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Urbanicity of Residence and Depression among Adults 50 Years and Older in Ghana and South Africa: An Analysis of the WHO Study on Global Ageing and Adult Health (SAGE)

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Abstract

Objectives: As the primary cause of disability worldwide, depression is a significant contributor to global morbidity and mortality and often disproportionately affects older adults. Several studies have demonstrated a link between urban residence and depression, but few studies have examined this association among older adult populations, and even fewer have studied it within an African context. Given that African societies are aging and urbanizing at rapid rates, this study aimed to assess the relationship between urbanicity and depression within older adult populations in two African countries.

Method: Data were drawn from the Ghana and South Africa samples of the World Health Organization Study on Global AGEing and Adult Health (SAGE) wave 1 (2007–2008).

Depression over the past 12 months was measured using self-reported treatment and depressive symptoms based on ICD-10 criteria in 4,209 Ghanaian and 3,148 South African adults aged 50 years and older residing in their current location for over one year.

Results: The 12-month prevalence of depression was 7.5% and 4.0% in Ghana and South Africa, respectively; 41.1% and 65.6%, respectively, lived in urban areas. Comparing urban to rural residents, the adjusted odds ratio (OR) for depression in multivariable analysis was 1.13 (95% CI: 0.71–1.79) in South Africa and 0.85 (95% CI: 0.55–1.31) in Ghana.

Conclusion: Results do not support a significant urban-rural difference in 12-month depression among Ghanaian or South African SAGE participants. Mental health resources in rural areas should therefore be enhanced in these countries for more equitable distributions between the two settings given similar need.

Keywords

urbanization; mental health; Africa

Introduction

Depression is the primary cause of disability internationally and is a significant contributor to global morbidity and mortality (World Health Organization, 2017). The global prevalence stands between 4.1% and 4.7% for current or past month major depressive disorder (MDD) based on the Global Burden of Disease 2010 estimates (Ferrari et al., 2013), and the World Health Organization (2017) indicates that over 300 million people are currently affected. Depression not only negatively impacts quality of life, but it also increases the risk of heart disease and suicide (Ferrari et al., 2013) and can be a precursor to other mental illnesses (Freeman & Garety, 2003).

The world is urbanizing rapidly, particularly in low- and middle-income countries (LMICs) (United Nations Department of Economic and Social Affairs Population Division, 2014). In addition, the global population is aging due to declines in fertility and mortality and increases in life expectancy (Beard et al., 2016; World Health Organization, 2014), and a growing number of older adults are living in cities (Michael & Yen, 2014). The continent of Africa is projected to be the most quickly urbanizing region in the world by the start of the next decade (United Nations Department of Economic and Social Affairs Population Division, 2014). Africa has also seen large increases in life expectancy, with African countries comprising half of the nations gaining over 10 years in life expectancy between 1990 and 2012 (World Health Organization, 2014); and the size of the older adult population is increasing more quickly than in high-income countries (Velkoff & Kowal, 2006).

Several studies have demonstrated an association between urbanicity and depression—as well as other mental illnesses (Peen, Schoevers, Beekman, & Dekker, 2010). Though results vary, many findings support a rural-urban disparity with increased rates of depression among people living in urban areas (Crowell, George, Blazer, & Landerman, 1986; Karmakar & Raychaudhuri, 2015; Maguire & O'Reilly, 2015; Peen et al., 2010; Penkalla & Kohler, 2014; Sundquist, Frank, & Sundquist, 2004; J. L. Wang, 2004; Wiens, Williams, Lavorato, Bulloch, & Patten, 2017). Yet, despite the fact that older adults often face conditions that may increase their risk for depression—such as social isolation, bereavement, and declining health and functionality (Alexopoulos, 2005)—a limited number of studies have focused specifically on this age group (Abe, Fujise, Fukunaga, Nakagawa, & Ikeda, 2012; Bergdahl, Allard, Lundman, & Gustafson, 2007; Fujise et al., 2016; Kim, Stewart, Shin, Yoon, & Lee, 2004; Li, Liu, Xu, & Zhang, 2016; Walters et al., 2004). Furthermore, most of these studies come from high-income countries in Europe and North America and increasingly from Asia.

Given the suggested links between urbanicity and mental health and given that aging and urbanization are global phenomena with marked growth on the African continent, depression has the potential to be an increasing problem for the elderly and the general population as a whole in the African region. However, only a few studies were identified from the African region related to urbanicity and depression that demonstrate both supportive and unsupportive results (Amoran, Lawoyin, & Lasebikan, 2007; Lundberg, Cantor-Graae, Rukundo, Ashaba, & Ostergren, 2009; Wissing, Temane, Khumalo, Kruger, & Vorster, 2013). Thus, the paucity of studies in African settings is a noticeable gap in the literature that needs to be addressed. It is therefore pertinent that the public health community gain a better understanding of how urbanicity relates to depression in this geographic area in order to prevent and manage its occurrence in the midst of urban growth; and prioritizing research on this topic among older populations may be a particular necessity.

This study will explore the relationship between urbanicity of current residence and depression in the African nations of Ghana and South Africa to better understand these associations within an African context. Given the general trends observed in the literature so far, we hypothesize that urban residents in both countries are more likely to suffer from depression.

Methods

Data

This study used data from Wave 1 of the World Health Organization (WHO) Study on Global AGEing and Adult Health (SAGE)—a multi-country, longitudinal study of adults aged 18 years and older, with an emphasis on individuals aged 50 years and above (Kowal et al., 2012). SAGE is conducted in six low- and middle-income countries—including Ghana and South Africa in addition to China, India, Mexico, and Russia—and employs a stratified, multistage cluster design for its sampling strategy (Biritwum, 2013; Phaswana-Mafuya & Peltzer, 2013). Data in the two countries were collected in 2007 and 2008 using household and individual survey questionnaires administered through in-person interviews (Biritwum, 2013; Phaswana-Mafuya & Peltzer, 2013). Individual response rates were 80% in Ghana and 77% in South Africa (Biritwum, 2013; Phaswana-Mafuya & Peltzer, 2013). Additional details of the overall study are described elsewhere (Kowal et al., 2012).

