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Multidimensional Quality of Life of Older Adults in South Africa

Natalia Kopylova[1] · Talita Greyling[1,2] · Stephanié Rossouw[3,4]

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Abstract

It is estimated that by 2050, the world population over the age of 65 will reach 1.5 billion. The United Nations predicts that the fastest growth will be in Africa, which suffers from extreme poverty and inequalities. Therefore, older people who play an essential role in African culture face significant well-being challenges. To mitigate these challenges and improve quality of life (QoL), we must first assess their well-being levels. Well-being is a multidimensional concept and needs a multidimensional measure. However, the dimensions that explain older people's QoL differ from other age groups and between developed and developing countries. We construct a unique index applicable to Africa. We functionalised the index using the South African National Income Dynamic Study dataset. By applying the new index empirically, we determine the level of QoL of older adults. Additionally, we establish which dimensions explain the most variance signalling areas for policy intervention. Furthermore, analysing panel data allows us to follow older individuals' well-being over time to determine the trend. Lastly, we analyse different demographic groups' well-being to establish the most vulnerable. We find the dimensions that explain the most variance are *household services, economic status, safety, mental and physical health*. The well-being of older adults increased over time, likely due to policy interventions, and the most vulnerable group is black African women in traditional and farming areas. Other developing countries could adopt our QoL index to measure the well-being of older people at a micro-level.

✉ Stephanié Rossouw
stephanie.rossouw@aut.ac.nz

Extended author information available on the last page of the article

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Introduction

It is estimated that by the year 2050, the world population over the age of 65 will reach 1.5 billion people. The United Nations predicts that this rapid ageing will mainly happen in developing countries situated in Africa (United Nations, Department of Economic and Social Affairs, Population Division, 2020). This is problematic because the continent is already plagued by extreme poverty and high inequalities. Rapid ageing in Africa may further affect economic growth, the sustainability of families, the ability of governments and communities to provide resources for older people, and international relations. Hence, the Second World Assembly on Ageing guided the development of social policies at national and international levels to address the opportunities and challenges of population ageing (United Nations, 2002). However, Kofi Annan, a former Secretary-General of the United Nations, stated that "the real test will be in implementation" of these policies (United Nations, 2002). A decade later, the summary report submitted to the Human Rights Council showed that governments still fail to guarantee the well-being of older people (United Nations Human Rights Council, 2013).

Ensuring the well-being[1] of older adults in the African context is especially important since they fulfil a crucial role in society. Grandparents often provide childcare to allow parents to work far away from home (StatsSA, 2021a, b, c, d, e). Additionally, older African men are seen as decision-makers among their communities, upholding values and beliefs (StatsSA, 2021a, b, c, d, e; Apt, 1992).

The first step in addressing the well-being of older people lies in measuring it. As Peter Drucker famously said, "If you can't measure it, you can't manage it". However, there is a need for an accurate measure specifically tailored to the needs of older adults living in Africa, which is home to the poorest of the poor (Zimmer & Das, 2014). Since some of the domains of QoL are more relevant to older people and differ from the Western world, a unique multidimensional composite index is needed.

Such an index could be applied to measure the current well-being of older people and determine any changes over time. This will allow us to ascertain the success of implemented policies and identify areas for future policy intervention. Unfortunately, it is still common to use simplistic measures of well-being such as life expectancy, the old-age dependency ratio or poverty lines (Chen et al., 2018). This is not good enough because we know that Quality of Life (QoL) is multidimensional (Sen, 1985; Walker, 2005). Any measure should include domains of an economic and non-economic nature and objective and subjective indicators (Stiglitz et al., 2009). Furthermore, Sen (1985) suggests that well-being should be considered from various aspects of life.

Previous studies measuring older individuals' QoL were mostly not tailored to African countries. The indices could not capture whether multidimensional well-being improved over time or established the success of policy initiatives. Primarily this was attributable to a lack of adequate data. Studies used cross-sectional data (Ralston, 2018; Phaswana-Mafuya et al., 2013), while other studies only used

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[1] Well-being and quality of life are used interchangeably

individual indicators (Forjaz et al., 2010; Wister et al., 2019; Doron et al., 2019) or focused on macro-level to compare well-being dimensions and countries. To make a difference in the QoL of older people, policy should be implemented at a micro-level. Therefore, a measure should be developed to specifically capture the well-being of older people (in developing countries), which can be customised according to the needs of individual countries. Such a measure can inform policymakers on those dimensions that should be addressed, the success of implemented policy measures and highlight the most vulnerable older adult cohort (Chen et al., 2018; HelpAge, 2019; UNECE, 2018).

Given the above, the study's primary contribution is to construct a multidimensional QoL index that includes domains of an economic and non-economic nature and objective and subjective indicators focusing specifically on older adults living in Africa. To the best of our knowledge, no other study constructed such an index specifically applicable to developing countries at a micro-level. We call our index the Quality of Life Index of Older People (QoLIOP). We choose a South African (SA) dataset in our empirical application of the index, namely the National Income Dynamic Study (NIDS), due to the richness of the dataset.

In addition, SA is an interesting case study as the proportion of older adults is rapidly increasing (one of the fastest growth rates in Africa). In 2020, 9.2% (5.51 million) of the population was 60 years or older (StatsSA, 2021a, b, c, d, e). Furthermore, the country is unique as it is the most unequal country globally (Gini coefficient of 65 in 2015), and it has an unstable socioeconomic and political situation with an official[2] unemployment rate of 32.6% (StatsSA, 2021a, b, c, d, e). SA's older people are poor (44% of older adults) and food insecure, with almost 19% of older adults not meeting the food poverty line of R441 ($30.69). Additionally, a significant proportion access the Old Age Pension welfare payment (StatsSA, 2021a, b, c, d, e). With the SA population aging (many over 60 years), there is also an increase in chronic conditions and disabilities (Garin et al., 2016). SA has targeted policies, such as the SA Policy for Older Persons and the Plan of Action on Ageing (Republic of South Africa, 2005). In 2006, the Older Persons Act 13 (Republic of South Africa, 2006) was developed to empower older people and promote and maintain their status, rights, well-being, safety, and security. These policies, acts, and social welfare payments offer the opportunity to measure whether these improve the well-being of older adults over time.

Using SA's NIDS panel dataset, the QoLIOP will allow us to empirically determine the current QoL level among older people. Additionally, we will establish which dimensions in the QoLIOP explain the most variance signalling areas for policy intervention. As we have the benefit of using panel data, we follow older individuals' well-being over time to determine the trend and compare the QoL of different demographic groups to highlight the most vulnerable. This index can be customised

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[2] The official definition of unemployed persons of 15–64 years old is when persons were not employed; and actively looked for work; and were available for work or had not actively looked for work. The expanded definition of unemployment rate (43.2% in 2021) describes persons of 15–64 years old, not employed and were available for work but discouraged from seeking work. Unemployed youth (aged 15–34 years) were the driver of both unemployment rates (StatsSA, 2021a, b, c, d, e).

by other countries (especially those in Africa) to inform policymakers on QoL levels, the most important dimensions, the trends over time, and highlight the most vulnerable groups among older people.

The results show that the newly developed composite multidimensional index is robust and reflects the well-being of older people in an African country. For our empirical application case study, South Africa, we find that the dimensions of *household services, economic status* and *safety* explained the most variance in QoLIOP. We find that the QoL of older adults increased over time as they aged due to the improvements made in the *household services, economic status* and *mental health* dimensions. The dimensions that showed a decrease are *safety* and *health*. We find that white South Africans have the highest QoL among demographic groups, followed by coloureds and Africans.

We note with interest that only the QoL of black South Africans increased over time, whereas it decreased for the other population groups. Furthermore, we find that the QoL of black South Africans is catching up with the other population groups. This shows that the South African government's policy measures implemented in 2006 to empower older and disadvantaged groups had a positive effect. Finally, older males have higher QoL scores compared to females. The older adults that live in rural (traditional) areas have the lowest QoL scores, especially females residing in farming households.

The rest of the paper is structured as follows. The next section contains a brief discussion on the relevant literature and provides theoretical underpinnings for our multidimensional QoL index. "Methodology and data" section outlines the methodology and describes the data used in presenting the functionality of the index. The empirical application of the index and analyses follow in "Empirical application of the QoLIOP" section, while the paper concludes in "Conclusions" section.

