



A cross-sectional observational study of the psychometric properties of comprehensive health assessments of older adults in 14 African nations: The Pan-African Utilization of Lay Assessment Systems (PAULAS) Project

John P Hirdes^{a,*}, Brittany Ellis^a, Sospeter Gatobu^b, Oluwakemi Aderibigbe^c, Roberta Adutwumwaah Ntem^d, Emmanuel Bagaragaza^e, Festo Bali Christopher^f, Aynie Gebrekidan^g, Enock Chisati^h, Bonaventure Egbujieⁱ, Desderius Haufiku^j, Yohana J Mashalla^k, Reem T. Mulla^a, Moussiliou Noël Paraïso^l, Osman Sankoh^m, Emmanuel Sendaulaⁿ, Benoite Umubyeyi^o, George Aidoo^p, Yassine Benhajali^q, Ezeala-Adikaibe Birinus^r, Marie Claire Gasanganwa^s, Darius Gishoma^t, Finn Hartwell-Kinnear^u, Esther Jiya^v, Veronica Kiondo^w, Zahra Morawej^k, Justine Nagawa^x, Christopher Perlman^a, George A Heckman^y, Leon Geffen^u

^a University of Waterloo, School of Public Health Sciences, Canada

^b University of Nairobi, Kenya

^c University of Waterloo, Canada

^d Good Old Age Golden Foundation, Ghana

^e Association des Dames du Calvaire Etablissements Jeanne Garnier, France

^f South Sudan Community Change Agency (SOSUCCA), South Sudan

^g KEA-MED University College, Public Health, Ethiopia

^h Kamuzu University of Health Sciences, Malawi

ⁱ Toronto Grace Health Centre, Canada

^j School of Nursing and Public Health, Namibia

^k Hubert Kairuki Memorial University, Tanzania

^l University of Abomey-Calavi, Department of Health Promotion, Benin

^m University of Management and Technology (UNIMTECH), Sierra Leone

ⁿ Reach Out Mbuya Community Health Initiative, Uganda

^o Département Recherche Enseignement Formation, Maison Médicale Jeanne Garnie, France

^p University of Ghana, Ghana

^q Douglas Research Centre, Canada

^r University of Nigeria Teaching Hospital, Medicine, Nigeria

^s University of Rwanda, Rwanda

^t Rwanda Biomedical Center, Rwanda

^u University of Cape Town, South Africa

^v Mthunzi Minds, Malawi

^w Kalibu Elderly Clinic, Malawi

^x Reach One Touch One Ministries, Uganda

^y Western University, Canada

* Corresponding author at: School of Public Health Sciences, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada.
E-mail address: hirdes@uwaterloo.ca (J.P. Hirdes).

HIGHLIGHTS

- As part of the UN Decade for Healthy Aging, the WHO has suggested that all older adults aged 60 years or more should receive an annual comprehensive health and social care needs assessment. However, no standard system for such an assessment is in place, and the feasibility of completing it in African nations is unknown.
- This study examines the feasibility of using a standardized, self-reported assessment system supported by lay health assessors in 14 African nations. Consistent with previous pilot studies in South Africa, we demonstrated that the interRAI Check-Up is feasible for use in African community care settings and that it yields psychometrically sound and clinically meaningful data for older adults.
- This study provides evidence that assessments supported by lay health workers using the interRAI Check-Up self-reported version can be used to inform clinical practice and can be used as a basis for comprehensive assessment in low-middle resource settings.

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ABSTRACT

Introduction: Many African countries face challenges in adapting their health systems to meet the needs of rapidly aging populations. Limited health human resources, inadequate geriatric expertise, and poor understanding of the aging process present barriers to effectively supporting older Africans.

Methods: The Pan-African Utilization of Lay Assessment Systems (PAULAS) project is a cross-sectional observational study to examine the potential use of the interRAI Check-Up Self-Report (CUSR) assessment instrument in 14 African countries. The primary study aim was to determine whether the CUSR could be used to respond to the UN Decade of Healthy Aging recommendation that all older adults receive an annual health and social needs assessment. Psychometric performance is a major focus but other aspects of feasibility that were examined included time to complete the assessment, cultural acceptability, response rates, and completion rates.