Inclusion in the sample used for this analysis was limited to adults 50 years and older who had resided in their current location for more than one year. The residency restriction was chosen to encompass the 12-month time frame assessed for depression so as to reduce the likelihood that depression preceded residence in the area. From the 5,573 individuals contained in the Ghana dataset, exclusions were made due to respondent ages under 50 years (839), missing or unknown age (10), missing or unknown length of residency in one's current location (485), and duration of residency of 1 year or less (30). This resulted in a final sample size of 4,209 for Ghana. For South Africa, exclusions to the original 4,227 sample were also made due to an age under 50 years (385), missing age (2), missing or unknown length of residency (663), and 1 or fewer years of residency (29). The final sample size in South Africa was thus 3,148.

Measures

Depression: Individuals were classified as having depression in the past 12 months if they self-reported treatment for depression in the past 12 months or past two weeks or if in the past 12 months they met the *International Classification of Diseases*, 10th revision (ICD-10) (World Health Organization, 1993) criteria for mild depressive episode based on an algorithm developed from reported symptoms. Symptom questions in the SAGE survey were modeled after the World Mental Health Survey Composite International Diagnostic Interview (CIDI) (He, Muenchrath, & Kowal, 2012). To be classified as having depression, respondents should have reported at least two of the three basic symptoms of depressed mood, lack of energy, or loss of interest lasting at least 2 weeks in duration and occurring nearly every day. The endorsement of a combination of additional symptoms related to low confidence or self-esteem, hopelessness, suicidal thoughts or attempts, impaired concentration, psychomotor retardation or agitation, sleep disturbance, or appetite changes was also required to reach a total of at least 4 symptoms.

Urbanicity: The exposure of interest, urbanicity of participants' current area of residence, was based on the household questionnaire item designating the household setting as either urban ("an urban area that has been legally proclaimed as being urban. Such areas include towns, cities and metropolitan areas") or rural ("all other areas that are not classified as being urban. This includes commercial farms, small settlements, rural villages and other areas which are further away from towns and cities"). In Ghana, areas are considered urban if the population is at least 5,000 while South Africa designations are based on a combination of land use and type of settlement (Ghana Statistical Service, 2012; Statistics South Africa, 2003). Two participants in the South Africa dataset had missing information on household setting. However, information on municipality names was used to assign an urban-rural designation for 1 of these participants.

Socio-Demographic Variables: Age (50–59, 60–69, 70–79, and 80+), sex (male/female), marital status (never married, currently married/cohabiting, separated/divorced, widowed), education level (no formal education, some primary, primary completed, secondary completed, post-secondary completed), household size, and employment status (currently working, not currently working, never worked) were among the covariates considered. Wealth was measured in quintiles based on household permanent income derived from a list of country-specific assets including the possession of hard goods, access to water, sanitation and cooking fuel, and physical properties of the residence (i.e., floors, walls, stove) (Ferguson, Tandon, Gakidou, & Murray, 2003). Religion categories were reduced to none, Christianity, Islam, primal indigenous, and other in Ghana; and the additional category of Hinduism was also included in South Africa. Ethnicity was classified as Akan, Ewe, Ga-Adangbe, Gur, and other for Ghana and as African/Black, White, Coloured, Indian/Asian, and other for South Africa.

To isolate the effects of urbanicity from those of migration, residential mobility was also included as a covariate and was based on responses to the question "have you always lived in this village/town/city?" (yes/no). Bereavement was also assessed as a potential covariate based on household deaths in the past 24 months (yes/no).

Functional Disability: Functional disability was used as a marker of overall health status and chronic conditions and was calculated as a score based on the 12-item WHO Disability Assessment Schedule-II (Sousa et al., 2010). The items assessed trouble performing activities in the past 30 days, such as concentrating or learning a new task, interacting with friends and strangers, participating in community activities, standing, taking care of household responsibilities or daily work, walking, bathing, and dressing. Scores were based on Likert scale ratings of 1 (none) to 5 (extreme/can't do), with a total possible functional disability score range from 12 (no disability) to 60 (extreme disability). If a respondent did not have a response to all 12 items, their total score was prorated by averaging the scores based on the number of answered questions and multiplying this average by 12.

Cognitive Performance: Cognitive performance was based on five cognitive tests: immediate and delayed verbal recall, forward digit span, backward digit span, and verbal fluency. Verbal recall was tested through the number of words correctly repeated by the respondent from a list of 10 words recited by the interviewer. Immediate verbal recall was assessed with 3 trials, and scores were summed across the trials. For individuals without all 3 trials, scores were prorated by averaging the sum score for the number of completed trials and multiplying by 3, the expected total number of trials. Delayed verbal recall required respondents to remember the same list of 10 words after the completion of other tests (approximately 10 minutes later). Digit span scores were the longest digit sequence recited back correctly by the respondent, both forwards and backwards, after hearing a sequence of numbers (maximum of 9). Verbal fluency scores were based on the number of animals the respondent could correctly name in one minute. Z-scores were calculated for each cognitive test to standardize the results, and these were summed to produce a composite z-score. Overall z-scores were also prorated for those who did not complete all 5 tests by multiplying the average of the z-scores for the completed tests by 5.

Statistical Analysis

Data were analyzed using STATA 13. Point estimates for variables were calculated using the raw sample data as well as after applying individual survey weights using the `svy` command in STATA to produce nationally representative estimates. The `svy` command uses the Taylor linearization method to estimate standard errors (StataCorp, 2013). Personal weights in the SAGE survey were calculated based on the individual selection probability and were post-stratified by region, locality, sex, and age in Ghana and by province, sex, and age in South Africa. Weights were not normalized (Biritwum, 2013; Phaswana-Mafuya & Peltzer, 2013). Because some strata in the South Africa dataset contained only one primary sampling unit, which does not allow for estimation of variance, these single unit strata were centered at the overall mean.