Literature Review

Existing Multidimensional Indices of Older Adults

Existing multidimensional indices of QoL of older adults, which measures the extent of the progress of active ageing in European countries, include the Active Ageing Index (AAI) (UNECE, 2018) and the Global AgeWatch Index (GAWI) (HelpAge International, 2015). Their goal is to create a global overview of the ageing challenges faced by various countries and help politicians and policymakers focus on ageing-related issues. Additionally, the Hartford Index of Societal Aging measures societal adoption of ageing in 18 Organisation of Economic Cooperation and Development (OECD) countries (Chen et al., 2018).

These indices have several limitations, such as focusing mainly on developed countries, non-comparable data sources, and lacking theoretical underpinning and transparency. Additionally, income insecurity is measured by GDP per capita, which is not the best indicator since the relationship between a country's economic development and older people's well-being is not direct (Varlamova et al., 2017). Moreover, life expectancy indicators obtained higher weights which can be discriminative

towards the countries that experience high mortality rates. Furthermore, comparisons among various groups (like gender or race) are difficult due to the lack of data on many indicators and an age restriction with a minimum of 65 and a maximum limit of 85 does not allow for the analysis of the oldest adults in this cohort.

Apart from the above, various other composite indices for older people have been attempted internationally. However, they explore domains of QoL of older adults from a specific nature like an index on the satisfaction with their local place of residence (Forjaz et al., 2010), isolation index (Wister et al., 2019) or index on human rights (Doron et al., 2019).

The literature on the one-dimensional QoL of older people is abundant. Often, it is expressed in terms of socioeconomic well-being measured by i) household income and per capita income (Gildner et al., 2019), ii) psychological well-being (Møller & Radloff, 2013; Ralston, 2018), iii) a health perspective (Phaswana-Mafuya et al., 2013; Oldewage-Theron & Egal, 2021) or iv) QoL of older South Africans depending on their housing, for example, at the residential care facilities (van Biljon et al., 2015). However, there is a need for a multidimensional index.

Dimensions of QoL of Older Adults

When investigating which dimensions influence the QoL of older adults, Kelley-Gillespie (2009) proposed it should be viewed from the perspective of general systems theory. This theory emphasises the significance of people's interactions with various systems that impact their behaviour, circumstances and QoL. This means that positive and negative internal or external forces affect an individual's QoL on multiple micro- (individual, family) and macro (community) levels.

Researchers agree that despite the variety in methods used to measure QoL, the components are quite similar (Brown et al., 2004; Kelley-Gillespie, 2009). A synthesis of the existing literature shows that the QoL of older adults has the following overlapping domains (Kelley-Gillespie, 2009): i) social; ii) physical; iii) psychological; iv) cognitive; v) spiritual, and vi) environmental.

While Bond (1999) argued there is no agreement concerning those domains that reflect low or high QoL, some studies investigated the importance of specific domains in older people's lives. Results showed that health (Evans et al., 2005; Henchoz et al., 2015), activities of daily living (Henchoz et al., 2015; Robleda & Pachana, 2019), sensory abilities (Kalfoss & Halvorsrud, 2009; Molzahn et al., 2010), mobility (Kalfoss & Halvorsrud, 2009; Molzahn et al., 2010), home environment (Kalfoss & Halvorsrud, 2009), family (Evans et al., 2005; Henchoz et al., 2015), finances (Henchoz et al., 2015), social life or relationships (Robleda & Pachana, 2019; van Biljon et al., 2015), neighbourhood safety (Henchoz et al., 2015; Paschoal et al., 2007), living arrangements (Evans et al., 2005), spirituality (van Biljon et al., 2015) and energy (Molzahn et al., 2010) were of high importance.

Change in QoL of Older Adults over Time and Differences between Various Groups

Certain theories in gerontology highlight that older individuals learn to adapt to their strengths and weaknesses and thus have more realistic goals, increasing their well-being. For example, socio-emotional selectivity theory suggests that individuals spend more time doing activities that contribute directly to their well-being (Charles & Carstensen, 2009). While some studies find a decrease in well-being over time (Fernández-Ballester et al., 2011), some theories propose that individuals are born with a predisposition to a certain level of happiness and, based on genetics and personality, will always revert to it (Lucas, 2007). Nonetheless, researchers agree that QoL outcomes vary across the lifespan (Lang & Heckhausen, 2001; Jokisaari, 2004) and draw no conclusion on whether it is a continuous process or a generational effect (Blanchflower & Oswald, 2008).

Measuring the QoL of different groups of older adults highlights the most vulnerable groups in a country. The hypothesis that being old and belonging to a minority group has been found to have a double jeopardy effect meaning that the combined negative effects of two stigmatised statuses have a double disadvantage to the outcome due to their interactive effects (Chappell & Havens, 1980). Literature on gender-based, racial and environmental differences in QoL outcomes among older adults is scarce and inconclusive.

There is no clear consensus on whether older females experience higher levels of subjective well-being than older males (Pinquart & Sorensen, 2000; Chappell & Havens, 1980; Meggiolaro & Ongaro, 2015; Sindhuja et al., 2021) nor on which factors influence older men and women's well-being respectively, i.e., support and financial levels for men and participating in group activities, friendships and government assistance for women (Rishworth et al., 2020).

Regarding racial differences, two studies undertaken in the USA by Ortega et al. (1983) and Tang et al. (2019) found that older African Americans were significantly more satisfied with life than whites. In contrast, Krause (1993), also using an American dataset, found the opposite.

Furthermore, the literature has shown that environmental factors may cause possible differences depending on the place of residence. Some studies find that people residing in rural areas achieved higher scores in some domains of QoL (Tavares et al., 2014), while others found that those individuals who reside in urban areas had enhanced subjective well-being than their rural counterparts due to the positive effects of social networks and support systems (Tobiasz-Adamczyk & Zawisza, 2017). Nzabona et al. (2016) confirmed that older persons living in urban areas felt lonelier.

Limitations of Previous Research

From the discussion in "Existing multidimensional indices of older adults", "Dimensions of QoL of older adults", "Change in QoL of older adults over time and differences between various groups" sections, studies that focused on developing

instruments to assess QoL among older adults have several limitations that we aim to address in our study. Firstly, we construct a QoL index that is *more suitable for developing countries*. More specifically, we functionalise a composite *multidimensional QoL index for an African country* where most of the world's vulnerable older people reside. To the best of the authors' knowledge, this has not been done before. We also benefit from *no age restrictions* when applying our index since we include older adults of 60 years and above without a maximum limit. Secondly, while the advantage of international indices lies in comparison across dimensions and countries, such comparability often leads to the loss of accuracy in evaluating multidimensional QoL. Additionally, while these indices might highlight the plight of older people, it does not allow for practical policy initiatives at the country level. Therefore, we rely on one nationally representative data source in our study and *inform policymakers accordingly*. Thirdly, most studies used cross-sectional, non-representative or macro data and data estimates, while we benefit from a *panel dataset spanning five waves*. This allows us to follow the same individuals over time to determine *well-being changes* and highlight the *most vulnerable groups among older people*.

Methodology and Data

Constructing the Multidimensional QoLIOP

In constructing the composite Quality of Life Index of Older People (QoLIOP), we follow the methodology as put forth in the 'Handbook on Constructing Composite Indicators' (OECD, 2008), Hagerty and Land (2007), Land (2014) and Greco et al. (2019).

First, guided by the theory and the literature (see "Existing multidimensional indices of older adults", "Dimensions of QoL of older adults", "Change in QoL of older adults over time and differences between various groups" sections), we select the domains and the indicators within each domain which likely can explain the QoL of older people.

Next, we normalise each indicator to adjust scales for our data to be comparable. We code indicators with nominal and ordinal scales in the same direction, with lower values showing the worse outcome and higher values the best. Then we use the discretisation method to transform continuous variables (household expenditure and years of education) into categorical data.

Different multivariate methods are available to explore the data structure, such as principal component analysis (PCA) and factor analysis (FA). However, we use categorical principal component analysis (CATPCA), a form of PCA, which is best suited for the categorical nature of our data. CATPCA allows for nonlinear relationships between indicators and manages indicators with mixed measurement scales, while PCA fails to do so. CATPCA assigns category quantifications to the variables of mixed measurements, also referred to as optimal scaling (spline ordinal, spline nominal, ordinal and nominal) (Linting et al., 2007). CATPCA uses an iterative algorithm that alternates the estimation of optimal quantifications and the linear PCA model, which is achieved by minimising a least-squares loss function (for more technical information on CATPCA, please refer to Gifi, 1990; Linting et al., 2007).