Results: 8,142 individuals aged 50 years or older were assessed in 14 African countries. The CUSR instrument displayed high reliability in this population with most of the 42 reported scale reliabilities having alpha values above 0.70. Similarly, the evidence of convergent validity was consistent with findings from high resource nations. Response rates were very high in all countries with few refusals, and median item non-response rates were below 2%. The mean time to complete was 21.6 minutes. Focus group feedback suggested modest revisions to the instrument for adaptation to the African context.

Conclusion: The interRAI CUSR can provide a psychometrically sound comprehensive assessment of older adults that may be used in African settings.

1. Background

Increased life expectancy at birth and population aging (Kinsella & He, 2009) have been regarded as among the most important public health achievements of the 20th century (Achievements in Public Health, 2000). Yet, when it comes to population aging and health care for older adults, Africa is not the first region that comes to mind for most gerontologists, service organizations, or policy experts (Apt, 2012). According to the US Census Bureau (He, 2022), Africa had the smallest percentage of its population aged 60 years or more (5.6%) in 2020. The corresponding percentage in Europe for those aged 65 years or older (25.5%) was almost five times larger (He, 2022). However, the absolute number of older persons in Africa is already comparable to those in North America and it is ten times greater than the number of persons aged 60 or more in Oceania (He, 2022). Moreover, the population of older adults in Africa South of the Sahara is projected to increase from an estimated 43 million in 2010 to 67 million by 2025 and 163 million by 2050 (World Health Organization 2024).

In high resource nations, the per capita use of primary care and other forms of health care are substantially higher among older adults due to their greater needs for all types of care (Santos-Eggimann, 2002). However, in Africa, basic access to primary care is often severely limited (Wagstaff & Neelsen, 2020; World Health Organization 2008). High out-of-pocket expenses and sparsely available universal health coverage pose major financial barriers for impoverished individuals (Wagstaff & Neelsen, 2020; Enabulele, 2020). Further, people in isolated rural settings must either cope without health care services or travel substantial distances to access necessary care. The costs and physical demands of distant travel may be prohibitive for many older adults (Adamek et al., 2022; HelpAge International 2018).

Africa also lacks adequate health human resources to address the needs of older adults. African nations south of the Sahara have about 11% of the global population and about one quarter of the world's disease burden, yet only 3% of the world's health workforce (Dalton,

2014). In the 1980's, one physician served an average 10,800 persons compared with 300 persons in high resource nations (Huddart et al., 2003). The corresponding numbers per nurse were 2,100 persons in Africa compared with 170 in high resource nations (Huddart et al., 2003). While this situation has improved over time, most African nations still face critical health human resource limitations (Dalton, 2014).

Based on workforce estimates from the World Health Organization between 2017-2019, South Africa, Nigeria, and Rwanda had 7.9, 3.8 and 1.2 physicians per 10,000 persons, respectively, compared with 24.4 and 26.1/10,000 in Canada and the United States (World Health Organization 2025). In the same period, the availability of nurses in Rwanda (9.5 per 10,000 persons) was about 1.5 times greater in Nigeria, 5 times greater in South Africa, 11 times greater in Canada and almost 16 times greater in the United States (World Health Organization 2025). South Africa is the best-case scenario for health human resources in Africa, although it has one third the number of physicians per capita compared with Canada and less than half the number of nurses (NationMaster 2024). For further comparison, Canada has 122 times more physicians and 33 times more nurses per capita than Malawi (NationMaster 2024).