Bivariate logistic regression models were run to determine the unadjusted association between independent variables and the depression outcome. Multivariable logistic regression was used to calculate odds ratios (ORs) for depression comparing urban to rural residents and adjusting for key demographic variables and covariates significantly associated with the outcome in each country. Age, sex, and residential mobility were included *a priori* as covariates.

Although weighting is generally considered to produce unbiased estimates (Korn & Graubard, 2011), the utility of applying weights beyond descriptive statistics—which are intended to be nationally representative—to inferential statistics is debated (Korn & Graubard, 2011; Solon, Haider, & Wooldridge, 2015). Moreover, in cases where weights are highly variable, they can lead to inefficient estimates (Korn & Graubard, 2011). As a result, we conducted exploratory data analysis of the weights to determine their distribution and potential inefficiency. Weights were very widely distributed and resulted in substantial inefficiency, particularly for South Africa. Therefore, regression analyses did not apply weights but employed design-based models accounting for clustering and stratification using the svy command in STATA while also adjusting for most variables related to the survey design as an alternative (Korn & Graubard, 2011). However, to assess the sensitivity of results to the survey design, the main unweighted analyses were compared to secondary analyses using design-based models adjusting for survey weights as well as clustering and stratification (results not shown). Weighted estimates for Ghana were similar to unweighted results; and while the magnitude of the main effect differed for South Africa in weighted unadjusted analyses, differences between weighted and unweighted models attenuated after adjustment. Thus, the conclusions of the analysis for the main effect in both countries were unchanged after weighting.

Ethics

This study was given a determination of Not Human Subjects Research by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board due to its secondary analysis of existing, de-identified data available from the WHO for research.

Results

Characteristics of the Sample

In the Ghanaian sample, 41.1% of adults 50 years and older lived in urban areas based on national population estimates from the sample. Table 1 presents the characteristics of the Ghana sample by urban-rural residence and their corresponding national estimates. Apart from recent household deaths, which were equally low among urban and rural residents, there were significant urban-rural differences in all other sociodemographic characteristics of the sample. At the population level based on weighted estimates, employment status, education, wealth, ethnicity, and religion differed significantly between urban and rural residents. In particular, urban residents were more likely to be currently unemployed, have education, come from wealthier households, belong to Akan or Gur ethnic groups, and practice Christianity or Islam.

Nationally, 65.6% of older adults 50 years and older in South Africa were urban residents. Table 2 presents descriptive statistics for the South Africa sample. Population estimates indicate that urban residents were significantly more likely to be educated, have more wealth, have ever worked, be non-Black, and have ever moved but less likely to practice no or traditional religion.

The national prevalence of 12-month depression among adults 50 years and older was 7.5% and 4.0% in Ghana and South Africa, respectively.

Association between Urbanicity and Depression

Missing data for relevant variables were minimal, comprising generally 3% or less of respondents. As a result, all analyses were conducted as complete case analyses. In the Ghanaian sample, 7.2% of urban compared to 7.8% of rural residents were depressed, resulting in a crude odds ratio (OR) for depression comparing urban to rural Ghanaian residents of 0.92 (95% CI: 0.61–1.39). Sex, age, level of education, wealth, employment status, ethnicity, residential mobility, bereavement, functional disability, and cognitive function were independently associated with the depression outcome and therefore included in the multivariable model (Table 3). After adjusting for covariates, the association between urbanicity and depression was 0.85 (95% CI: 0.55–1.31).

Women had a 39% increased odds (95% CI: 5% to 84%) of depression compared to men. Additionally, older age groups were more likely to be depressed than younger age groups, increasing in a stepwise fashion, which was nonsignificant after adjustment. Current unemployment also led to significantly increased odds of depression compared to those currently working, while moving during one's lifetime significantly reduced the odds of depression. Likewise, increased cognitive function significantly reduced the odds of depression. No consistent pattern was seen with depression for education or household income after adjustment; however, completing secondary school and belonging to the 2nd income quintile significantly increased the odds of depression compared to those without schooling and those in the lowest household income quintile.

In South Africa, 3.3% of rural and 4.8% of urban residents in the sample suffered from depression in the past 12 months. The unadjusted OR for 12-month depression comparing urban to rural residents in South Africa was 1.46 (95% CI: 0.94–2.28) and was only significant at the 10% alpha level. Age, marital status, education level, employment status, ethnicity, wealth, and functional disability were significantly associated with depression in bivariate analyses (Table 4) and included in the multivariable model along with sex and residential mobility. After controlling for covariates, the adjusted OR for the association between urbanicity and depression remained nonsignificant but was decreased to 1.13 (95% CI: 0.71–1.79).

In the adjusted model, the odds of depression significantly decreased in a dose-response fashion with increasing age in the South Africa sample. Separated, divorced, or widowed individuals had significantly greater odds of depression than those who were never married, as did those who were currently unemployed or had never worked compared to those currently working. Individuals from wealthier households, particularly those in the middle and upper quintiles, also appeared to be at significantly increased risk of experiencing depression. The odds of depression also significantly increased with increasing functional disability by 4% (95% CI: 2%–6%) for each point increase in the functional disability score.