Using different combinations of our selected indicators, we run various CATPCAs to determine the best fit and select the most appropriate indicators to explain the relevant components. The results show that closely related indicators load on the same components. Eigenvalues measure the total variance in the data explained by each component, while the sizes of the eigenvalues determine the number of components that need to be extracted. The largest possible variance guides our final set of indicators in the data.

There are a few options to weight the index, such as equal weighting, various objective statistical measures, and subjective weighting. Equal weights do not account for variation in weights of the individual indicators, while subjective weights are often not internationally comparable as they depend on the opinion of various stakeholders (OECD, 2008). We selected CATPCA as it benefits from being an objective weighting method: it allocates weights according to the variance explained in the data instead of depending on subjective evaluations of the weights of researchers or policymakers (Decancq & Lugo, 2013; Booysen, 2002). It means that the data itself determines the weighting. The standard method of constructing composite indices using CATPCA, PCA or FA includes only the factor loadings on the first component.

However, if the first component does not provide sufficient explanatory value, Nicoletti et al. (2000) suggest a method to use not only the first component but also to consider the subsequent extracted components. Therefore, we aim to keep the most variation of the data with the minimum number of components. We use the factor loadings as the weights of our intermediate composites indices (ICI), i.e., the different sub-dimensions of QoL. We square each factor loading and scale it to a unity sum to obtain the ICI. In addition, we also weight each of the extracted components to derive our QoLIOP. These weights are equal to the proportion of the explained variance of the extracted component in the dataset (Nicoletti et al., 2000). In doing so, we determine that the first component explains the most variance and therefore carries the largest weight in the composite index. All subsequent components explain less variance and attract a lower weight in the index.

We chose the linear aggregation method rather than a geometric or multi-criteria aggregation method because it assumes that indicators have preferential independence and are more compensatory. In other words, it allows the dimension with a higher score to compensate (offset) the dimension with the lower score (Dobbie & Dail, 2013). Linear aggregation permits the assessment of the marginal contribution of each indicator separately, which, further added together, yields a total value (OECD, 2008). Furthermore, linear aggregation is simplistic and eases the replication of the methodology used to construct the index.

Finally, to test the robustness of the QoLIOP to the subjective choices we made regarding the (i) imputation of missing data, (ii) scaling of the variables, (iii) method of weighting and (iv) aggregation of the composite index, we conduct an uncertainty and sensitivity analysis. The different methods to treat the "missingness" in the data include pairwise and listwise deletion, which is compared to our choice using CATPCA. Additionally, we use different optimal scaling methods such as spline ordinal and spline nominal to compare our scaling results. The weighting method we apply is equal weighting. Furthermore, we used geometric aggregation rather than linear

aggregation to aggregate the different dimensions of QoL. To test the robustness of our index to these subjective choices, we calculate the Pearson correlation coefficient between our index and the alternative indices. If the correlation is strong, positive and significant, we assume our index to be robust (see Jordá et al., 2015).

We test the linkage (correlation) of the QoLIOP to other published indices and well-being measures as an additional method to validate our index (Hagerty & Land, 2007; OECD, 2008). Lastly, we also compare the trend of a single indicator of subjective well-being to our index, included in the dataset but not included in the composite index itself. For this purpose, we make use of life satisfaction. If the trend over time is significantly correlated, we assume that the QoLIOP is a valid representation of the quality of life for older adults in South Africa (Groh et al., 2010).

In applying the QoLIOP using the NIDS dataset, we calculate the mean per subsample either per wave or demographic group. We tested the significance of the difference in the mean scores of the different sub-samples (per wave or demographic group) using a t-test for those sub-samples with two categories (gender and geographical area) and one-way between-sub-sample analysis of variance (ANOVA) for sub-samples with two or more categories (population group).

Data

The data used to demonstrate an empirical application of the QoLIOP comes from the National Income Dynamics Survey (NIDS).[3] NIDS is a face-to-face longitudinal survey repeated with the same individual household members every two years (Chinhema et al., 2016). This dataset focuses on the livelihoods of individuals and households over time. The reason for choosing the NIDS data to demonstrate the construction of the index lies with the questionnaire capturing data on many dimensions of QoL, including the socioeconomic profiles of households and their individuals. Additionally, we have information on sources of income, including grants, household expenditures, assets, community-level data, and health-related components, which is ideal for this study as it covers various aspects of older adults' well-being. Furthermore, NIDS allows for countrywide coverage as all nine provinces were targeted for the individual and household questionnaires (Leibbrandt et al., 2009).

To select the sample data used in the construction of QoLIOP, we included all five waves from the individual and household levels spanning a period from 2008 to 2017. As our focus is on the well-being of older adults, we include older persons of 60 years and above (as per our definition mentioned in "Introduction" section). We choose individuals 60 years or older in wave one and follow these individuals over five waves meaning that there were no new entrees of individuals within those five waves. We excluded those individuals that died in one of the waves. Moreover, we excluded those individuals that did not answer the questionnaire in at least three waves.

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[3] The data is stored on the DataFirst portal: http://www.datafirst.uct.ac.za/dataportal/index.php/catalog/NIDS

Table 1 Demographic characteristics of the sample of older adults

Variable	Obs	% of Sample	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
Gender:							
female	4510	70	902	902	902	902	902
male	1925	30	385	385	385	385	385
Population group:							
black African	4935	76.67	987	987	987	987	987
coloured	835	12.98	167	167	167	167	167
Asian / Indian	80	1.24	16	16	16	16	16
white	585	9.09	117	117	117	117	117
Geographical area:							
urban	2679	40.95	527	535	538	541	538
rural	3756	59.05	760	752	749	746	749
N	6435		1287	1287	1287	1287	1287

Source: Author's calculations based on the NIDS dataset

As a first instance, we pool the data from all five waves when constructing the QoLIOP. In this manner, we derive the same weights over time and across sub-samples making the QoL indices comparable (see "Empirical application of the QoLIOP" section). The final balanced data consists of 1287 individuals in the target age group (60+) and 6435 observations in all five waves.

The demographic characteristics of SA's older population are represented in Table 1. A substantial proportion of older South Africans consists of females, 70% or 902 individuals. The share of black Africans in the sample is significant at 77% (987 older adults), with a smaller percentage share allocated to the other population groups. We divide geographical areas into urban and rural areas. In the SA context, urban areas are continuously built-up areas with economic activity and land use such as cities, towns, townships, and suburbs (StatsSA, 2021a, b, c, d, e). We combined the categories "traditional" and "farms" into "rural" according to the StatsSA definition that rural area includes tribal/traditional areas (former homeland areas), commercial farms and informal settlements (StatsSA, 2021a, b, c, d, e). A high level of those living in urban areas (60% or 760 individuals) is expected since older people prefer a slower and more relaxed lifestyle.

Empirical Application of the QoLIOP

In our empirical application of the QoLIOP, we first illustrate the construction of the index and, secondly, the application to the South African NIDS dataset.

Construction of the Multidimensional QoLIOP

Following the methodology as set out in "Constructing the multidimensional QoLIOP" section, we firstly identify likely dimensions and indicators to be included in a composite index to measure the QoL of older people. We base the selection of the dimensions and the indicators on the theoretical framework, reviewed literature, the existing indices (see "Existing multidimensional indices of older adults", "Dimensions of QoL of older adults", "Change in QoL of older adults over time and differences between various groups" sections), and the NIDS data availability.

We notice that national and international indices include certain common dimensions of older adults' well-being, namely: health, income, housing, safety, social, and the environment. However, we find a wide range of indicators to measure these dimensions.

