

The roles of depression and social relationships in the onset and course of loneliness amongst Nigerian elders

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Abstract

Objectives: Few studies in Africa have investigated the risk profile and course of loneliness in old age. This study examined the risk factors for onset and chronicity, as well as the predictors of recovery from loneliness in a large representative sample of community dwelling older Africans.

Methods/Design: A household multistage probability sample of Nigerians who were 65 years or older was drawn from a geographical area with approximately 25 million population. Loneliness was measured using the 3-item University of California (UCLA) scale in 2007 and annually in 2008 and 2009. Social engagement, social network, and depression were evaluated using the WHO Composite International Diagnostic Interview. Respondents were also administered the 30-item Geriatric Depression Scale. Multivariate logistic regression models were used to explore for risk factors. Estimates of adjusted hazard ratios (HR) for recovery were derived with the discrete time version of the Cox regression model for time invariant explanatory variables.

Results: Of 1704 respondents, 1525 were free of loneliness, using the UCLA scale, in 2007. A total of 209 (18.8%) persons developed new onset of loneliness in 2008 and 2009. Depression (O.R = 2.9, 95% C.I = 1.3–6.7), unmarried status (OR = 2.1, 95% C.I = 1.2–3.9) and social isolation (OR = 1.8, 95% CI = 1.0–3.2) independently predicted loneliness onset. Baseline demographic, health, social, and lifestyle factors were not associated with a chronic course of loneliness. The overall recovery rate estimated over two years was 89.5% (95% CI = 75.3–106.4). Being male (HR = 1.3, 95% C.I = 1.0–1.6), ≥ 80 years (HR = 1.4, 95% CI = 1.2–1.8) and having good social engagement at baseline (HR = 1.5, 95% C. = 1.1–2.0) independently predicted recovery from loneliness.

Conclusions: Over a 2-year period, nearly one in five community-dwelling Africans developed new onset loneliness in old age, with a similar proportion having a chronic course of the emotional experience. While depression and indices of social isolation at baseline were associated with onset, good social engagement predicted recovery from loneliness.

KEYWORDS

loneliness, low- and middle-income countries, social relationships, social support

1 | INTRODUCTION

Loneliness is a subjective emotional experience of being apart from others.¹ Though related to social isolation, it is a distinct phenomenon.² While social isolation is an objective measure of inadequate social relationships, loneliness is the result of one's negative evaluation of the quality of such relationships.³ It is thus often observed that being around individuals with whom we share emotional proximity and support is more satisfying than to be surrounded by a crowd.⁴ Also, in contrast to social isolation, which can be intentional, loneliness is always involuntary.⁵

Loneliness has strong neurobiological and evolutionary bases.⁶ Studies show that a substantial proportion of the liability to loneliness is accounted for by inherited genetic characteristics.⁷ The experience of loneliness in older adults, in particular, has also been shown to result in imbalance in the expression of cytokines,⁸ altered neuroendocrine regulation of stress⁹ and altered immunity.¹⁰ In turn, these neurotoxic effects of loneliness in older adults culminate in several physical and mental health problems.¹¹

Globally, research on loneliness in older adults has mostly focused on its deleterious effects on their health and well-being, and only a few studies have investigated factors in old age that are determinants of onset, chronicity or recovery from loneliness.¹² Yet, information about the risk profile of loneliness onset and chronicity is important for primary prevention strategies against the many negative outcomes of the emotional experience, as well as for the translation of secondary prevention interventions¹³ to everyday practice.

The knowledge gap on the predictors of onset and course of loneliness in old age among persons living in low- and middle-income countries (LMICs) is even more striking. First, LMICs, especially those in sub-Saharan Africa (SSA), have the largest increase in global migration of younger people,¹⁴ a phenomenon that could potentially be a factor for social isolation and loneliness in the left-behind older persons.¹⁵ The effect of social isolation on the onset and longitudinal course of loneliness in older people living in LMICs is yet to be examined.

Second, several studies conducted in Europe and North America point to the association of living in neighborhoods characterized by low education and economic status with loneliness in older adults.¹⁶ Such relationship is yet to be examined in LMICs. Third, in a series of studies by our group,^{17,18} we found some of the highest global prevalence and incidence rates of late-life depression among Nigerian older persons. The extent to which the high rates of late-life depression impacts on onset, chronicity, or recovery from loneliness in people living in SSA is unknown.

As contextual factors are important in determining onset and course trajectories of health conditions,¹⁹ the social, economic, health, and lifestyle correlates of the onset and course of loneliness can be expected to differ between LMICs and high income countries. In the present study, we aimed to examine the risk factors for onset and chronicity, as well as the predictors of recovery from loneliness among community-dwelling older Nigerians who were participants in the Ibadan Study of Ageing (ISA).