Discussion

Although relatively little population-based literature on depression in either country is available, the overall prevalence of depression among older adults in Ghana (7.5%) and South Africa (4.0%) based on this analysis was consistent with other findings (Ferrari et al., 2013; Tomlinson, Grimsrud, Stein, Williams, & Myer, 2009), as well as estimates from other studies involving SAGE data (He et al., 2012; Peltzer & Phaswana-Mafuya, 2013; Thapa, Martinez, & Clausen, 2014). The results of this analysis did not confirm the hypothesis of higher rates of depression among urban residents. These findings contradict previous meta-analysis results, which indicated significant unadjusted and adjusted odds ratios of 1.39 (95% CI: 1.23–1.58) and 1.28 (95% CI: 1.13–1.44), respectively, for mood disorders including depression in urban compared to rural residents (Peen et al., 2010), as well as a more recent systematic review of urbanicity and mental illness in Europe which revealed that of nine studies examining mood disorders, seven found at least some evidence of a higher occurrence of mood disorders in urban settings (Penkalla & Kohler, 2014). They also contrast with other individual studies (Karmakar & Raychaudhuri, 2015; Kim et al., 2004; Maguire & O'Reilly, 2015; Vassos, Agerbo, Mors, & Pedersen, 2016; Walters et al., 2004; Wiens et al., 2017), although these findings are again based on studies from Europe, North America, and Asia.

Among studies within African settings, some have also demonstrated higher rates of depression among urban residents. A study from Uganda found that Ugandans born in urban areas reported significantly more depressive symptoms in the past week compared to those born in rural areas (Lundberg et al., 2009), and significantly more cases of lifetime and 12-month major depressive disorder were observed in urban compared to rural Nigerian older adults, though results lost significance after adjusting for economic status (Gureje, Kola, & Afolabi, 2007). A recent analysis from the South Africa National Income Dynamics Study also observed significantly lower depressive symptoms in areas classified as rural and tribal authorities compared to urban informal areas (Tomita et al., 2017). Though nonsignificant, the direction of effects for South Africa in the current analysis also appeared to suggest potentially greater odds of 12-month depression in urban residents in line with the aforementioned studies. However, other South African studies conducted by Wissing et al. (2013) found no significant urban-rural difference or a rural preponderance in depressive symptoms, but results were not adjusted for demographic or other characteristics.

Conversely, all models for Ghana in the present analysis consistently demonstrated slightly lower, though nonsignificant, odds of depression for urban residents. This is in line with some studies, as not all literature has consistently supported a positive association between urbanicity and depression, including in Taiwan (Cheng, 1989), former Soviet nations (Stickley, Koyanagi, Roberts, & McKee, 2015), China (Li et al., 2016), Sweden (Bergdahl et al., 2007), Japan (Abe et al., 2012; Fujise et al., 2016) Nigeria (Amoran et al., 2007; Idowu, Yusuf, Akpa, & Gureje, 2016), and the United States (Breslau, Marshall, Pincus, & Brown, 2014; Probst et al., 2006).

Although no studies have examined the association between urbanicity and depression as a primary research question using SAGE data, a few peer-reviewed studies have explored

correlates of depression in SAGE countries. Unlike the present analysis, some of these studies used more limited definitions of depression; and their samples included all individuals 50 or older regardless of length of residence, which does not address the potential for selective migration. Nonetheless, those studies involving South Africa and Ghana likewise did not find a significant association between residence and measures of depression in these samples (Anand, 2015; Minicuci et al., 2014; Peltzer & Phaswana-Mafuya, 2013; Thapa et al., 2014), which lends support to the results presented here.

Although no significant difference was found for the association between urbanicity and depression in either South Africa or Ghana, the results may indicate a weak trend towards different directions of effects in each. Reasons for slight differences between the two countries and disparate findings in other studies may reflect contextual differences between settings in the nature of urban and rural areas and of urbanization. The literature similarly suggests that variation in the association between depression and urbanicity may be affected by factors relating to the local context (Cheng, 1989; Stickley et al., 2015). Differences may also result from variations in underlying mechanisms for the urbanicity-depression relationship. Although the mechanisms remain unclear, a number of factors have been hypothesized, including lack of access to green space, neighborhood disadvantage, poverty, poor nutrition and harmful exposures in early life, and social fragmentation (Galea, 2011; McKenzie, 2008). From the perspective of an ‘urban health penalty’ (Eckert & Kohler, 2014; Vlahov & Galea, 2002), many of these detrimental factors are believed to be more common among city-dwellers in certain settings; however, this too may be context-specific.

In terms of model results for other variables in the current analysis, women in Ghana were consistently at greater odds of experiencing depression in the last year, which is in accordance with the general preponderance of depression among women globally (Parker & Brotchie, 2010; K. Wang et al., 2016) as well as some other SAGE analyses for Ghana (Minicuci et al., 2014; Thapa et al., 2014). However, no significant difference was seen by gender in South Africa, which confirms results in some SAGE studies (Brinda et al., 2016; Peltzer & Phaswana-Mafuya, 2013; Thapa et al., 2014), though other studies across all age groups have observed significant gender differences in South Africans (Gorrindo, Chatterji, Kowal, Epstein, & Weinstein, 2013; Tomita, Labys, & Burns, 2015; Tomlinson et al., 2009).

The direction of effects for age on depression also differed between the two countries, with odds increasing with age in Ghana—though not significantly after adjustment—but decreasing significantly with age in South Africa. This also confirms patterns seen in other findings (Anand, 2015; Minicuci et al., 2014; Peltzer & Phaswana-Mafuya, 2013; Thapa et al., 2014). Marital status did not have a significant effect on depression in Ghana, although the direction of effects was as expected. However, it was a significant factor in South Africa in the expected direction, although those never married appeared to be uncharacteristically at the least risk, which has been reported elsewhere (Kessler & Bromet, 2013).

Lack of employment was a significant risk factor for depression in both countries as expected (Zimmerman & Katon, 2005), but having never worked in Ghana appeared protective, though the numbers in this category were low. In some cases, never working may be a voluntary choice and thus would differ qualitatively from unemployment, which may

explain this result. Or it may require greater self-reliance and enhance self-efficacy and a sense of control, thus reducing depression (Link, Lennon, & Dohrenwend, 1993).