Our initial selection replicates those dimensions found in the abovementioned indices; however, the NIDS dataset has certain data restrictions; therefore, we could not include the environmental or the political participation dimension. The identified dimensions and likely indicators are explained below:

1. Education. Nearly all existing indices mentioned in "Existing multidimensional indices of older adults" section used *years of education* as one of the indicators. We also added the indicator *reading skills* to capture the literacy level of older people due to government-enforced educational inequalities in the Apartheid era. Older adults in our sample were alive during this time and would have received a limited education.
2. Health. Our analysis represents overall physical health by the subjective indicator of *self-reported health status*. The *consultation about health* variable was also included indicating the number of times an individual sought medical assistance. *Disabilities, diabetes, eyesight* and *hearing* represent the physical conditions of an individual. *Personal care, medical aid, effort, exercising* and *smoking* indicate the levels of individuals' ability to look after themselves.
3. Mental health. Drawing on existing indices, we included the mental health dimension with the following indicators: *happiness*, *loneliness*, *depression* and *hope*.
4. Economic status. In terms of income dimensions, there was little variation in the indicators in existing indices, i.e., *pension receipt* and *employment status*. *Household income* is one of the other indicators used in all the indices. However, we used the *household expenditure per person* indicator since it directly measures household well-being (Slesnick, 1998).
5. Safety. Regarding the safety dimension, there are indicators like *trust in neighbours*, *murders*, *theft*, *violence*, and *drugs* and *alcohol consumption in the neighbourhood* indicators according to the Elderly Quality of Life Index (EQoLI) (Paschoal et al., 2007).
6. Housing. According to the literature and other indices, the housing dimension includes basic needs like *toilet access, rubbish removal, water access*, and *electricity, number of rooms per person* and *type of dwelling*.

7. Social contact. According to the literature and other indices, *marital status, number of children, number of people living in the household,* and *religion* are indicators that can be used in the analysis.

As explained in the methodology, to normalise the data, we recode all the variables in the same coding direction (higher values represent better QoL outcomes for older adults) and discretise the selected continuous variables (household expenditure and years of education).

Next, we use exploratory factor analysis, namely CATPCA, to determine the closest related indicators and loads on a specific extracted component, highlighting a latent QoL dimension captured in the NIDS data. These dimensions would be specific to a developing country due to the use of the South African dataset.

To execute the CATPCA, we test our data for suitability for our analysis using the KMO measure of sampling adequacy and Bartlett's test of sphericity. The results showed that our sample is suitable for the CATPCA analysis. The overall KMO was 0.803, which is above 0.5, meaning that our sample has high sampling adequacy. Bartlett's test of sphericity showed a 0.0000 p value which is less than 0.05; thus, we reject the null hypothesis of no correlation in the dataset and conclude that there is enough correlation among the indicators to use CATPCA.

Following the Kaiser criteria, which states that components with eigenvalues of more than one should be extracted, and the results of the scree plot (see Supplementary Information Fig. S1), we extract five components. Furthermore, we find that five components are appropriate and theoretically sound and mirrored by the literature review. The extracted components explain approximately 58% of the variance. According to Hair et al. (2014), there is no absolute threshold for the percentage of variance criterion; however, it is satisfactory to use approximately 60% (also see in Greyling & Tregenna, 2017 and Rossouw & Naude, 2008). We use varimax rotation rather than the oblimin method to simplify the structure of the CATPCA as we found our components to be orthogonal. See Table 2 for the final CATPCA results reflecting the five extracted components and the selection of the most suitable indicators.

On inspection of those indicators with the highest loading on the five extracted components, each defining a latent sub-dimension of quality of life, we named these dimensions accordingly: *household services*, *economic status*, *safety*, *mental health* and *health*. Figure 1 depicts these dimensions and the indicators best suited to measure them.

We weight the index using the final results of the CATPCA (see Table 2) as explained in the methodological section. For example, to weight the sub-index for *health,* we multiply each of the indicators with the weights: consultation about health (0.39), self-reported health status (0.38), disability (0.23). To construct the final index, we weight the sub-indices as explained in the methodology and linearly aggregate the subindices: *household services* sub-index (0.27), *economic status* sub-index (0.24), *safety* sub-index (0.21), *mental health* sub-index (0.15), *health* sub-index (0.13).

Table 2 Factor loadings used to weight the composite indices based on a rotated component matrix (Varimax rotation)

Indicator	Extracted components					Squared factor loadings scaled to unity sum				
	1	2	3	4	5	1	2	3	4	5
Toilet access	**0.845**	0.265	0.023	0.051	−0.031	**0.287**				
Rubbish removal	**0.832**	0.195	−0.005	0.059	−0.055	**0.279**				
Water access	**0.807**	0.093	−0.017	0.054	0.033	**0.262**				
Energy source	**0.655**	0.103	−0.063	0.038	0.023	**0.172**				
Years of education	0.256	**0.826**	0.088	0.101	−0.003		**0.322**			
Reading skills	0.284	**0.787**	0.07	0.093	0.029		**0.292**			
HH expenditure pp.	0.333	**0.725**	0.123	0.088	−0.065		**0.248**			
Pension receipt	0.002	**−0.541**	−0.041	0.035	−0.053		**0.138**			
Frequency of murders	−0.005	0.151	**0.795**	0.039	−0.014			**0.297**		
Frequency of theft	0.018	−0.137	**0.759**	−0.007	0.116			**0.270**		
Frequency of violence	−0.045	0.062	**0.738**	0.078	−0.089			**0.255**		
Frequency of drugs	−0.025	0.36	**0.617**	0.019	0.062			**0.178**		
Loneliness	−0.03	0.005	0.002	**0.786**	0.025				**0.428**	
Depression	0.012	0.039	0.024	**0.775**	0.087				**0.416**	
Happiness	0.259	0.097	0.095	**0.475**	−0.008				**0.156**	
Consultation about health	−0.109	0.051	0.039	−0.04	**0.709**					**0.386**
Self-reported health status	−0.012	0.218	0.005	0.181	**0.706**					**0.382**
Disability	0.095	−0.157	−0.002	0.004	**0.55**					**0.232**
% variance in data	15.752	13.950	12.102	8.475	7.510					
Eigenvalue	2.835	2.511	2.178	1.525	1.352					
% variance of extracted components	0.273	0.241	0.209	0.147	0.130					

Source: Author's calculations

*Factor loadings in bold indicate the highest loadings per component

**Extracted components explain 57.8% (15.8+13.9+12.1+8.5+7.5) of the variance of the data
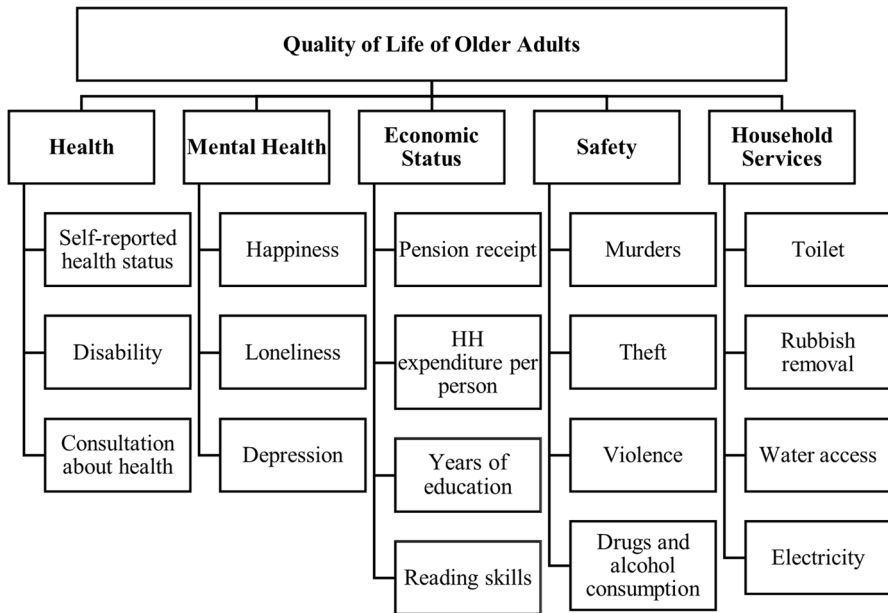
Fig. 1 The model of QoL of older adults

**Table 3** Correlation between alternative composite QOL indices

Well-being indices	QoLIOP	QoLIOP (equal)	QoLIOP (geometric)	LS
QoLIOP	1.0000			
QoLIOP (equal)	0.9769***	1.0000		
QoLIOP (geometric)	0.9650***	0.9909***	1.0000	
LS	0.3491***	0.3423***	0.3278***	1.0000

Source: Authors' calculations using NIDS

***Correlation is significant at the 0.001 level. QoLIOP = composite well-being index with CATPCA weighting and linear aggregation. QoLIOP (equal) = composite well-being index with equal weighting and linear aggregation. QoLIOP (geometric) = composite well-being index with equal weighting and geometric aggregation. LS = life satisfaction–-- single-dimensional measure of QoL transformed into index

To ensure the robustness of our QoLIOP index, we refer to the sensitivity analysis results in Table 3.[4] This shows that the alternative QoLIOP indices constructed using alternative weighting (equal weighting) and different aggregation methods using equal weighting (linear – and geometric) are highly correlated. Based on these results, we conclude that our QOLIOP is robust to the subjective choices in constructing the index.