Key points

- Approximately 20% of community-dwelling older Africans develop new onset of loneliness
- Depression and social isolation are independent risk factors for loneliness onset in old age
- Loneliness is a relatively short-term phenomenon in the majority of older Africans
- Recovery from loneliness is independently predicted by good social engagement

2 | METHODS

2.1 | Sample selection and recruitment

The ISA is comprised two inter-related studies, each set-up to evaluate the health and well-being as well as related contextual factors of older adults living in communities in Nigeria. An initial cross-sectional study was conducted in 2003/2004. This was followed by a 5-year prospective observational study of the same cohort conducted in three waves in 2007, 2008, and 2009. Loneliness was first examined in the 2007 wave of ISA and annually in 2008 and 2009.

The ISA cohort is based on a stratified multistage cluster sample derived from eight contiguous states in the predominantly Yoruba-speaking region of Nigeria. This region had a population of approximately 25 million people at the time of the studies. Details of the sample selection procedure have been fully described.¹⁸ The surveys were approved by the University of Ibadan/University College Hospital, Ibadan Joint Ethics Review Board. Participants were those who provided consent, mostly verbal (either because of illiteracy or by choice), before interviews were conducted.

2.2 | Measures

Face to face interviews were carried out in the homes of participants to assess a range of domains. All instruments used in the ISA were subjected to cultural adaptation and translation into the local Yoruba language (using the iterative back-translation method).

2.2.1 | Loneliness

The experience of loneliness was assessed using the 3-item University of California (UCLA) at Los Angeles (UCLA) scale.²⁰ The 3-item scale was adapted from the 20-item Revised UCLA loneliness scale.²¹ Respondents were asked the following questions: (1) How often do you feel you lack companionship? (2) How often do you feel isolated from others? (3) How often do you feel left out? In every case, they were offered the option of three responses on a Likert scale: Often,

	2007	2008	2009
New onset cohort			
Chronically lonely		1	1
Prevalent cohort			
Chronically lonely	1	1	1/X
Recovered from loneliness	1	0	0/X

FIGURE 1 Definition of loneliness trajectories in the Ibadan Study of Ageing. Red, T1; Blue, T2; 1, Participants meeting criteria for loneliness; 0, Participants no longer met criteria for loneliness; X, Lost to follow-up [Colour figure can be viewed at wileyonlinelibrary.com]

sometimes, not at all/never. Responses to the items produce a loneliness score of 3–9, with higher scores indicating more intense loneliness. In line with previous studies,^{22,23} ISA participants with a score of ≥ 6 were categorized as lonely. The 3-item UCLA scale demonstrates strong correlation with the parent 20-item measure ($r = 0.82$).²⁰ Its reliability in the ISA was 0.87 alpha (average inter-item correlation = 0.68).

2.2.2 | Definition of loneliness trajectory groups

New onset cases of loneliness (in 2008 and 2009) were classified as subjects meeting UCLA scale criteria for loneliness for the first time in the corresponding follow-up waves. New onset cases were determined after censoring prevalent cases of loneliness in 2007. To ascertain chronic loneliness, we grouped together prevalent (in 2007) and new onset cases (in 2008) to increase our sample size. Participants in this grouping who still met loneliness criteria in a subsequent wave were considered to have chronic loneliness (Figure 1). As shown in Figure 1, participants with prevalent loneliness who did not meet such criteria in any subsequent waves were considered to have recovered from loneliness.

2.2.3 | Social relationships

Social network was assessed with the relevant items in the World Health Organization Composite International Diagnostic Interview (CIDI).²⁴ The items enquire about the frequency of respondent's contact with family members who do not live with the respondent as well as the frequency of contact with friends. The response options provided in the CIDI are 1 (nearly every day), 2 (3–4 days per week), 3 (1–2 days per week), 4 (1–3 days a month), 5 (less than once in a month), 6 (never). In this report, participants with contacts that were less than once in a month were categorized as having social isolation, while those with more than once in a month contacts were grouped as having adequate social relationships. Social participation was also assessed with the CIDI. Participants were asked the following two questions: "During the last 30 days, how much did you join in family activities such as eating together, talking with family members, visiting family members, working together?" and "During the last 30 days, how much did you join in community activities such as festivities, religious activities, talking with community members, working

together?" Answers were rated as 1 (not at all), 2 (a little bit), 3 (quite a bit), and 4 (a lot). In this study, participants who answered "not at all" to either question were rated as having poor social participation.