Although socioeconomic status is generally believed to have an inverse relationship with depression and poverty is viewed as a risk factor (Link et al., 1993; Zimmerman & Katon, 2005), surprisingly, education and wealth did not have predictable patterns with depression in either country; and whereas education was protective in Ghana in unadjusted analyses, it appeared to become a risk factor otherwise and was only slightly protective at the highest levels in the adjusted South Africa analyses. Wealth also appeared to be more of a risk factor in general except at the highest quintile in Ghana and the 2nd quintile in South Africa, which were the only estimates in the expected direction but were nonetheless not significantly different from the lowest quintile. These unanticipated results may have been affected by multicollinearity between education and wealth. To assess this, variance inflation factors (VIFs) were calculated for models containing these variables to quantify how much the variances of model estimates were inflated due to multicollinearity. However, VIFs were found to be in the range of 1–2 in both countries, which is much lower than the value of 10 typically designated as an indicator of multicollinearity (Miles, 2005). Furthermore, the literature suggests that education has a more regular association with common mental disorders than income (Patel & Kleinman, 2003), and a few other SAGE studies confirm similar irregular and nonsignificant patterns in South Africa (Peltzer & Phaswana-Mafuya, 2013; Ramlagan, Peltzer, & Phaswana-Mafuya, 2013). Alternatively, results may be related to the quality of the wealth measurement itself, although its basis on household possessions rather than reported income or expenditures should be less prone to bias (Ferguson et al., 2003).

Residential mobility was consistently protective against depression in the Ghanaian setting, which also goes against assumptions and findings that migration and mobility are risk factors for depression and mental illness because of their disruptive effects on stability and social ties, associations with a sense of loss, or difficulties with adjustment (Bhugra, 2003). However, given the diversity of reasons for migration and of outcomes following migration, acclimatization processes, and characteristics of migrants, impacts on mental health may vary; and research does point to variation in rates of depressive disorders in migrants (Bhugra, 2003).

Results for health status variables, specifically functional disability and in Ghana cognitive function, were consistent with the literature and in the expected direction (Cole & Dendukuri, 2003). Cognitive function did not appear to have much of an effect among South Africans in this analysis, which is in agreement with findings from Peltzer and Phaswana-Mafuya (2013); and a meta-analysis has likewise demonstrated ambiguous associations between cognitive impairment and depression in older adults (Cole & Dendukuri, 2003).

Analyses were also run with additional depression-related outcomes using less stringent definitions to capture possible subsyndromal cases of depression. Specifically, we used an outcome only requiring at least 2 of the 3 key depressive symptoms (depressed mood, lack of energy, or loss of interest) lasting several days in the past 12 months; and a dichotomous none/any outcome was created from a survey item on depressed affect based on the question

“overall in the last 30 days, how much of a problem did you have with feeling sad, low or depressed?” Results of these additional analyses (not shown) also did not indicate a significant difference between rural and urban residents, and for the most part the direction of effects for these depression-related outcomes appeared to be similar.

A sizeable number of observations were excluded from the sample because they did not meet the inclusion criteria due to missing data. Many of these individuals were similarly missing information on several covariates and the depression outcome. However, there was no significant difference between excluded respondents and the remaining sample in terms of urban-rural exposure, so it is not expected that their exclusion would have introduced considerable bias to the results.

A limitation of this study is that the data are cross-sectional, so the ability to draw conclusions about causation is limited since temporal order cannot be verified. While we restricted the sample to individuals with more than one year of residence in their current location to minimize the potential for depressed individuals selectively moving to urban or rural areas, one cannot completely rule out the possibility that the outcome preceded the exposure. Nonetheless, according to a study of Finnish residents, depressive symptoms were not found to predict subsequent residential mobility or movement to areas of different population density—a measure of urbanicity—thus suggesting no evidence of selective movement in this setting (Airaksinen et al., 2016). And other studies that have utilized longitudinal data to arrive at incidence have still observed significant effects (Sundquist et al., 2004). An additional limitation was that the assessment of urbanicity was restricted to an urban-rural dichotomy based on the data, and this may mask important distinctions among areas that fall along the continuum of urbanicity because urban-rural binary classifications and measures based on unidimensional factors may not adequately account for the variations and multidimensionality of the construct (Dahly & Adair, 2007). Furthermore, although the WHO CIDI on which the depression section of the SAGE survey is based is a common tool for international use on psychiatric disorders that has been previously tested in international settings (Wittchen, 1994), there remains the question of the appropriateness of standard measures because of cross-cultural differences in how individuals may respond to items eliciting depressive symptoms—or even in the manifestation of depression itself—that may bias results (Draguns & Tanaka-Matsumi, 2003; Patten, 2003). However, cross-national research has demonstrated a similar cluster of symptoms for depression (Draguns & Tanaka-Matsumi, 2003; Simon, Goldberg, Von Korff, & Üstün, 2002), though there are cultural differences in the relative contribution of various symptoms (Draguns & Tanaka-Matsumi, 2003). Despite these limitations, this study is crucial in expanding and contributing to knowledge on the association between urbanicity and depression in older adult populations and specifically from middle-income African countries, which have been understudied. Moreover, the use of population-based survey data from SAGE as opposed to clinical or other geographically limited samples increases confidence in the findings.

Conclusion

The study results do not support a significant difference in the odds of 12-month depression between urban and rural SAGE participants in Ghana or South Africa. The implications of

this research are that the allocation of mental health resources for prevention and treatment may not need differential distribution between these setting types; thus, because mental health resources in Africa are disproportionately concentrated in urban areas (Monteiro, 2015), the governments of Ghana and South Africa should bolster resources in rural areas to address inequities if rural residents are indeed no less likely to suffer from depression than their urban counterparts. Further research should attempt to replicate these findings, assess more detailed measurements of urbanicity, use other statistical techniques and employ longitudinal study designs to ensure robustness of results.