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[4] See Table S1 in Supplementary Information for the results of different methods to treat the "missing-ness" in the data.
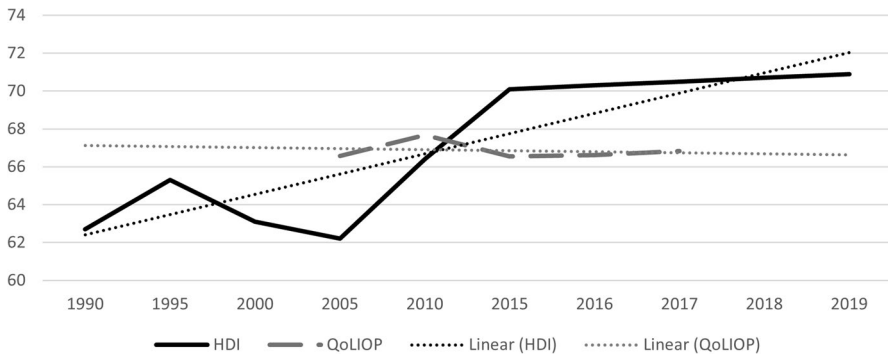
Fig. 2 Comparison of the trendlines of the HDI and QoLIOP indices. Source: UNDP (2020) and Authors' calculations using NIDS

We also correlated the QoLIOP to the single-dimensional measure of QoL – subjective well-being (life satisfaction) and found that it was positively correlated with a medium correlation level (Table 3). This implies that although a single-dimensional measure such as life satisfaction might reflect the trend in QoL, it has limitations. Subjective well-being is an umbrella measure of experienced well-being and does not highlight the exact dimensions of QoL that should be prioritised to increase the well-being of older people.

Finally, to test the linkage (correlation) of the QoLIOP to other published indices and well-being measures as an additional method to validate our index, we were limited in our choices, as no other multidimensional composite well-being index exists for older adults in South Africa. A likely alternative measure for well-being that we use as a robustness check is the HDI (Fig. 2). The HDI index published yearly shows an improvement in the QoL of the SA population. However, one must remember that it is constructed at the macro-level and includes only three domains, compared to our index, which is more comprehensive and constructed at the micro-level. When comparing the trends of both HDI and QoLIOP, we find an upward trend.

Based on these findings, we assume the QoLIOP is a valid measure of the quality of life of older adults in South Africa (Groh et al., 2010); thus, it measures what it is purported to measure.

Empirical Application of the QoLIOP Index Using NIDS Data

Based on the results from "Construction of the multidimensional QoLIOP" section, we can determine those components explaining the most variance in the QoLIOP. The dimension that explains the most variance in the dataset also carries the highest weight in the composite index. Therefore, we assume it has the highest importance in the QoL of older people in SA. In order of the most explained variance, they are *household services* explaining 15.8% of the variance in the data, *economic status* (13.9%), *safety* (12.1%), *mental health* (8.5%) and *health* (7.5%) (see Table 2).

The dimension that explains the most variance and can be seen as the most important is the *household services* dimension. According to Maslow's hierarchy

of needs (Maslow, 1943), this dimension represents the essential needs people need to fulfil for survival and security. The importance is consistent with previous research where access to basic needs like water, residing in a house and having electricity are some of the biggest contributors to people's well-being in SA (Greyling & Tregenna, 2017; Kalfoss & Halvorsrud, 2009). The importance of *household services* can be arguably more important to older adults, with 36.4% of African older adults staying in three or more generation households. Therefore, stressing the importance of access to basic services in overcrowding situations (StatsSA, 2021a, b, c, d, e).

The second most important dimension was *economic status*. In South Africa, less than 15% of the older population are in the labour force market, increasing the burden on the productive population (StatsSA, 2021a, b, c, d, e). Additionally, lower incomes from being less active in the labour force are associated with poorer health and psychological well-being (Arendt, 2005). As of March 2020, there were 3.7 million older people (69% of the whole older population) who received an Old Age Grant (OAG) of R1780 ($122) (StatsSA, 2021a, b, c, d, e). Notably, the older-adults-headed households were more likely to depend on grants as the main source of income. However, even though the comprehensive social security system in SA could make older adults feel more secure, *economic status* still plays a larger role than other dimensions because of the risk of rising living costs and fewer options for continued income.

Safety was another dimension that contributed the most to the variance of QoL of older adults in SA. It is not surprising, considering that SA has the third-highest crime rate globally, with 77% in 2021 (World Population Review, 2021). This finding is consistent with the literature (Henchoz et al., 2015; Robleda & Pachana, 2019). High frequencies of violence, theft, murders, drugs, or alcohol abuse in the neighbourhood have a significant impact on the well-being of individuals. In South Africa, the risk of being a victim of a crime causes older adults to feel more vulnerable.

Mental health showed a smaller variance in the QoL of older people. Older people may experience stressors, for example, the loss of health, independence, a decline in functional abilities, and the loss of their loved ones, that influence their mental outlook (Gabriel & Bowling, 2004).

It was expected that the *health* dimension would have a higher variance in the QoL of older people since there is an increase in chronic conditions and disabilities among this cohort. The most common conditions among the older adults were high blood pressure (47.3%), diabetes (16.6% in 2019) and arthritis (15.6% in 2019) (StatsSA, 2021a, b, c, d, e). Most of the older population in SA (75.7% in 2019) rely on the public health system (StatsSA, 2021a, b, c, d, e). Although public health care is free for older people, they struggle to access quality care due to the challenges of waiting times, medical staff shortages, and transport costs (Solanki et al., 2019). Instead, they rely heavily on self-medication (63.5% in 2019) and do not consider it necessary to consult a medical doctor (27.4% in 2019) (StatsSA, 2021a, b, c, d, e).

Our secondary application of the QoLIOP is to follow individuals across time and determine the change in the level of QoL of the same people across the waves (see Table 4). For this purpose, we use the panel nature of the NIDS dataset.

Table 4 Change of the QoLIOP scores and its ICIs over time (Mean, %)

|	Min	Max	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Δw1 to w5
QoLIOP	36.786	99.007	66.566	67.678	66.555	66.607	66.821	0.255
ICI_1 = HH Services	50	100	73.308	75.249	76.157	76.599	76.952	3.644
ICI_2 = Economic Status	26.844	100	50.933	51.652	51.857	52.937	53.728	2.795
ICI_3 = Safety	20	100	68.165	64.011	60.485	61.822	60.969	−7.196
ICI_4 = Mental Health	25	100	81.255	83.938	82.762	83.552	84.409	3.154
ICI_5 = Health	26.967	100	62.311	69.124	65.208	59.635	59.479	−2.832

Source: Authors' calculations using NIDS

Table 4 shows that the mean QoLIOP increased over time. The QoLIOP increased overall by approximately three percentage points, suggesting that SA older people maintain and maximise their gains in their later life which agrees with the Selectivity Theory by Charles and Carstensen (2009) mentioned in "Change in QoL of older adults over time and differences between various groups" section. The minimum QoLIOP score that an individual received was approximately 37% which indicates that some older people still experience relatively low levels of QoL and lack fulfilment of their basic needs.
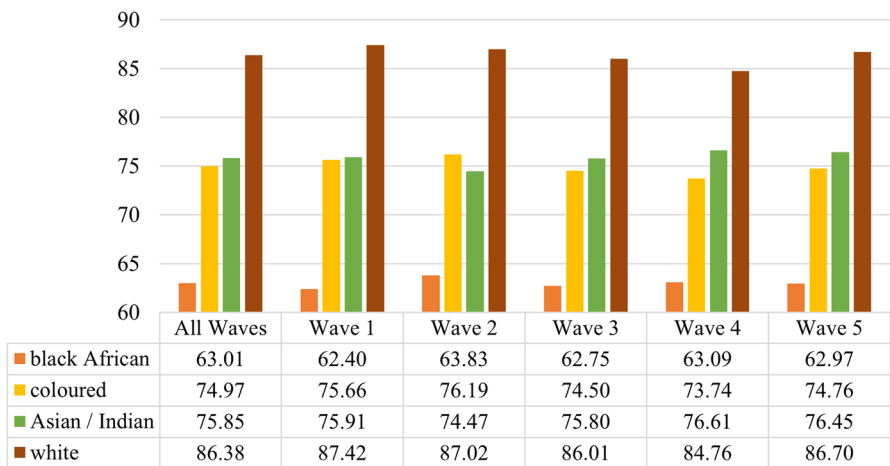
To test if the differences are significant between wave 1 and wave 5, we use a t-test. We specifically compare the differences between wave 1 and wave 5. Thus, for a period of approximately ten years, as the influence on well-being should be measurable and significant over this longer period of time. As we know, the outcome of the implementation of fiscal policy is not immediate (the results of the t-test can be found in Table S2 in Supplementary Information). We find that the mean level of the QoLIOP differs significantly between wave 1 and wave 5. This is proof that policy measures applied did increase the well-being of older people.