2.2.4 | Depression

Major depressive disorder (MDD) was assessed with the CIDI version 2.0.²⁴ Diagnosis was based on the criteria of the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV).²⁵ The DSM IV organic exclusion rules were imposed in making a diagnosis of MDD. Additional quantitative assessment of depression was conducted using the 30-item Geriatric Depression Scale (GDS).²⁶ The GDS has been used extensively among Yoruba Nigerians where cut-off scores of ≥ 11 had a kappa agreement of 0.65 with psychiatrist diagnosed depression.²⁷

2.2.5 | Other data

Participants were asked their age (in years) and the number of years of formal education attained in their lifetime. In cases where participants had no records or information about their dates of birth, estimates of age were determined using a previously validated list of historical events.²⁸ Residence was classified as rural (<12,000 households), semi-urban (12,000–20,000 households) or urban (>20,000 households) based on the Nigerian census categorization at the time of study. Economic status was estimated using an inventory of 21 household and personal items,²⁹ and each respondents total number of possessions was classified relative to the median number of possessions of the overall sample as low (≤ 0.5); low-average ($>0.5-1.0$); high-average ($>1.0-2.0$) or high (>2). For reasons of low sample sizes of the higher economic categories, high average and high were merged to form a single high economic category. Participants were also asked to rate their overall health as very good, good, fair, or poor using the CIDI. Use of tobacco and alcohol was categorized, based on self-report, as ever having smoked or not, and ever used alcohol or not. Those who responded in the affirmative to ever using alcohol were further classified into regular (weekly use or more often) or occasional users (less often than weekly use). The Katz index of independence in activities of daily living (Katz ADL)³⁰ was used to assess the ability of participants to perform ADL independently. Instrumental activities of daily living (IADL) was evaluated

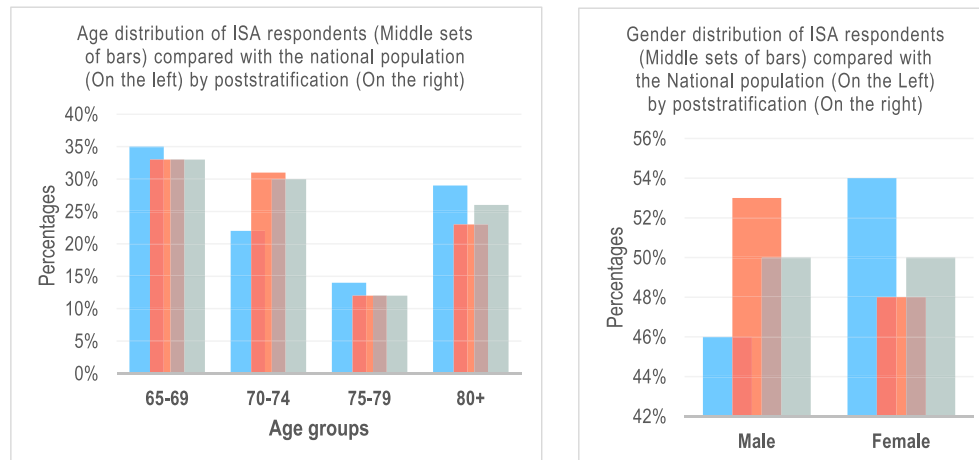


FIGURE 2 Poststratification weights applied to target sex and age range to achieve National representativeness of the Ibadan Study of Ageing sample. Left bar = unweighted, middle bar = weighted, right bar = national census [Colour figure can be viewed at wileyonlinelibrary.com]

by the ability of the participants to perform seven functions in the following areas³¹: climbing a flight of stairs, reaching above the head to carry something weighing about 4.5 kg, stooping, gripping small objects with hands, shopping, and activities such as sweeping the floor with a broom or cutting grass. Each of the activities in the two domains (ADL and IADL) was scored: (1) can do without difficulty, (2) can do with some difficulty, (3) can do only with assistance, (4) unable to do activity. We classified as functionally disabled, any respondent with a rating of three or four on any item.

2.3 | Data analyses

The demographic characteristics of those who survived, died, or were censored between 2007 and 2009 were compared using Pearson chi-square test, with a Rao and Scott correction³² to account for the survey design. Descriptive statistics such as means and standard deviations were used to summarize quantitative variables while frequencies and percentages were used for categorical variables. Characteristics of the study sample were compared according to their loneliness trajectories using the chi-squared test or *t*-test for categorical or continuous variables, respectively. The analyses took account of the stratified multistage sampling procedure and the associated clustering by applying weights as appropriate. We made adjustment for differences between the sample and the total Nigerian population by applying post-stratification weights to the target sex and age range.

For the purpose of investigating the risk factors for onset and chronicity, as well as the predictors of recovery from loneliness, we conducted weighted logistic regression analyses with the respective loneliness trajectory groups as the dependent variables. Demographic, health, social, and lifestyle factors that were significantly different in bivariate analyses were included as covariates in adjusted models.