When services are available in Africa, specific expertise in health care for older persons in primary care (and specialization in geriatric medicine and geriatric psychiatry) is almost completely absent (Dotchin et al., 2013). The lack of training in geriatrics means that care for older adults is often only disease-centered without attention to intrinsic capacity, geriatric syndromes, frailty, functional status, or mental health. Expertise in geriatrics is inadequate on the continent, and training in geriatric medicine is not widely available in colleges or universities (Buowari, 2022). As an example, only 4% of medical programs in African nations south of the Sahara included mandatory training in geriatrics (Frost et al., 2015). This is a major problem for two reasons. First, the complexity of geriatric patients requires careful attention to the interactions of multiple biomedical, psychosocial, functional, sensory, and environmental factors that can result in atypical manifestations of

physical and mental health problems. These are made worse when misdiagnosis and avoidable errors in prescribing or medical treatment exacerbate older adults' underlying conditions (Onder & Vetrano, 2018). Second, most of the major geriatric syndromes and health problems affecting older adults cannot be assessed with simple diagnostic procedures based on laboratory tests or diagnostic imaging (Onder & Vetrano, 2018). Cognitive impairment, disability, frailty, depression, pain, incontinence, falls, and caregiver distress require evaluation based on standardized, scientifically validated comprehensive geriatric assessments (Onder & Vetrano, 2018). Most African nations do not have the infrastructure nor the health human resources to conduct this type of assessment using regulated health professionals in primary care (Adebisi & Lucero-Prisno, 2022; Aboderin & Beard, 2015).

Approaches used to support health needs of older adults in high resource nations cannot be easily transferred to address aging in Africa (Makoni, 2008). African countries are more diverse in terms of languages, social organizations, and social environment compared to the whole of Europe (Apt, 2012). The diversity is even more pronounced when comparing northern and southern African nations (Apt, 2012; Ogura & Jakovljevic, 2018).

The United Nations has put forward a series of recommendations for the Decade of Healthy Ageing aimed at improving the health of older adults globally (World Health Organization). However, given Africa's daunting health human resource challenges it may be difficult to realize major changes in this population. One indicator calls specifically for countries to report on the "percentage of older persons aged 60 years and over who received comprehensive health and social care needs assessment (annual health check) in the last 12 months" (World Health Organization). The indicator does not specify the precise nature of that health evaluation. However, it arguably requires a comprehensive, culturally appropriate geriatric assessment to identify and respond to the health and well-being of older persons in Africa. While there have been studies to validate unidimensional clinician-rated measures of health conditions affecting older adults (Akinyemi et al., 2022; Mgebejedo et al., 2022; Khatib et al., 2024), we have found no evidence of testing of a comprehensive, multidimensional assessment system that can support care planning for older persons. A promising and scalable option is the interRAI Check-Up Self-report (CUSR), a standardized, comprehensive geriatric assessment based on reliable and validated interRAI systems (Geffen et al., 2020; Gray et al., 2009; Heckman et al., 2013).

The interRAI CUSR assessment system designed for community-dwelling older persons can be self-administered by an older person or it can also be completed with the assistance of an interviewer if literacy is a concern (Morris et al., 2018). Initial studies of the CUSR in South Africa, South Korea, New Zealand, and Canada demonstrated good psychometric properties (Geffen et al., 2020; Morris et al., 2018; Iheme et al., 2022; Hikaka et al., 2026) including South African evidence of criterion validity when compared against clinician ratings (Geffen et al., 2020; Iheme et al., 2022). Studies in South Africa, Canada, and New Zealand showed that it takes about 30 minutes to complete on average (Iheme et al., 2022; Hikaka et al., 2026; Geffen et al., 2020). In addition, the instrument was reported to be culturally acceptable in studies focused on older adults in South Africa (Geffen et al., 2020) and South Korea (Kim et al., 2025) as well as with Maori older adults in New Zealand (Hikaka et al., 2026). Nonetheless, there was a clear need to further expand the evaluation of the instrument in low and middle-resource nations.