A significant improvement of 4% has been made in the *household services* dimension scores. Likely signalling the results of The National Development Plan (NDP, 2012) and the National Water Act (RSA, 1997). These policy measures have made significant progress in providing water supply and sanitation services since the end of Apartheid. However, there are still backlogs and challenges (Mudombi, 2020). *Economic status* scores increased over the years by 3%, which could be attributed to the government providing inflation-linked adjustments to the OAG (National Treasury, 2016). The *mental health* dimension showed that psychological well-being improved with age by 3%, consistent with the U-shaped happiness curve (Blanchflower & Oswald, 2008). Furthermore, *safety* scores have worsened over the years by 7%, consistent with the national statistics on crime (South African Police Service, 2021). The decline of the *health* dimension scores by 3% is not surprising since old age is associated with fragility and an increase in chronic conditions (StatsSA, 2021a, b, c, d, e).

In the following section, we test the differences between demographic groups (gender, population and demographic area) to see if the differences are significant (the results can be found in Table S3 in Supplementary Information). We found
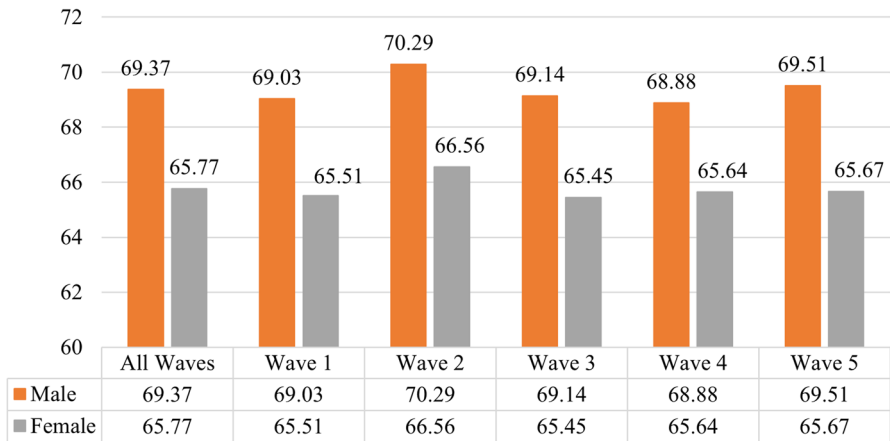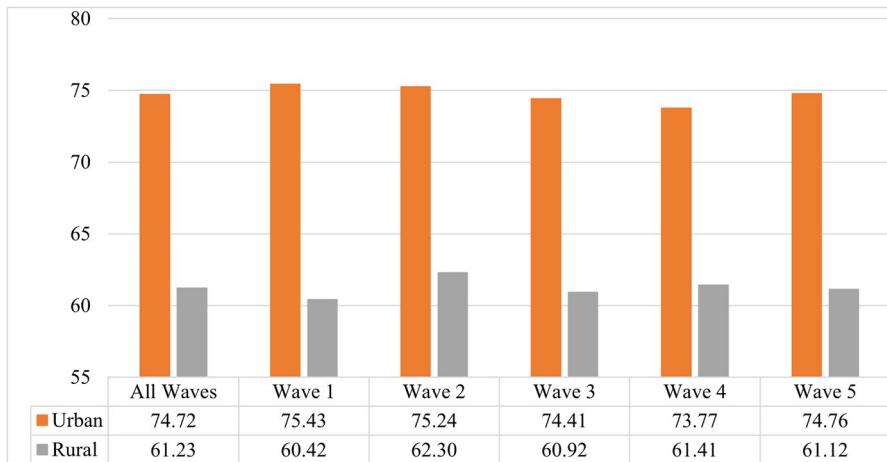
Fig. 3 Gender comparisons of the average of the QoL indices of older adults (60+). Source: Authors' calculations using NIDS

	All Waves	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
■ Male	69.37	69.03	70.29	69.14	68.88	69.51
■ Female	65.77	65.51	66.56	65.45	65.64	65.67

Fig. 4 Population group comparisons of the average of the QoL indices for older adults (60+). *Source: Authors' calculations using NIDS*

	All Waves	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
■ black African	63.01	62.40	63.83	62.75	63.09	62.97
■ coloured	74.97	75.66	76.19	74.50	73.74	74.76
■ Asian / Indian	75.85	75.91	74.47	75.80	76.61	76.45
■ white	86.38	87.42	87.02	86.01	84.76	86.70

that gender, geographical area, population groups (race) and belonging to a farming household had significant differences among the categories.

Older males have higher QoL scores than females (see Fig. 3). In each group, the QoLIOP increased over time, though by a negligible margin: females increased from 65.51% to 65.67%, and males improved their scores from 69.03% to 69.51%. Our findings are consistent with the literature results (Chappell & Havens, 1980; Ebrahim et al., 2013). Pinquart and Sorensen (2000) stated a few reasons why women have lower well-being. Firstly, on average, older women have

	All Waves	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
■Urban	74.72	75.43	75.24	74.41	73.77	74.76
■Rural	61.23	60.42	62.30	60.92	61.41	61.12

Fig. 5 Geographical area comparisons of the average of the QoL scores of older adults (60+). Source: Authors' calculations using NIDS

lower material resources due to the previous income inequalities. Secondly, their morbidity rates are higher, and lastly, they are more likely to be widowed.

When comparing population groups (see Fig. 4), older white people were found to have higher QoL levels than black African, coloured and Asian. The lowest QoL was found among older black Africans, consistent with the literature (Krause, 1993; Ebrahim et al., 2013). Possible reasons for this result could lie in the historical inequalities created by the Apartheid era. For example, in 2019, there were more illiterate older females (0.67 million) than males (0.32 million), and the majority of them were black African older people (0.91 million or 92% of all illiterates) (StatsSA, 2021a, b, c, d, e). When it comes to basic services, the African population group experienced the worse access to piped water (only 64% had access in 2019), sanitation (almost 80% had access in 2019) or waste disposal (46% in 2019) compared to other population groups where almost everyone had access (StatsSA, 2021a, b, c, d, e). However, despite the past inequalities, the QoL of black Africans is catching up with the other population groups. This shows that the South African government's policy measures implemented in 2006 to empower older people and policies such as the National Development Plan and Black Economic Empowerment to resolve economic and non-economic disparities among disadvantaged population groups have been relatively successful.

Figure 5 illustrates that the older adults that live in rural areas have the lowest QoL scores in our sample. This is consistent with the previous research (Nzabona et al., 2016; Tobiasz-Adamczyk & Zawisza, 2017), where individuals living in urban areas had enhanced well-being outcomes compared to those in rural areas. Rural areas in SA are characterised as economically and socially deprived due to urban migration, which causes a lack of services, facilities and employment opportunities (van Schalkwyk et al., 2014).

Conclusions

Given that rapid ageing is happening mainly in developing countries and that the fastest growth will be in Africa, we constructed the first multidimensional QoL index for older adults (QoLIOP), focusing specifically on the needs of older adults in Africa at a micro-level. Choosing a dataset of an African country allowed us to determine the current level of QoL of older persons and the dimensions of QoL most important in explaining their well-being. Furthermore, applying the index empirically, we determined whether the well-being of a specific group of older adults increased over time and identified the most vulnerable groups.