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Table 1:

Sociodemographic Characteristics of the Ghana Sample

	Rural (n=2487)		Urban (n=1722)		Total (N=4209)	
	N	% (w%)	N	% (w%)	N	% (w%)
Sex						
Male	1385	55.7 (53.2)	832	48.3 (52.3)	2217	52.7 (52.8)
Female	1102	44.3 (46.8)	890	51.7 (47.7)	1992	47.3 (47.2)
Age Categories						
50–59	920	37.0 (38.2)	727	42.2 (41.8)	1647	39.1 (39.7)
60–69	709	28.5 (28.0)	475	27.6 (27.1)	1184	28.1 (27.6)
70–79	593	23.8 (23.7)	369	21.4 (22.2)	962	22.9 (23.1)
80+	265	10.7 (10.1)	151	8.8 (8.9)	416	9.9 (9.6)
Employment Status^a						
Currently Working	1909	76.9 (76.9)	1109	64.6 (63.7)	3018	71.9 (71.5)
Never Worked	34	1.4 (1.3)	29	1.7 (2.2)	63	1.5 (1.6)
Not Working	539	21.7 (21.9)	579	33.7 (34.1)	1118	26.6 (26.9)
Marital Status^a						
Never Married	25	1.0 (1.1)	25	1.5 (1.5)	50	1.2 (1.3)
Married/Cohabiting	1488	60.1 (60.7)	901	52.7 (57.5)	2389	57.1 (59.5)
Separated/Divorced	310	12.5 (11.7)	282	16.5 (14.7)	592	14.1 (12.9)
Widowed	652	26.3 (26.5)	503	29.4 (26.1)	1155	27.6 (26.3)
Highest Education Level^a						
No Formal Education	1544	62.5 (61.2)	756	44.1 (43.4)	2300	55.0 (53.9)
Some Primary	262	10.6 (11.0)	157	9.2 (9.5)	419	10.0 (10.4)
Primary Completed	243	9.8 (10.2)	209	12.2 (11.8)	452	10.8 (10.9)
Secondary Completed	376	15.2 (15.6)	488	28.5 (29.3)	864	20.6 (21.2)
Post-Secondary Completed	47	1.9 (2.0)	103	6.0 (6.0)	150	3.6 (3.7)
Permanent Income Quintile^a						
1	678	27.3 (25.5)	153	8.9 (7.6)	831	19.8 (18.1)
2	610	24.5 (23.7)	221	12.9 (12.5)	831	19.8 (19.1)

	Rural (n=2487)		Urban (n=1722)		Total (N=4209)		
	N	% (w%)	N	% (w%)	N	% (w%)	
3	556	22.4 (23.9)	274	15.9 (15.1)	830	19.7 (20.3)	
4	423	17.0 (17.4)	439	25.6 (25.9)	862	20.5 (20.9)	
5	219	8.8 (9.5)	631	36.7 (38.9)	850	20.2 (21.6)	
Ethnicity^a							p<0.001
Akan	1127	46.1 (46.7)	895	52.9 (52.0)	2022	48.9 (48.9)	
Ewe	174	7.1 (8.4)	115	6.8 (5.9)	289	7.0 (7.4)	
Ga-Adangbe	220	9.0 (9.5)	205	12.1 (11.7)	425	10.3 (10.4)	
Gur	169	6.9 (6.6)	188	11.1 (13.3)	357	8.6 (9.3)	
Other	753	30.8 (28.8)	288	17.0 (17.1)	1041	25.2 (24.0)	
Religion^a							p<0.001
None	151	6.1 (6.0)	59	3.4 (3.2)	210	5.0 (4.8)	
Christianity	1573	63.4 (65.4)	1313	76.4 (75.5)	2886	68.7 (69.6)	
Islam	370	14.9 (14.3)	294	17.1 (18.2)	664	15.8 (15.9)	
Primal Indigenous	372	15.0 (13.6)	43	2.5 (2.4)	415	9.9 (9.0)	
Other	14	0.6 (0.8)	9	0.5 (0.7)	23	0.5 (0.7)	
Ever Moved^a							p=0.027 (p=0.212)
No	1708	68.7 (69.1)	1126	65.4 (65.0)	2834	67.3 (67.5)	
Yes	779	31.3 (30.9)	595	34.6 (35.0)	1374	32.7 (32.5)	
Any Household Deaths In 24 Months?^a							p=0.503 (p=0.672)
No	2450	98.6 (98.6)	1691	98.8 (98.8)	4141	98.7 (98.7)	
Yes	35	1.4 (1.4)	20	1.2 (1.2)	55	1.3 (1.3)	
	Mean (wMean)	SE (adj SE)	Mean (wMean)	SE (adj SE)	Mean (wMean)	SE (adj SE)	
Total Household Members	5.61 (5.55)	0.07 (0.11)	5.37 (5.64)	0.08 (0.14)	5.52 (5.59)	0.05 (0.08)	p=0.020 (p=0.603)
Functional Disability Score	21.91 (21.95)	0.17 (0.35)	21.32 (21.21)	0.22 (0.41)	21.67 (21.65)	0.13 (0.26)	p=0.033 (p=0.163)
Cognitive Performance Z-Score	-0.32 (-0.34)	0.07 (0.13)	0.30 (0.38)	0.09 (0.17)	-0.07 (-0.05)	0.05 (0.10)	p<0.001

SE: standard error; w or adj denote weighted or adjusted values accounting for the sampling weights.

p-values in parentheses correspond to weighted estimates and are based on Pearson design-based F statistics (categorical variables) or adjusted Wald tests (continuous variables). Where no second p-value is listed, the p-value is also <0.001 as in the standard chi-square or T-test for unweighted results.

^aTotals for variable are less than the sample total due to missing data.