To investigate the predictors of time to recovery from loneliness, we used the discrete time version of the Cox regression model for time invariant explanatory variables to derive estimates of hazard

ratios for recovery, assuming proportional hazards. We first performed an unadjusted analysis. Next, we adjusted for the effect of age, gender, economic and health status as well as social engagement. These were factors that might have significantly affected both survival from 2007 to the end point of 2009 and the course of loneliness.

All estimates from regression models, along with their 95% confidence intervals (CI), are presented. Data were analyzed using Stata version 14.0.³³ The survey commands in Stata were used to account for the study sampling scheme. A significance level of <0.05 was used throughout the analyses.

3 | RESULTS

3.1 | Study sample

The differences between the ISA sample and the Nigerian population, before and after poststratification adjustments, with regards to age and gender are presented in Figure 2. A total of 1704 respondents were eligible for the loneliness study. As shown in Figure 3, the ISA loneliness sample comprised participants who were either successfully followed up from 2003/04 ($N = 1356$) and those who were newly recruited in the 2007 wave ($N = 348$). Of the 1704 respondents, 1525 were free of loneliness in 2007, based on their scores on the UCLA scale. They constituted the new onset loneliness cohort that was subsequently followed up in 2008 and 2009. They constituted the cohort for the assessment of new onset of loneliness in 2008 and 2009. Their mean age in 2007 was 72.7 (± 7.4) years. The characteristics of the sample is presented in Table 1.

3.2 | Onset and chronic course of loneliness

Of the 1525, we identified 133 and 76 cases of new onset loneliness in 2008 and 2009, respectively. These produced a total of 209 (18.8%) persons with new onset loneliness in the ISA. Of the 133

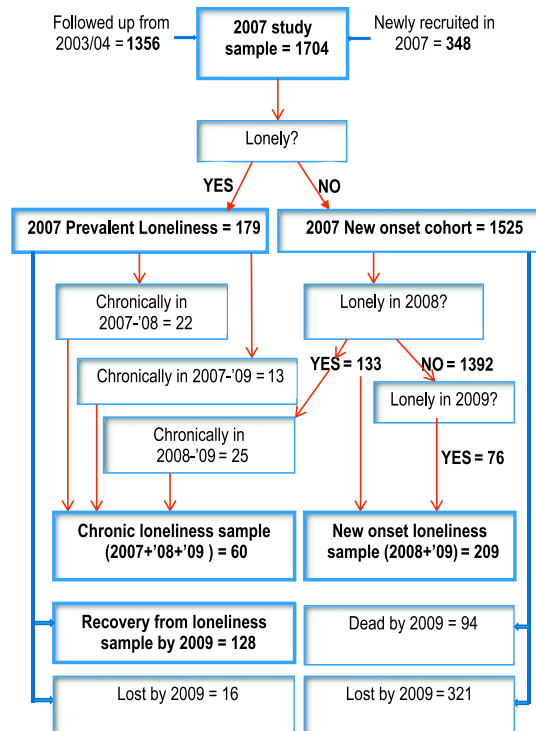


FIGURE 3 Flow chart showing participants with New onset and Persistent loneliness as well as those who recovered between 2007 and 2009 in the Ibadan Study of Ageing [Colour figure can be viewed at wileyonlinelibrary.com]

participants with new onset loneliness in 2008, 25 (18.8%) continued to meet same criteria in 2009.

In weighted multiple logistic regression analyses, depression (OR = 2.9, 95% CI = 1.3–6.7), unmarried status (OR = 2.1, 95% CI = 1.2–3.9), which was mainly due to widowhood, as well as social isolation (OR = 1.8, 95% CI = 1.0–3.2) at baseline were independent predictors of loneliness onset (Table 2). In the same table, chronicity of loneliness was not predicted by the baseline factors investigated.

3.3 | Recovery from loneliness

Estimated over 2 years (2007–2009), the overall recovery rate from loneliness in the ISA was 89.5% (95% CI = 75.3–106.4). Participants in the highest economic category had the best recovery rates (Table 3). In Cox regression analyses including time invariant explanatory variables, being male (HR = 1.3, 95% CI = 1.0–1.6), ≥ 80 years (HR = 1.4, 95% CI = 1.2–1.8), and having good social engagement at baseline (HR = 1.5, 95% CI = 1.1–2.0) predicted time to recovery from loneliness.

4 | DISCUSSION

In this 2-year prospective survey, we found that 18.8% of older persons living in Nigerian communities developed new onset of loneliness. A similar proportion had a chronic course of the emotional

experience. Depression and indices of social isolation were independently associated with onset of loneliness. A relatively high recovery rate from loneliness, estimated over 2 years, was observed in this population. Recovery from loneliness in the ISA was independently predicted by male gender, being ≥ 80 years and having good social engagement at baseline.