The main objective of the Pan-African Utilization of Lay Assessment Systems (PAULAS) project described in this paper was to determine whether it is feasible to obtain psychometrically sound data with the interRAI CUSR instrument when completed by lay health assessors in 14 countries in Africa (testing in two more African countries planned or underway). Our hypothesis was that the positive findings from previous South African research could be replicated in other African nations with fewer resources. If so, this would provide evidence that the instrument

could be used as a basis for meeting the United Nation's recommended annual health assessment to contribute to improved health outcomes of older adults in low- and middle- resource settings. In addition, the CUSR could potentially provide valuable evidence to respond to calls for data regarding non-communicable diseases and disability as a support to efforts to improve the quality of primary care (Maher et al., 2010).

Evaluating feasibility is often a non-linear iterative process that answers basic questions about whether a larger, more costly study can or should be done (Eldridge et al., 2016). Obtaining valid and reliable data is a necessary but not sufficient condition that must be met for implementation of an assessment system to scale up to widespread use. Other considerations related to feasibility include cultural acceptability of the assessment, practicality, resource requirements, required adaptations, demand, limited efficacy testing, and need for system change to integrate the intervention into routine practice (Bowen et al., 2009). The PAULAS project was intended to address some, but not all of these considerations. The issue of whether the interRAI CUSR results in improved health outcomes described in other UN Decade of Healthy Aging was not in scope for this project. Rather the singular aim was to determine whether the interRAI CUSR could be used to fulfill the indicator regarding completion of an annual comprehensive assessment.

2. Methods

2.1. Study design, settings and sample sizes

Our team collected assessment data for this cross-sectional observational study between 2019 and 2025 in selected regions of 14 African nations: Benin, Egypt, Ethiopia, Ghana, Kenya, Malawi, Nigeria, Rwanda, Sierra Leone, South Africa, South Sudan, Sudan, Tanzania, and Uganda (see Fig. 1). Data collection is also currently planned or underway in Tunisia and Namibia; however, results from those studies are not yet available to be included here. Participants were assessed in various community settings using a cross-sectional design (Geffen et al., 2020; Heckman et al., 2013).

In addition to pre-existing data from South Africa (2019-2021: 2,713 assessments) and Nigeria (~300 assessments), each country aimed to gather 300 or more CUSR assessments with the support of trained lay health assessors. All countries except South Africa collected most or all of their study data between 2023-2025. The target sample size of 300 per country was specified to balance practical considerations of what was feasible with a limited project budget and adequate numbers to complete basic statistical tests for internal consistency and convergent validity. For example, as a rule of thumb a target sample size of at least 100 individuals is reasonable for estimating scale reliabilities with five items and an alpha value of 0.70.

We also gathered information related to the practicality of using the interRAI CUSR in diverse settings. The rates of refusal to participate in the study were tracked by study site coordinators, and item non-response was appraised through secondary analyses of the data. Time to complete the assessment was only done in one Nigerian site as the first phase of this research. In other countries, data were often captured on paper and then transcribed to clinical software provided by an industry partner. Time to complete the paper-based assessments was not tracked.

In addition, we used focus groups with the country lead researchers to discuss cultural acceptability and need for adaptations within each country. Country leads gathered feedback from the lay assessors in their countries prior to a combined meeting where they described their country-specific experiences.

2.2. Eligibility criteria and sampling

For the PAULAS study we mainly targeted community-based older adults aged 60 years and older who were receiving care in community settings. We excluded persons with cognitive impairment who were unable to provide consent, hospital in-patients, and patients in



Fig. 1. Map of participating countries (MapChart [Internet] 2025).

emergency departments. Where clinically justifiable, the study recruitment approach was flexible to allow cases where it was appropriate to use the assessment strategy with younger individuals. Given that there is not a singular model of primary care in Africa, a diverse range of community settings were targeted where such services might be provided, including primary care clinics, older adult centres, outreach programs, HIV/AIDS clinics, hospital outpatient services and community door-to-door screening. Standardized written information about the study was adapted for country specific situations and care settings.

