***	–0.509 (0.058) ***	–0.469 (0.078) ***	–0.486 (0.077) ***	–0.333 (0.083) ***	–0.341 (0.082) ***
Health condition	0.638 (0.064) ***	0.638 (0.063) ***	0.443 (0.088) ***	0.433 (0.087) ***	0.260 (0.090) ***	0.261 (0.089) ***
Perceived poorest	0.775 (0.148) ***	0.707 (0.148) ***	0.587 (0.195) ***	0.499 (0.194) ***	0.048 (0.183)	0.032 (0.183)
Perceived middle	0.149 (0.143)	0.104 (0.143)	0.033 (0.187)	–0.030 (0.187)	–0.318 (0.176) *	–0.315 (0.177) *
Remittances sent	–0.406 (0.072) ***	–0.423 (0.071) ***	–0.502 (0.098) ***	–0.517 (0.096) ***	–0.175 (0.099) *	–0.186 (0.099) *
Remittances received	–0.059 (0.059)	–0.068 (0.058)	–0.030 (0.080)	–0.042 (0.079)	0.071 (0.080)	0.047 (0.080)
Strong preference to stay	–	–0.940 (0.050) ***	–	–1.052 (0.069) ***	–	–0.896 (0.067) ***
R <sup>2</sup>	0.079	0.090	0.059	0.072	0.009 (within)	0.019 (within)

Notes: The data are weighted to represent population estimates. Standard errors are in parentheses. The omitted categories are white; rural tribal, and perceived richest third. The regressions in the first two models (regressions 1 to 4) included wave dummy variables. Regressions 3 and 4 were estimated only for adults in waves 2 to 5. \*\*\* Significant at 1% \*\* Significant at 5% \* Significant at 10%.

2007). However, although there is a growing body of empirical research which has investigated the individual, household and neighborhood factors that are associated with depression (Tomlinson et al., 2007; Hamad et al., 2008; Ardington & Case, 2010; Tomita & Burns, 2013; Meffert et al., 2015; Burger et al., 2017; Posel et al., 2021), there have been no studies which have estimated the relationship between living alone and depression, and particularly among working-age adults.

As in other countries, the increase in single-person households in South Africa signals more possibilities, both economic and social, for working-age adults to live alone. In the national household survey data from 2008 to 2017, analyzed in this study, adults who lived alone had significantly higher levels of education than other adults, and they were far more likely to be employed and to live in an urban area, and less likely to report a health condition. These are all characteristics associated with a greater ability to live alone.

However, living alone has also had an important political dimension in South Africa. Single-person households were a household form enforced by apartheid architecture, designed to inhibit family migration and thereby restrict the “influx” of Africans into “white” and typically urban areas of the country. Migrant workers, who were mostly male, were therefore often only “temporary” or “circular”, retaining a base in their household of origin, to which they would return in the event of unemployment, ill health or upon retirement.

Despite the removal of apartheid legislation, research has documented the persistence of these labor migration patterns since the mid-1990s (Posel & Casale, 2003; Collinson et al., 2007; Posel, 2010; Posel, 2020). This persistence has been attributed both to push factors, particularly insecurity in employment tenure and shortages in affordable family accommodation, and to pull factors from areas of origin, including a strong cultural attachment to the place where ancestors are buried and rituals are performed (Posel & Marx, 2013; Posel, 2020; Bank et al., 2020). The Marikana massacre on 16 August 2012, during which 34 miners (most of whom migrant laborers) were killed, served as a stark reminder of the durability of migrant labor patterns and the trans-locality of many migrants in South Africa (Bank et al., 2020).

In the data analyzed in this study, it was not possible to identify adults who were labor migrants in the households where they were resident members (their destination household). However, based on the

characteristics of adults who lived alone, it is highly likely that solo dwellers included labor migrants, some of whom remained “double rooted”, with roots still in their household of origin. In comparison to adults who lived with others, those who lived alone were significantly more likely to send remittances to another household (and significantly less likely to receive remittances), and they also reported a much lower preference to continue living in their current area.

In addition, solo dwellers had many of the characteristics associated with labor migrants in South Africa: they were significantly more likely to be African, male and to be living in an informal, or shack, settlement in an urban area. While it is not surprising that adults who lived alone were considerably less likely to be married than adults who lived with others, it is also telling that more than one in ten adults who lived alone was currently married.

Consistent with research in other countries, this study found that on average, adults who lived alone in South Africa reported significantly higher depression scores (as captured in the CES-D 10 scale) than adults who lived with others. This relationship remained highly significant and robust when the analysis controlled for the observable differences between the two groups of adults (in the pooled OLS models) and for unobservable and time-invariant characteristics (in the individual fixed effects model) that may vary non-randomly across sub-groups of the population.

A common explanation for why depressive symptoms have been found to vary significantly with living arrangements is that people who live with others have more access to social support structures or social networks than people who live alone. Lockdown conditions and social distancing during COVID-19 clearly highlighted the importance of social contact and social networks for people’s mental and emotional well-being (Zhang & Ma, 2020). Many studies have therefore found that controlling for social integration or social capital, for example at the neighborhood level, significantly reduces the vulnerability of solo dwellers to depression (Taylor, 2014; Stahl et al., 2017; Honjo et al., 2018; Zhang et al., 2019).

This study captured the social integration of adults using information that had been collected in all the waves of the data analyzed, on whether adults expressed a strong preference to continue living in their current area of residence. In the context of labor migration, this preference likely

describes the relationship of migrants to their destination area relative to their area of origin. Inconsistent with other research, adults who were more socially integrated (expressing strong preferences to stay) reported significantly lower depression scores on average, and the positive relationship between living alone and depression was reduced when adults with the same preferences were compared. Nonetheless, the relationship between living alone and depression scores remained positive and significant throughout all the regressions.

## 5. Conclusion

Historically, mental health services in South Africa have been significantly underfunded and mental health problems remain far less likely to be addressed than physical disorders (Sorsdahl et al., 2012; Burns, 2014). In the last decade the South African government has expressed its commitment to increase the provision of mental health services, and as articulated in the South African Declaration on the Prevention and Control of Non-Communicable diseases, to increase the number of people screened and treated for mental health problems by 30% by 2030 (Mayosi et al., 2009). When resources are scarce, the effectiveness of these interventions requires identifying which groups of the population are most at risk. This study has shown that adults who live alone in South Africa are one such group. The findings point also to the psycho-social implications of family fragmentation through labor migration, and they provide further motivation for interventions that make it possible for families to co-reside in urban areas. These interventions include the provision of affordable and safe family housing, in areas where employment opportunities are locally proximate (Hunter & Posel, 2012).

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## Ethical statement

Ethical clearance for the data used in the study was given by the Commerce Faculty Ethics Committee at the University of Cape Town. All the datasets are available in the public domain, and all information about respondent identities, used to track participants over time, has been excluded from the public release data.

## Author statement

This is a single-authored paper and all work for the paper has been done by the author.

## Declaration of competing interest

There are no conflicts of interest.

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