Table 2:

Sociodemographic Characteristics of the South Africa Sample

	Rural (n=1036)		Urban (n=2111)		Total (N=3148)	
	N	% (w%)	N	% (w%)	N	% (w%)
Sex						
Male	442	42.7 (38.8)	814	38.6 (41.0)	1256	39.9 (40.3)
Female	594	57.3 (61.2)	1297	61.4 (59.0)	1891	60.1 (59.7)
Age Categories						
50–59	425	41.0 (47.2)	947	44.9 (51.1)	1372	43.6 (49.7)
60–69	330	31.9 (30.8)	703	33.3 (31.4)	1033	32.8 (31.2)
70–79	204	19.7 (16.2)	346	16.4 (13.2)	550	17.5 (14.2)
80+	77	7.4 (5.8)	115	5.4 (4.4)	192	6.1 (4.9)
Employment Status^a						p<0.001
Currently Working	274	26.5 (25.4)	579	27.7 (33.1)	853	27.3 (30.4)
Never Worked	180	17.4 (23.2)	227	10.8 (8.4)	407	13.0 (13.5)
Not Working	579	56.1 (51.4)	1287	61.5 (58.5)	1866	59.7 (56.1)
Marital Status^a						p=0.033 (p=0.308)
Never Married	116	11.5 (15.3)	321	15.4 (15.1)	437	14.1 (15.1)
Married/Cohabiting	525	52.0 (49.8)	1042	50.0 (54.4)	1567	50.7 (52.8)
Separated/Divorced	69	6.8 (6.3)	134	6.4 (6.7)	203	6.6 (6.5)
Widowed	300	29.7 (28.6)	585	28.1 (23.8)	885	28.6 (25.5)
Highest Education Level^a						p<0.001
No Formal Education	427	41.9 (39.2)	359	17.4 (15.1)	786	25.5 (23.4)
Some Primary	284	27.9 (27.1)	480	23.2 (23.2)	764	24.7 (24.5)
Primary Completed	157	15.4 (16.6)	595	28.8 (26.8)	752	24.4 (23.3)
Secondary Completed	120	11.8 (14.3)	509	24.6 (27.4)	629	20.4 (22.9)
Post-Secondary Completed	30	2.9 (2.9)	126	6.1 (7.5)	156	5.1 (5.9)
Permanent Income Quintile^a						p<0.001
1	318	30.8 (33.0)	292	13.9 (14.6)	610	19.5 (20.9)
2	256	24.8 (23.8)	364	17.3 (17.5)	620	19.8 (19.7)
3	211	20.5 (21.1)	402	19.1 (17.3)	613	19.6 (18.6)

	Rural (n=1036)		Urban (n=2111)		Total (N=3148)	
	N	% (w%)	N	% (w%)	N	% (w%)
4	162	15.7 (14.4)	478	22.7 (22.7)	640	20.4 (19.8)
5	84	8.1 (7.6)	567	27.0 (28.0)	651	20.8 (21.0)
Ethnicity ^a						p<0.001
African/Black	861	83.5 (91.4)	1087	51.6 (64.4)	1948	62.1 (73.7)
White	50	4.8 (4.0)	207	9.8 (12.3)	257	8.2 (9.4)
Coloured	105	10.2 (3.9)	536	25.5 (18.2)	641	20.4 (13.3)
Indian/Asian	14	1.4 (0.6)	269	12.8 (4.9)	283	9.0 (3.5)
Other	1	0.1 (0.1)	6	0.3 (0.1)	7	0.2 (0.1)
Religion ^a						p<0.001
None	110	10.6 (10.8)	42	2.0 (2.1)	152	4.9 (5.1)
Christianity	867	83.9 (83.1)	1802	85.8 (89.3)	2669	85.2 (87.1)
Hinduism	6	0.6 (0.1)	105	5.0 (2.1)	111	3.5 (1.4)
Islam	2	0.2 (0.2)	96	4.6 (3.7)	98	3.1 (2.5)
Primal Indigenous	38	3.7 (4.2)	10	0.5 (0.6)	48	1.5 (1.9)
Other	10	1.0 (1.6)	45	2.1 (2.2)	55	1.8 (2.0)
Ever Moved ^a						p=0.115 (p=0.027)
No	773	74.7 (74.9)	1519	72.0 (67.2)	2292	72.9 (69.9)
Yes	262	25.3 (25.1)	590	28.0 (32.8)	852	27.1 (30.1)
Any Household Deaths In 24 Months? ^a						p=0.738 (p=0.263)
No	1034	99.8 (99.9)	2104	99.9 (99.7)	3138	99.8 (99.7)
Yes	2	0.2 (0.1)	3	0.1 (0.3)	5	0.2 (0.3)
	Mean (wMean)	SE (adj SE)	Mean (wMean)	SE (adj SE)	Mean (wMean)	SE (adj SE)
Total Household Members	4.05 (4.35)	0.08 (0.18)	4.05 (3.89)	0.05 (0.14)	4.05 (4.05)	0.04 (0.11)
Functional Disability Score	19.81 (21.03)	0.27 (0.62)	19.97 (20.30)	0.19 (0.39)	19.92 (20.55)	0.15 (0.32)
Cognitive Performance Z-Score	-0.51 (-0.57)	0.12 (0.22)	0.17 (0.32)	0.08 (0.18)	-0.05 (0.02)	0.07 (0.14)

SE: standard error; w or adj denote weighted or adjusted values accounting for the sampling weights.

p-values in parentheses correspond to weighted estimates and are based on Pearson design-based F statistics (categorical variables) or adjusted Wald tests (continuous variables). Where no second p-value is listed, the p-value is also <0.001 as in the standard chi-square or T-test for unweighted results.

^aTotals for variable are less than the sample total due to missing data.