The assessment data were collected in the community at the dwellings of participants or at participating organizational sites by trained lay assessors using licensed commercial software. Upon request, the assessment was completed on paper to accommodate technological and internet accessibility barriers in remote communities. All assessors

received comprehensive training on the assessment system prior to implementation. Assessors were recruited from the same communities where participants resided to increase acceptability. Most assessors were lay persons without prior health training who had strong interpersonal skills and literacy in the relevant languages. In all countries except South Africa and 300 assessments in Nigeria done before the initiation of the PAULAS project, data collection took place prospectively.

In some cases, study sites involved younger participants in their pilot projects. To maintain the focus of these analyses on older adults, we excluded persons under the age of 50 years from the analyses.

A detailed description of the study sites participating in the project is provided in the supplementary materials. The participating sites are: a) **Benin**: community-based data collection in the Town of Ouidah and City of Porto-Novo; b) **Egypt**: community-based data collection in three rural

areas and one urban area of Menoufia Governorate; c) **Ethiopia**: Menelik II Referral Hospital (Addis Ababa), Ras Desta Damtew Memorial Hospital (Addis Ababa), and St. Paul's Referral Hospital (Addis Ababa); d) **Ghana**: Good Old Age Golden Foundation community-based agency; e) **Kenya**: Gikambura Health Center (Kiambu County) and Ndeiya Health Center (Kiambu County); f) **Malawi**: Kalibu Elderly Clinic (Mchere village); g) **Nigeria**: The Heart Centre at Federal University Teaching Hospital (Imo State) and University of Nigeria Teaching Hospital (Enugu State); h) **Rwanda**: community-based data collection in Rulindo, Gicumbi, and Gakenke (rural Northern Province); i) **Sierra Leone** – the General Health Outpatient clinic at the Connaught Hospital (Freetown) and Waterloo Government Hospital and surrounding areas (Waterloo); j) **South Africa**: community-based data collection (Western Cape), community healthcare clinics (Western Cape), community-based organizations (Western Cape; Northeastern region; KwaZulu Natal Province), senior clubs (Western Cape), and non-profit faith-based welfare organization (Cape Town); k) **South Sudan**: hospital-based data collection and primary health care centres in urban Juba Central Equatoria State; l) **Sudan**: community-based data collection from the 3 administrative units (AU) in the Khartoum Locality (*Note: all data collection in Sudan occurred prior to the most recent outbreak of war*); m) **Tanzania**: Buguruni Health Center (Temeke Municipal Council), Kisarawe District Hospital, Homboza Health Center, and Masaki Health Centre (Kisarawe District Council), Mbagala Rangi Tatu Hospital (Temeke Municipal Council), Mlandizi Health Center and St. Gertrude Health Center (Kibaha District Council), Mwananyamala Regional Referral Hospital (Kinondoni Municipal Council), and Sinza Palestina Hospital (Ubungu Municipal Council); n) **Uganda**: Reach One Touch One Ministries (Mukono District) and Reach Out Mbuya Community Health Initiative (Kampala and Luweero District).

2.3. Bias

For this stage of establishing feasibility of using the CUSR in Africa, the study aim was not to obtain country samples that are nationally representative of the population of older adults in the countries involved. Establishing population parameters of demographic and clinical characteristics is not required for this stage of research. Rather, it is important to examine psychometric properties using samples with heterogeneity in the clinical characteristics of interest and the factors that may affect their measurement. For that reason, we sought participation by diverse organizations serving different community-based populations of older adults in different regions of Africa.

Organizations participated on a voluntary basis and individuals were invited to participate as part of their routine receipt of services. Door-to-door community studies were based on random samples from community lists or contacts with all residents of the community known to match the age criterion for inclusion. Therefore, although the samples might be assumed to be representative of the participating organizations, inferences should not be drawn about prevalence rates in the general population nationally. Representativeness was not a requirement for this study because our focus was on measures of association to test the performance and feasibility of the CUSR in various settings, which does not require national random samples (Thompson & Forbes, 1989).