The 18.8% estimated for new onset loneliness in the present study is substantially lower than 31.7% reported in the Health and Retirement Study (HRS).³⁴ The HRS loneliness report is based on the application of the UCLA loneliness scale to a large community sample of older Americans who were free of loneliness at baseline and were followed up in a single time-point over 4 years. The lower rates of loneliness in the ISA compared with the HRS is likely due to the well-known observation that social and emotional integration are better guaranteed in more “collectivist” societies³⁵ such as those in many parts of Africa. In addition, and as indicated by the high rates of recovery from loneliness in the present study, the subjective emotional experience may be a relatively short-term phenomenon in the majority of older Africans.

The results suggesting that depression and indices of social isolation were the main factors associated with onset of loneliness is in keeping with the global literature on loneliness in old age.¹² Notably, however, most previous studies investigating this relationship have taken a qualitative³⁶ or cross-sectional approach.^{12,37} In one such qualitative enquiry³⁶ from the Nigerian Niger-Delta region, groups of older persons identified lack of social interaction as an important driver of self-perceived loneliness. Lack of social interaction was expounded by participants as having little or no opportunity for a conversation and sharing of meals with others.³⁶ Studies from other LMICs such as Nepal³⁸ and China³⁹ found a significant relationship between living alone (vs. with family) and loneliness.

The previously cited HRS study³⁴ investigated the longitudinal relationship between change in depression severity and onset of loneliness. Compared with persons whose depression symptoms remained unchanged from baseline, those whose symptoms increased at follow-up had greater odds of being lonely.³⁴ The association of depression with loneliness has been proposed to occur through poor social engagement.⁴⁰ This is because depression may restrict the older persons ability to engage in meaningful social relationships. Given this observation, the results suggesting that social engagement predicted time to recovery from loneliness in the present study was not surprising.

The other predictors of recovery were being male and ≥ 80 years. Some prior studies⁴¹ speak to a possible differential effect of marital separation, either through death or divorce, on loneliness between older men and women. First, as women are generally more likely to live longer than men, the potential to be separated from a partner through death may be higher in older women. Conversely, and because of the usual age difference between men and their spouses (men being generally older), men who live up to ≥ 80 years in Africa, and many other parts of the world, are more likely to live with a partner than women who live to the same age. A pointer to the preceding observations is that, while 70.5% of ISA participants who

TABLE 1 Characteristics of Ibadan study of ageing participants who were included in the study of loneliness

Characteristics	Followed up from 2003/04 (N = 1356) n (%)	Recruited in 2007 (N = 348) n (%)	Followed up in 2009 (N = 1194) n (%)	Died between 2007 and 2009 (N = 105) n (%)	Lost between 2007 and 2009 (N = 405) n (%)
Demographic					
Age groups, years					
65–69	443 (36.9)	134 (38.5)	259 (22.9)	10 (12.9)	85 (23.8)
70–74	333 (29.9)	78 (22.4)	346 (33.1)	25 (23.4)	106 (31.6)
75–79	201 (19.1)	58 (16.7)	236 (23.3)	15 (24.5)	69 (19.3)
80+	379 (14.1)	78 (22.4)	353 (20.7)	55 (39.2)	145 (25.4)
Gender					
Male	635 (59.3)	100 (28.7)	524 (53.5)	50 (61.2)	161 (49.3)
Female	721 (40.7)	248 (71.3)	670 (46.6)	55 (38.8)	244 (50.7)
Residence					
Urban	322 (24.0)	131 (37.7)	453 (37.8)	50 (48.6)	144 (37.0)
Semi-urban	579 (42.8)	110 (31.6)	418 (34.7)	34 (32.3)	126 (31.7)
Rural	455 (33.2)	107 (30.7)	323 (27.6)	21 (19.2)	135 (31.4)
Education, years					
0	758 (53.9)	758 (53.9)	528 (53.0)	50 (53.2)	180 (57.2)
1–6	329 (24.6)	329 (24.5)	237 (25.9)	19 (21.0)	73 (20.6)
≥7	269 (21.5)	269 (21.6)	183 (21.1)	20 (25.8)	66 (22.2)
Economic status					
Low	372 (20.3)	69 (19.8)	235 (16.7)	35 (21.9)	114 (23.2)
Low-average	504 (35.3)	129 (37.1)	471 (36.5)	32 (35.8)	148 (35.9)
High	480 (44.4)	150 (43.1)	488 (46.8)	38 (42.3)	143 (41.0)
Social relationships					
Marital status					
Married	699 (64.1)	260 (74.7)	673 (65.8)	54 (64.4)	203 (60.2)
Not married ^a	657 (35.9)	88 (25.3)	521 (34.2)	51 (35.6)	202 (39.9)
Good social engagement					
Yes	1091 (87.0)	308 (89.8)	1049 (90.4)	70 (77.1)	330 (87.0)
No	234 (13.1)	35 (10.2)	136 (9.6)	24 (22.9)	63 (13.0)
Good family contact					
Yes	1311 (99.2)	344 (100.0)	1183 (99.9)	95 (100.0)	394 (99.9)
No	16 (0.8)	-	2 (0.1)	0	2 (0.1)
Good friends contact					
Yes	1166 (91.2)	326 (94.8)	1095 (93.8)	89 (93.3)	360 (93.0)
No	162 (8.8)	18 (5.2)	90 (6.2)	6 (6.7)	36 (7.0)
Social Isolation					
No	1160 (90.8)	326 (94.8)	1093 (93.7)	89 (93.3)	358 (92.8)
Yes	169 (9.2)	18 (5.2)	92 (6.3)	6 (6.7)	38 (7.2)