We contributed to the existing literature by developing a multidimensional QoL index, which accurately measures the well-being of older people in Africa. Other African and developing countries can replicate the method to measure the well-being of their older people. It is important to determine the level of well-being of older people as we can only manage what we can measure. As the index is applied to a South African dataset, it highlights those dimensions most important to African countries rather than developed countries. Our choice of dataset gives us the benefit of deriving information about well-being changes over time and highlights the most vulnerable groups among older people. Often previous studies used either small cross-sectional data sets, thus not being nationally representative or macro data, which is important for cross-country analysis but does not highlight microeconomic issues for future policy initiatives.

Our results from CATPCA showed the dimensions of *household services*, *economic status*, and *safety* had the most variance in QoLIOP. Moreover, the QoL of older adults increased as they aged due to policies implemented and, therefore, the improvements made in *household services*, *economic status* and *mental health* over time. We found that black Africans have the lowest QoL compared to coloured and white South Africans. However, we found that only the QoL of black Africans increased over time and was catching up with the other population groups. Finally, older males have higher QoL scores compared to females. The older adults that live in rural areas have the lowest QoL scores.

Given our results, additional specific interventions are needed to improve the well-being of older adults. Possible policy initiatives could be targeted at improving housing conditions, reducing crime rates, improving access to health care, creating mental health policies specific to older adults, formulating policies to decrease gender and racial inequalities, and promoting active involvement of older adults in the economy. The introduction of these more specific initiatives parallel to already existing policies can provide basic human needs and improve the living standards of older adults, not only in South Africa or Africa but in the rest of the developing world.

Declarations

Competing Interests Talita Greyling is the editor in charge of *Pioneers in Quality of Life Theory and Research* for Applied Research in Quality of Life.

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References

Apt, N. A. (1992). Trends and prospects in Africa. *Community Development Journal, 27*(2), 130–139.

Arendt, J. N. (2005). Income and "outcomes" for the elderly: Do the poor have a poorer life? *Social Indicators Research, 70*, 327–347.

van Biljon, L., Roos, V., & Botha, K. (2015). A conceptual model of quality of life for older people in residential care facilities in South Africa. *Applied Research Quality Life, 10*, 435–457.

Blanchflower, D. G., & Oswald, A. J. (2008). Is well-being U-shaped over the life cycle? *Social Science and Medicine, 66*(8), 1733–1749.

Bond, J. (1999). Quality of life for people with dementia: Approaches to the challenge of measurement. *Ageing and Society, 19*, 561–579.

Booysen, F. (2002). An overview and evaluation of composite indices of development. *Social Indicators Research, 59*(2), 115–151.

Brown, J., Bowling, A., & Flynn, T. (2004). *Models of quality of life: A taxonomy, overview and systematic review of the literature*. European Forum on Population Ageing Research.

Chappell, N. L., & Havens, B. (1980). Old and female: Testing the double jeopardy hypothesis. *The Sociological Quarterly, 21*, 157–171.

Charles, S., & Carstensen, L. (2009). Socioemotional selectivity theory. In H. Reis & H. Spreche (Eds.), *Encyclopedia of human relationships* (pp. 1578–1581). Sage Publications.

Chen, C., Goldman, D. P., Zissimopoulos, J., Rowe, J. W., & Research Network on an Aging Society. (2018). Multidimensional comparison of countries' adaptation to societal aging. *Proceedings of the National Academy of Sciences, 115*(37), 9169–9174.

Chinhema, M., Brophy, T., Brown, M., Leibbrandt, M., Mlatsheni, C., & Woolard, I. (Eds.). (2016). *National Income Dynamics Study panel user manual*. Southern Africa Labour and Development Research Unit.

Decancq, K., & Lugo, M. A. (2013). Weights in multidimensional indices of wellbeing: An overview. *Econometric Reviews, 32*(1), 7–34.

Dobbie, M. J., & Dail, D. (2013). Robustness and sensitivity of weighting and aggregation in constructing composite indices. *Ecological Indicators, 29*, 270–277.

Doron, I., Cox, C., & Spanier, B. (2019). Comparing older persons' human rights: Exploratory study of the international older Persons' human rights index (IOPHRI). *The Gerontologist, 59*(4), 625–634.

Ebrahim, A., Botha, F., & Snowball, J. (2013). Determinants of life satisfaction among race groups in South Africa. *Development Southern Africa, 30*(2), 168–185.

Evans, S., Gately, C., Huxley, P., Smith, A., & Banerjee, S. (2005). Assessment of quality of life in later life: Development and validation of the QuiLL. *Quality of Life Research, 14*, 1291–1300.

Fernandez-Ballester, R., Arias, E.-D., Santacreu, M., & Ruvalcaba, N. (2011). Quality of life in Mexico and in Spain. In *The global dynamics of aging* (Chapter 2, pp. 3–24). Nova Science Publishers.

Forjaz, M. J., Prieto-Flores, M.-E., Ayala, A., Rodriguez-Blazquez, C., Fernandez-Mayoralas, G., Rojo-Perez, F., & Martinez-Martin, P. (2010). Measurement properties of the community wellbeing index in older adults. *Quality of Life Research, 20*, 733–743.

Gabriel, Z., & Bowling, A. (2004). Quality of life from the perspectives of older people. *Ageing and Society, 24*(5), 675–691.

Garin, N., Koyanagi, A., Chatterji, S., Tyrovolas, S., Olaya, B., Leonardi, M., et al. (2016). Global multi-morbidity patterns: A cross-sectional, population-based, multi-country study. *Journals of Gerontology: Medical Sciences, 71*(2), 205–214.

Gifi, A. (1990). *Nonlinear multivariate analysis*. Wiley.

Gildner, T. E., Liebert, M. A., Capistrant, B. D., D'Este, C., Snodgrass, J. J., & Kowal, P. (2019). Perceived income adequacy and well-being among older adults in six low- and middle-income countries. *Journals of Gerontology: Social Sciences, 74*(3), 516–525.

Greco, S., Ishizaka, A., Tasiou, M., & Torrisi, G. (2019). On the methodological framework of composite indices: A review of the issues of weighting, aggregation, and robustness. *Social Indicators Research, 141*(3), 1–34.

Greyling, T., & Tregenna, F. (2017). Construction and analysis of a composite quality of life index for a region of South Africa. *Social Indicators Research, 131*, 887–930.

Groh, A. P., von Liechtenstein, H., & Lieser, K. (2010). The European venture capital and private equity country attractiveness indices. *Journal of Corporate Finance, 16*(2), 220–224.

Hagerty, M. R., & Land, K. C. (2007). Constructing summary indices of quality of life, a model for the effect of heterogeneous importance weights. *Sociological Methods and Research, 35*(40), 455–496.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis*. Pearson Education Limited.

HelpAge. (2019). *Global AgeWatch*. Retrieved July 16, 2019, from http://globalagewatch.org/

HelpAge International. (2015). In A. Mihnovits & A. Zaidi (Eds.), A *Global AgeWatch Index 2015: methodology update*. Available from https://www.helpage.org/global-agewatch/reports/global-agewatch-index-2015-insight-report-summary-and-methodology/

Henchoz, Y., Meylan, L., Goy, R., Guessous, I., Bula, C., Demont, M., et al. (2015). Domains of importance to the quality of life of older people from two Swiss regions. *Age and Ageing, 44*, 979–985.

Jokisaari, M. (2004). Regrets and subjective well-being: A life course approach. *Journal of Adult Development, 11*(4), 281–288.

Jordá, V., Trueba, C., & Sarabia, J. M. (2015). Evolution of global inequality in human well-being: A sensitivity analysis. *International Journal of Computational Economics and Econometrics, 5*(1), 108–125.

Kalfoss, M., & Halvorsrud, L. (2009). Important issues to quality of life among Norwegian older adults: An exploratory study. *The Open Nursing Journal, 3*, 45–55.

Kelley-Gillespie, N. (2009). An integrated conceptual model of quality of life for older adults based on a synthesis of the literature. *Applied Research Quality Life, 4*, 259–282.

Krause, N. (1993). Race differences in life satisfaction among aged men and women. *Journal of Gerontology, 48*(5), 5235–5244.

Land, K. C. (2014). Composite index construction. In Michalos (Ed.), *Encyclopedia of quality of life and well-being research* (pp. 1152–1156). Springer.

Lang, F. R., & Heckhausen, J. (2001). Perceived control over development and subjective well-being: Differential benefits across adulthood. *Journal of Personality and Social Psychology, 81*(3), 509–523.

Leibbrandt, M., Woolard, I., & de Villiers, L. (2009). *Methodology: Report on NIDS wave 1*. NIDS.