2.4. Data collection instrument

The CUSR is part of the interRAI suite of assessment instruments that are used internationally in routine care to support care and health system planning for vulnerable populations (Gray et al., 2009; Kim et al., 2025; Van Der Roest et al., 2019; Schumacher et al., 2023; Rajpara et al., 2022). This standardized comprehensive geriatric assessment includes items on participant demographics, health conditions and diagnoses, mental and physical well-being, healthcare utilization, and economic circumstance (Geffen et al., 2020; Iheme et al., 2022). The time to complete the CUSR assessment is 30 minutes on average and

considers self-reported participant responses and their care partners as needed. Unlike traditional comprehensive geriatric assessment, the CUSR can be self-administered or completed with the support of lay persons, offering a reliable and scalable means to characterizing the well-being of older adults in lower-resourced settings such as those in Africa (Geffen et al., 2020).

Aside from standalone assessment items, the interRAI CUSR includes several validated clinical scales. The self-reported mood scale has been previously validated against mood disorder diagnoses, sleep disturbance, and self-harm behaviours in clinical populations in Canada (Hirdes et al., 2022). Daily severe, horrible or excruciating pain is detected based on interRAI Pain Scale scores of 3-4 (Życzkowska et al., 2007). The Change in Health, End-stage disease, and Signs and Symptoms (CHESS) scale is a measure of frailty-related health instability that is strongly associated with mortality in multiple clinical populations including community based older adults (Hirdes et al., 2014; Williams et al., 2022). The Cognitive Performance Scale is a widely used measure of cognitive function that has been validated extensively in diverse populations (Morris et al., 2016). In addition, the interRAI CUSR includes both Instrumental Activities of Daily Living (IADLs) and Activities of Daily Living (ADL), based on capacity for IADLs and performance for ADLs (Morris et al., 2013).

2.5. Instrument translation

Validated translations of the CUSR were available in all languages required. The original English version of the instrument was professionally translated into 16 languages of participating countries (Acoli, Afrikaans, Amharic, Arabic, Chichewa, Dendi, Fongbe, Hausa, Igbo, IsiXhosa, IsiZulu, Kikuyu, Kinyarwanda, Kiswahili, Luganda, Yoruba) using the following process: forward translation, back translation, back translation review, and proof-reading. The procedure has also been used in the integration of interRAI assessment systems in new cultural contexts (Onder et al., 2012). Original English and French versions of the CUSR were also utilized in participating countries where appropriate. The back translation requirement is an essential step required to resolve matters of cultural applicability of self-reported items (e.g., to avoid non-translatable colloquialisms) and to ensure common meaning across study sites.

2.6. Analytical approach

We used percentage and frequency distributions to describe cross-national sample characteristics. Chi-square tests were used to evaluate statistical significance of bivariate analyses. Previously validated summary scales embedded in the interRAI CUSR were used to describe clinical characteristics of the study samples. For all scales, lower numbers represent less impairment. Functional status was assessed using the Activities of Daily Living Hierarchy scale (ADLH), ranging from 0 (no impairment) to 6 (total dependence) (Van Der Roest et al., 2019). Self-performance of instrumental activities was assessed using the Instrumental Activities of Daily Living Capacity Hierarchy scale (IADLH), ranging from 0 (independent) to 6 (total dependence) (Van Der Roest et al., 2019). Cognitive function was assessed using the Cognitive Performance Scale (CPS), ranging from 0 (intact) to 6 (very severe impairment) (Van Der Roest et al., 2019). Conventional cut-points were used to collapse scale scores to simplify the comparisons.

The main way to measure reliability in studies of this type is based on internal consistency of scales using Cronbach's alpha as a test statistic. Alpha values of 0.70 are generally regarded as acceptable, whereas values of 0.80 or more are excellent. In addition to those threshold values, it is important to consider the relative performance for measures known to be more reliable as well as the number of items used in the scale. In clinical contexts, interRAI scales related to functional status tend to have higher reliability scores than those dealing with depressive symptoms or mood.

Items with missing data were excluded from the analyses using a pairwise deletion. No imputations were used to infer values for missing data.