TABLE 1 (Continued)

Characteristics	Followed up from 2003/04 (N = 1356) n (%)	Recruited in 2007 (N = 348) n (%)	Followed up in 2009 (N = 1194) n (%)	Died between 2007 and 2009 (N = 105) n (%)	Lost between 2007 and 2009 (N = 405) n (%)
Health and lifestyle					
Smoking					
Yes	561 (44.1)	119 (34.5)	468 (40.0)	41 (41.1)	166 (43.5)
No	709 (55.9)	226 (65.5)	714 (60.0)	56 (58.9)	229 (56.5)
Alcohol					
Ever	598 (48.6)	113 (33.0)	622 (56.0)	55 (56.5)	204 (54.0)
Never	699 (51.4)	230 (67.0)	549 (44.0)	42 (43.5)	186 (46.0)
Good self-reported health					
Yes	1227 (94.5)	334 (97.4)	1150 (97.8)	87 (87.9)	375 (94.2)
No	77 (5.5)	9 (2.6)	29 (2.2)	13 (12.1)	19 (5.8)
Functional disability					
Yes	230 (16.5)	56 (16.1)	230 (16.5)	42 (34.5)	97 (20.7)
No	964 (83.5)	292 (83.9)	964 (83.5)	63 (65.5)	308 (79.3)

^aDeath or divorce.

reported marital separation through death of a spouse were women, 88.9% of those who were currently married were men.⁴²

It is important to interpret the results of this study in the context of several strengths and limitations. To the best of our knowledge, this is the first investigation of onset and course of loneliness in a large representative cohort of community dwelling older Africans. The large sample size, covering a wide geographical area which was equivalent to about a quarter of the entire Nigerian population at the time of study, allows for broader generalization of our findings. However, the ISA surveys were completed 11 years ago and, given the dynamic nature of contextual social factors, some of the risk and protective factors may have changed in the interval, with the possibility that the rates reported here may also have changed. Nevertheless, the information on loneliness provided by the ISA may still be very relevant given the paucity of epidemiological studies on the emotional experience of the rapidly growing older populations of SSA. Similar to every prospective cohort study, attritions increased across the follow-up period. We found that those who were lost to follow-up were more likely to belong in the lowest age category (65–69 years). We therefore ensured that the effect of age was accounted for across our analyses. In contrast to prior studies relying on answers to a single item inquiry about loneliness, we have used standardized criteria to estimate onset, chronicity and recovery from the emotional experience. We also completed three repeated assessments of loneliness with high response rates (70% and 80% of the baseline sample followed up in 2009). Moreover, because we obtained a wide range of information on the demographic, social, health, and well-being of the participants, we were able to correct for several confounders of the relationship between baseline factors and

clinical course of loneliness. Despite limitations, the listed strengths of the present study serve to increase the reliability of the information obtained.

In concluding, nearly one in five older persons living in Nigerian communities developed new onset loneliness over a 2-year period (2007–2009) with a similar proportion having a chronic course of the emotional experience over the same period (2007–2009). While depression and indices of social isolation were the main factors associated with onset of loneliness, good social engagement at baseline was associated with recovery from the emotional experience in this SSA context. The findings of the present study have potential for early identification of older persons who are likely to develop loneliness and offer an opportunity for early intervention. There is a range of effective interventions for depression and loneliness, which have been developed for older adults in Europe and North America.¹³ Interventions based on social activities schedules, group discussions as well as self-expression using various modalities such as art and creative methods, going on day-trips, networking with other older adults as well as links to community resources have been shown to be effective in preventing loneliness in older people.¹³ These interventions could be adapted to the social, economic, and cultural contexts of SSA. Such context-appropriate interventions could, in turn, reduce the burden of depression and loneliness in the sub-region.