Linting, M., Meulman, J. J., Groenen, P. J., & Van der Kooij, A. J. (2007). Nonlinear principal components analysis: Introduction and application. *Psychological Methods, 12*(3), 336–358.

Lucas, R. E. (2007). Adaptation and the set-point model of subjective well-being: Does happiness change after major life events? *Current Directions in Psychological Science, 16*(2), 75–79.

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review, 50*(4), 370–396.

Meggiolaro, S., & Ongaro, F. (2015). Life satisfaction among older people in Italy in a gender approach. *Ageing & Society, 35*(7), 1481–1504.

Møller, V., & Radloff, S. (2013). Perceptions of fortune and misfortune in older south African households: Social assistance and the 'Good Life'. *Social Indicators Research, 111*, 633–664.

Molzahn, A., Skevington, S. M., Kalfoss, M., & Makaroff, K. S. (2010). The importance of facets of quality of life to older adults: An international investigation. *Quality of Life Research, 19*, 293–298.

Mudombi, S. (2020). *Unpacking water and sanitation access in South Africa: A renewed call for more action*. Trade & Industrial Policy Strategies.

National Treasury. (2016). *Budget review 2016*. National Treasury Republic of South Africa.

NDP. (2012). *National Development Plan 2030: Our future-make it work*. National Planning Commission.

Nicoletti, G., Scarpetta, S., & Boylaud, O. (2000). *Summary indicators of product and market regulation with an extension to employment protection legislation OECD economics department working papers no. 226*. Organisation for Economic Co-operation and Development.

Nzabona, A., Ntozi, J., & Rutaremwa, G. (2016). Loneliness among older persons in Uganda: Examining social, economic and demographic risk factors. *Ageing & Society, 36*, 860–888.

OECD. (2008). *Handbook on constructing composite indicators: Methodology and user guide*. OECD.

Oldewage-Theron, W., & Egal, A. A. (2021). Is food insecurity a problem among the elderly in Sharpeville, South Africa? *Food Security, 13*, 71–81.

Ortega, S. T., Crutchfield, R. D., & Rushing, W. A. (1983). Race differences in elderly personal well-being. *Research on Aging, 5*(1), 101–118.

Paschoal, S. M., Filho, W. J., & Litvoc, J. (2007). Development of elderly quality of life index - EQOLI: Theoretical - conceptual framework, chosen methodology, and relevant items generation. *Clinics, 62*(3), 279–288.

Phaswana-Mafuya, N., Peltzer, K., Chirinda, W., Kose, Z., Hoosain, E., Ramlagan, S., et al. (2013). Self-rated health and associated factors among older south Africans: Evidence from the study on global ageing and adult health. *Global Health Action, 6*(1), 1–6.

Pinquart, M., & Sorensen, S. (2000). Influences of socioeconomic status, social network, and competence on subjective well-being in later life: A meta-analysis. *Psychology and Aging, 15*(2), 187–224.

Ralston, M. (2018). The role of older persons' environment in aging well: Quality of life, illness, and community context in South Africa. *The Gerontologist, 58*(1), 111–120.

Republic of South Africa. (2005). *South African policy for older persons and plan of action*. Department of Social Development.

Republic of South Africa. (2006). *Older persons act no. 13 of 2006. Government gazette 497(29346)*. Government Printers.

Rishworth, A., Elliott, S. J., & Kangmennaang, J. (2020). Getting old well in sub Saharan Africa: Exploring the social and structural drivers of subjective wellbeing among elderly men and women in Uganda. *International Journal of Environmental Research and Public Health, 17*, 1–18.

Robleda, S., & Pachana, N. A. (2019). Quality of life in Australian adults aged 50 years and over: Data using the schedule for the evaluation of individual quality of life (SEIQOL-DW). *Clinical Gerontologist, 42*(1), 101–113.

Rossouw, S., & Naude, W. (2008). The non-economic quality of life on a sub-national level in South Africa. *Social Indicators Research, 86*, 433–452.

RSA. (1997). *Water services act no.18522*. Government Gazette.

van Schalkwyk, B., Schoeman, C., & Cilliers, J. (2014). The interface between rural communities in South Africa and their urban counterparts: The significance for sustainable rural community development in the Vaalharts area. *The Sustainable City, 191*, 453–462.

Sen, A. (1985). *Commodities and capabilities*. Oxford University Press.

Sindhuja, C. V., Vijayashri, R., & Rashmi, A. T. (2021). Life satisfaction and emotional wellbeing among aged, living in activity-oriented and non-activity oriented elderly care providers. *Indian Journal of Gerontology, 35*(4), 495–510.

Slesnick, D. T. (1998). Empirical approaches to the measurement of welfare. *Journal of Economic Literature, 36*(4), 2108–2165.

Solanki, G., Kelly, G., Cornell, J., Daviaud, E., & Geffen, L. (2019). Population ageing in South Africa: Trends, impact, and challenges for the health sector. *South African Health Review, 1*, 175–182.

South African Police Service. (2021). National crime statistics financial years (2010/2011–2019/2020).

StatsSA. (2021a). *Financial statistics of national government 2019/2020*. Statistics South Africa.

StatsSA. (2021b). *Gross domestic product: First quarter 2021*. Statistics South Africa.

StatsSA. (2021c). *Marginalised groups series IV: The social profile of older persons, 2015–2019*. Statistics South Africa.

StatsSA. (2021d). *Mid-year population estimates*. Statistics South Africa.

StatsSA. (2021e). *Quarterly labour force survey quarter 1: 2021*. Statistics South Africa.

Stiglitz, J. E., Sen, A., & Fitoussi, J. (2009). *The measurement of economic performance and social progress revisited: Reflections and overview*. Sciences Po Departement of Economics.

Tang, F., Jang, H., Rauktis, M. B., Musa, D., & Beach, S. (2019). The race paradox in subjective wellbeing among older Americans. *Ageing & Society, 39*, 568–589.

Tavares, D. M., Bolina, A. F., Dias, F. A., Ferreira, P. C., & Haas, V. J. (2014). Quality of life of elderly. Comparison between urban and rural areas. *Investigación y Educación en Enfermería, 32*(3), 401–413.

Tobiasz-Adamczyk, B., & Zawisza, K. (2017). Urban-rural differences in social capital in relation to self-rated health and subjective well-being in older residents of six regions in Poland. *Annals of Agricultural and Environmental Medicine, 24*, 162–170.

UNECE. (2018). *Active ageing index (AAI) in non-EU countries and at subnational level*. United Nations Economic Commission for Europe.

United Nations. (2002). *Political declaration and Madrid international plan of action on ageing*. United Nations.

United Nations, Department of Economic and Social Affairs, Population Division. (2020). *World Population Ageing 2019*. United Nations.

United Nations Human Rights Council. (2013). *Summary report of the consultation on the promotion and protection of the human rights of older persons*. A/HRC/24/25.

Varlamova, M., Ermolina, A., & Sinyavskaya, O. (2017). Active ageing index as an evidence base for developing a comprehensive active ageing policy in Russia. *Population Ageing, 10*, 41–71.

Walker, A. (2005). A European perspective on quality of life in old age. *European Journal of Ageing, 2*, 2–12.

Wister, A., Cosco, T., Mitchell, B., Menec, V., & Fyffe, I. (2019). Development and concurrent validity of a composite social isolation index for older adults using the CLSA. *Canadian Journal on Aging, 38*(2), 180–192.

World Population Review. (2021). *Crime rate by country 2021*. Retrieved from World Population Review: https://worldpopulationreview.com/country-rankings/crime-rate-by-country

Zimmer, Z., & Das, S. (2014). The poorest of the poor: Composition and wealth of older person households in sub-Saharan Africa. *Research on Aging, 36*(3), 271–296.

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Authors and Affiliations

Natalia Kopylova[1] · Talita Greyling[1,2] · Stephanié Rossouw[3,4]

Natalia Kopylova
nataliakopylova@hotmail.com

Talita Greyling
talitag@uj.ac.za

[1] School of Economics, University of Johannesburg, P O Box 524, Auckland Park 2006, South Africa

[2] Honorary Adjunct Academic, School of Social Science & Public Policy, Auckland University of Technology, Auckland, New Zealand

[3] School of Social Science & Public Policy, Auckland University of Technology, Private Bag 92006, Auckland 1142, New Zealand

[4] School of Economics, College of Business and Economics, University of Johannesburg, Johannesburg, South Africa