Table 3:

Regression Results for Odds of Depression in Ghana

	Unadjusted OR (CI)	Adjusted OR (CI)
Residence		
Rural	Ref	Ref
Urban	0.92 (0.61–1.39)	0.85 (0.55–1.31)
Sex		
Male	Ref	Ref
Female	1.66 (1.30–2.12) ***	1.39 (1.05–1.84) *
Age		
50–59	Ref	Ref
60–69	1.46 (1.06–2.02) *	1.25 (0.86–1.93)
70–79	1.76 (1.25–2.50) **	1.27 (0.81–1.99)
80+	2.73 (1.87–3.99) ***	1.48 (0.84–2.61)
Marital Status		
Never married	Ref	-
Married/Cohabiting	0.71 (0.21–2.36)	-
Separated/Divorced	1.25 (0.36–4.30)	-
Widowed	1.29 (0.37–4.46)	-
Education Level		
None	Ref	Ref
Some Primary	0.84 (0.57–1.24)	1.27 (0.84–1.93)
Primary Completed	0.51 (0.32–0.81) **	0.81 (0.48–1.34)
Secondary Completed	0.77 (0.57–1.05)	1.60 (1.03–2.47) *
Post-Secondary Completed	0.44 (0.18–1.10)	1.27 (0.48–3.38)
Ethnicity		
Akan	Ref	Ref
Ewe	0.51 (0.27–0.97) *	0.52 (0.27–0.99) *
Ga-Adangbe	0.59 (0.34–1.02)	0.60 (0.34–1.06)
Gur/Northern	1.00 (0.60–1.67)	1.22 (0.71–2.09)
Other	0.74 (0.47–1.17)	0.78 (0.46–1.30)
Religion		
None	Ref	-
Christianity	0.77 (0.45–1.33)	-
Islam	1.07 (0.58–1.95)	-
Primal indigenous	0.70 (0.33–1.48)	-
Other	Cd	-
Ever Moved		

	Unadjusted OR (CI)	Adjusted OR (CI)
No	Ref	Ref
Yes	0.51 (0.35–0.74) ***	0.54 (0.36–0.80) **
Employment Status		
Currently working	Ref	Ref
Never worked	0.25 (0.03–1.89)	0.19 (0.03–1.48)
Not working	2.10 (1.63–2.71) ***	1.61 (1.18–2.18) **
Permanent Income Quintile		
1	Ref	Ref
2	1.56 (1.10–2.22) *	1.65 (1.14–2.38) **
3	1.07 (0.72–1.59)	1.06 (0.69–1.64)
4	1.11 (0.72–1.70)	1.10 (0.70–1.75)
5	0.73 (0.48–1.11)	0.83 (0.52–1.34)
Recent Household Deaths		
No	Ref	Ref
Yes	2.43 (1.09–5.40) *	2.38 (0.94–6.06)
Total Household Members	1.01 (0.96–1.06)	-
Functional Disability	1.03 (1.02–1.05) ***	1.00 (0.98–1.02)
Cognitive Performance	0.89 (0.87–0.92) ***	0.93 (0.89–0.96) ***

*
p<0.05

**
p<0.01

***
p<0.001

p<0.1 in italics

Cd: category dropped out of the analysis due to an absence of depression cases

Table 4:

Regression Results for Odds of Depression in South Africa

	Unadjusted OR (CI)	Adjusted OR (CI)
Residence		
Rural	Ref	Ref
Urban	1.46 (0.94–2.28)	1.13 (0.71–1.79)
Sex		
Male	Ref	Ref
Female	1.25 (0.86–1.82)	0.96 (0.65–1.42)
Age		
50–59	Ref	Ref
60–69	0.55 (0.37–0.81) **	0.36 (0.23–0.56) ***
70–79	0.48 (0.28–0.83) **	0.24 (0.12–0.45) ***
80+	0.17 (0.04–0.67) *	0.08 (0.02–0.32) **
Marital Status		
Never married	Ref	Ref
Married/Cohabiting	1.26 (0.69–2.31)	1.26 (0.67–2.37)
Separated/Divorced	2.38 (1.10–5.13) *	2.46 (1.07–5.65) *
Widowed	1.69 (0.89–3.22)	2.09 (1.03–4.22) *
Education Level		
None	Ref	Ref
Some Primary	1.64 (0.95–2.84)	1.23 (0.70–2.16)
Primary Completed	1.81 (1.04–3.14) *	1.21 (0.68–2.15)
Secondary Completed	1.68 (0.96–2.92)	0.97 (0.49–1.91)
Post-Secondary Completed	1.38 (0.51–3.78)	0.77 (0.23–2.56)
Ethnicity		
African/Black	Ref	Ref
White	1.65 (0.92–2.94)	1.48 (0.65–3.37)
Coloured	1.39 (0.90–2.13)	1.16 (0.76–1.78)
Indian/Asian	2.21 (1.26–3.87) **	1.34 (0.71–2.56)
Other	Cd	Cd
Religion		
None	Ref	-
Christianity	1.11 (0.35–3.56)	-
Hinduism	3.08 (0.86–10.99)	-
Islam	1.20 (0.27–5.35)	-
Primal indigenous	3.09 (0.83–11.59)	-
Other	0.50 (0.05–5.40)	-

	Unadjusted OR (CI)	Adjusted OR (CI)
Ever Moved		
No	Ref	Ref
Yes	1.21 (0.82–1.78)	1.09 (0.74–1.60)
Employment Status		
Currently working	Ref	Ref
Never worked	<i>1.93 (0.95–3.95)</i>	2.18 (1.02–4.67) *
Not working	2.21 (1.26–3.88) **	3.07 (1.71–5.51) ***
Permanent Income Quintile		
1	Ref	Ref
2	0.95 (0.48–1.87)	0.87 (0.43–1.77)
3	2.00 (1.13–3.54) *	<i>1.74 (0.99–3.03)</i>
4	1.87 (1.00–3.49) *	1.59 (0.82–3.09)
5	2.05 (1.16–3.64) *	2.13 (1.10–4.15) *
Recent Household Deaths		
No	Ref	-
Yes	5.54 (0.58–52.74)	-
Total Household Members	0.94 (0.87–1.02)	-
Functional Disability	1.03 (1.02–1.05) ***	1.04 (1.02–1.06) ***
Cognitive Performance	1.02 (0.97–1.07)	-

*
p<0.05

**
p<0.01

***
p<0.001

p<0.1 in italics

Cd: category dropped out of the analysis due to an absence of depression cases