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TABLE 2 Risk profile of onset (2008/2009) and chronic course (2007-2009) of loneliness in the Ibadan Study of Ageing

Risk factors	Onset (nonlonely respondents as reference)			Chronic course (nonpersistent loneliness as reference)		
	N = 209 n(%)	Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)	N = 60 n(%)	Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)
Social relationships						
Marital status						
Married	108 (62.4)	Reference	Reference	26 (56.7)	Reference	Reference
Not married ^b	101 (37.7)	1.2 (0.8, 1.9)	2.1 (1.2, 3.9)*	34 (43.3)	1.3 (0.7, 2.5)	2.1 (0.5, 9.2)
Place of residence						
Urban/Semi-urban	136 (66.5)	Reference	Reference	40 (71.6)	Reference	Reference
Rural	73 (33.5)	1.7 (1.1, 2.4)*	1.3 (0.8, 2.1)	20 (28.4)	0.6 (0.3, 1.2)	0.8 (0.3, 1.9)
Good Social engagement						
Yes	180 (90.5)	Reference	Reference	36 (65.0)	Reference	Reference
No	26 (9.5)	1.2 (0.6, 2.5)	1.1 (0.5, 2.4)	24 (35.0)	3.1 (1.2, 8.1)*	3.6 (0.9, 13.9)
Social isolation						
No	186 (93.6)	Reference	Reference	11 (12.8)	Reference	Reference
Yes	20 (6.4)	1.2 (0.7, 2.2)	1.8 (1.0, 3.2)*	49 (87.2)	1.3 (0.6, 3.1)	1.9 (0.6, 5.9)
Demographics						
Age, years						
<80	143 (79.8)	Reference	Reference	47 (83.0)	Reference	Reference
≥80	66 (20.2)	1.0 (0.6, 1.6)	0.9 (0.5, 1.9)	13 (17.0)	0.6 (0.3, 1.5)	0.3 (0.1, 1.1)
Gender						
Male	85 (50.6)	Reference	Reference	23 (51.3)	Reference	Reference
Female	124 (49.4)	1.1 (0.8, 1.6)	1.3 (0.8, 1.9)	37 (48.7)	1.1 (0.6, 2.0)	1.4 (0.7, 2.5)
Education, years						
≥1	80 (53.0)	Reference	Reference	28 (56.1)	Reference	Reference
0	82 (47.0)	0.8 (0.5, 1.3)	0.7 (0.4, 1.2)	22 (43.9)	0.6 (0.3, 1.4)	0.7 (0.3, 1.9)
Economic status						
High	72 (41.1)	Reference	Reference	14 (27.9)	Reference	Reference
Low-average	88 (41.1)	1.4 (0.7, 2.5)	1.0 (0.4, 2.2)	30 (55.5)	1.0 (0.4, 2.6)	1.1 (0.2, 5.6)
Low	49 (17.8)	1.3 (0.7, 2.4)	1.3 (0.6, 2.8)	16 (16.7)	2.3 (0.8, 6.2)	2.7 (0.7, 10.8)
Health and lifestyle						
Smoking						
Yes	83 (44.1)	Reference	Reference	22 (39.7)	Reference	Reference
No	123 (55.9)	1.3 (0.8, 1.9)	1.2 (0.8, 2.0)	38 (60.3)	1.3 (0.6, 3.2)	1.3 (0.4, 4.4)
Alcohol						
Ever	105 (56.2)	Reference	Reference	31 (60.2)	Reference	Reference
Never	99 (43.8)	1.0 (0.7, 1.5)	1.0 (0.6, 1.6)	29 (39.9)	1.2 (0.5, 3.0)	2.1 (0.6, 7.0)
Good self-reported health						
Yes	193 (95.5)	Reference	Reference	54 (90.0)	Reference	Reference
No	8 (4.5)	3.2 (0.8, 12.0)	2.4 (0.7, 8.7)	6 (10.0)	2.0 (0.5, 7.6)	2.4 (0.5, 10.7)
Depression symptoms						
No	176 (84.1)	Reference	Reference	37 (65.2)	Reference	Reference
Yes	30 (15.9)	2.6 (1.3, 5.3)*	2.9 (1.3, 6.7)*	23 (34.8)	1.4 (0.6, 3.6)	1.2 (0.5, 3.1)

TABLE 2 (Continued)

Risk factors	Onset (nonlonely respondents as reference)			Chronic course (nonpersistent loneliness as reference)		
	N = 209 n(%)	Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)	N = 60 n(%)	Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)
Major depressive disorder						
No	179 (88.7)	Reference	Reference	46 (80.7)	Reference	Reference
Yes	30 (11.3)	1.2 (0.6, 2.5)	1.1 (0.4, 3.1)	14 (19.3)	1.2 (0.6, 2.6)	0.9 (0.3, 2.6)
Functional disability						
Yes	48 (20.9)	Reference	Reference	19 (30.9)	Reference	Reference
No	161 (79.1)	1.5 (0.9, 2.3)	1.4 (0.7, 2.8)	41 (69.1)	1.7 (0.7, 3.8)	2.4 (1.0, 5.8)

^aAdjusted for depression symptoms, place of residence, age and gender.

^bDeath or divorce.

* $p < 0.05$.

TABLE 3 Predictors of recovery among Ibadan study of Ageing respondents who were lonely at baseline (2007)

Risk factors	Recovered N = 128/179 n (%)	Time to recovery N = 179		
		Recovery rate % (95% CI)	Unadjusted HR (95% CI)	Adjusted HR ^a (95% CI)
Social relationships	-	Overall = 89.5 (75.3, 106.4)	-	-
Marital status				
Not married ^b	54 (34.9)	78.8 (60.4, 102.9)	Reference	Reference
Married	74 (65.1)	99.3 (79.1, 124.8)	1.2 (0.9, 1.6)	0.9 (0.6, 1.3)
Residence				
Urban/Semi-urban	88 (68.6)	86.1 (64.0, 115.7)	Reference	Reference
Rural	40 (31.5)	98.8 (72.5, 134.7)	1.2 (0.9, 1.7)	1.2 (0.9, 1.5)
Good social engagement				
No	33 (24.0)	58.9 (41.9, 82.9)	Reference	Reference
Yes	94 (76.0)	111.9 (91.4, 137.0)	1.5 (1.2, 2.0)*	1.5 (1.1, 2.0)*
Social isolation				
Yes	24 (14.7)	88.9 (59.6, 132.6)	Reference	Reference
No	104 (85.3)	91.6 (75.6, 111.1)	1.0 (0.7, 1.4)	0.9 (0.6, 1.3)
Demographics				
Age, years				
<80	85 (69.4)	81.7 (66.1, 101.1)	Reference	Reference
≥80	43 (30.6)	110.3 (81.8, 148.7)	1.3 (1.1, 1.6)	1.4 (1.2, 1.8)*
Gender				
Female	60 (40.9)	78.4 (60.9, 101.0)	Reference	Reference
Male	68 (59.1)	102.3 (80.6, 129.7)	1.2 (1.0, 1.5)	1.3 (1.0, 1.6)*
Education, years				
0	67 (61.6)	94.3 (74.3, 119.9)	Reference	Reference
≥1	40 (38.4)	84.2 (61.8, 114.8)	0.9 (0.6, 1.3)	0.9 (0.6, 1.2)
Economic status				
Low	39 (25.6)	78.8 (57.6, 107.8)	Reference	Reference

(Continues)

TABLE 3 (Continued)

Risk factors	Recovered <i>N</i> = 128/179 <i>n</i> (%)	Time to recovery <i>N</i> = 179		
		Recovery rate % (95% CI)	Unadjusted HR (95% CI)	Adjusted HR ^a (95% CI)
Low-average	45 (35.1)	80.4 (60.0, 107.6)	1.0 (0.8, 1.3)	0.8 (0.6, 1.1)
High	44 (39.3)	117.3 (87.3, 157.7)	1.3 (0.9, 1.9)	1.0 (0.7, 1.6)
Health and lifestyle				
Smoking				
No	70 (53.4)	90.3 (71.5, 114.2)	Reference	Reference
Yes	57 (46.6)	92.7 (71.5, 120.2)	1.0 (0.9, 1.2)	1.0 (0.8, 1.3)
Alcohol				
Ever	67 (55.4)	87.6 (68.9, 111.3)	Reference	Reference
Never	58 (44.6)	94.3 (72.9, 122.0)	1.0 (0.8, 1.4)	1.0 (0.7, 1.4)
Good self-reported health				
No	10 (6.9)	76.9 (41.4, 143.0)	Reference	Reference
Yes	118 (93.1)	92.9 (77.6, 111.3)	1.2 (0.8, 1.9)	1.1 (0.7, 1.8)
Depression symptoms				
Yes	53 (41.8)	86.9 (66.4, 113.7)	Reference	Reference
No	73 (58.2)	94.2 (74.9, 118.5)	1.1 (0.9, 1.3)	1.0 (0.8, 1.3)
Major depressive disorder				
No	105 (76.5)	94.2 (77.8, 114.0)	Reference	Reference
Yes	23 (23.5)	73.0 (48.5, 109.9)	1.0 (0.8, 1.3)	1.1 (0.8, 1.5)
Functional disability				
Yes	32 (21.8)	79.0 (55.9, 111.7)	Reference	Reference
No	96 (78.2)	93.7 (76.7, 114.4)	1.3 (1.0, 1.6)	1.2 (0.9, 1.7)

^aAdjusted for Age, gender, economic and health status, social engagement.

^bDeath or divorce.

**p* < 0.05.

CONFLICT OF INTEREST

The authors have declared that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

Authors do not have permission to share data. Details on additional analyses and results are available on request from the corresponding author.

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