In this cross-sectional study, we did not gather data for “gold standard” scales for criterion validity for unidimensional constructs and arguably such gold standards have not been established for comprehensive multidimensional geriatric assessments for African populations. In addition, we cannot examine predictive validity without longitudinal data. However, we were able to examine patterns of associations in order to examine convergent validity of indicators known to be related based on other research (Hogeveen et al., 2017; The 1997). Statistical analyses were performed in SAS 9.4.

2.7. Patient and public involvement

Patients enrolled in one of the Ugandan sites participated in a prior study to examine the acceptability of the interRAI CUSR in their setting. In addition, the study by Iheme and colleagues (Geffen et al., 2020) included detailed participant feedback on the acceptability of the interRAI CUSR in Canadian sites.

2.8. Ethical considerations

Eligible participants were identified by organizational partners. Participants were informed in writing and orally about the study and invited to participate. Written and verbal consent was sought from participants according to local regulations of participating countries before entering the study. Ethical approval for the study was obtained from the University of Waterloo Ethics Review Committee (ORE # 44604). Ethical approval was also obtained from authorized ethical committees according to local regulations in each participating country.

3. Results

3.1. Participant demographics and health characteristics

Table 1 provides demographic and health indicators for the participants in the PAULAS project by country. Distributions of all variables shown in that table are significantly different at the $p < 0.0001$ level. For 11 of the 14 countries, most participants were female; however, the highest percentage was in the Ugandan sample where an HIV program specifically targeting older women was included. There were notable variations in marital status, with the largest percentage married in the Ethiopian sample (84.4%) and the smallest in the Ugandan sample (18.3%).

The mean age for the overall sample was 71.0 years (SD=8.8). The country-specific mean ages ranged from a low of 65.0 years (95% CL: 64.3–65.7) in Sierra Leone to a high of 74.7 years (95% CL: 74.1–75.6) in Uganda. Most participants were aged 60+ years; however, some participants aged 50 to 59 were retained from an earlier Nigerian sample and from more recent efforts in the other countries. It is interesting to note the sample variations in economic trade-offs between food, shelter, clothing, medications, and medical care. The percentages were highest in samples from Egypt (one of the wealthier African nations) and Uganda, where primarily older women with HIV and vulnerable older persons were targeted. On the other hand, the lowest rate of reported economic tradeoffs was in the Malawian participants.

With respect to health characteristics, Table 1 reports distributions for major age-related medical diagnoses and self-rated health. Diabetes was the most reported medical diagnosis; however, the rates for the Kenyan, South Sudan, and Egyptian samples stood out as particularly high (over 40%) whereas the rates in Rwanda and Malawi were very low (below 2%). The Ethiopian sample had higher rates of other diagnoses than most other country samples. However, in the Sudanese and Egyptian samples reports of other diagnoses were absent or very low. There were also notable variations in self-reported health, with less than 5% of

Table 1
Demographic and health related characteristics of PAULAS project participants, by country site.

Characteristic	Benin (n=383)	Egypt (n=300)	Ethiopia (n=301)	Ghana (n=353)	Kenya (n=334)	Malawi (n=332)	Nigeria (n=1,274)	Rwanda (n=298)	Sierra Leone (n=427)	South Africa (n=2,678)	South Sudan (n=296)	Sudan (n=250)	Tanzania (n=288)	Uganda (n=628)
Female	45.7	63.0	43.5	63.2	73.7	70.5	57.6	53.7	58.6	68.2	51.7	55.2	49.3	83.9
Married/Partner	55.4	65.0	84.4	33.7	63.2	35.8	62.2	49.5	41.0	38.9	47.5	58.4	57.8	18.3
Age group														
50-59	1.0	0.3	0.3	11.9	1.8	0.3	20.2	0.3	17.1	0.5	9.5	8.0	1.4	0.3
60-69	62.9	74.0	34.2	47.0	50.0	30.1	41.5	31.2	65.6	31.9	54.4	46.4	66.0	33.4
70-79	28.7	25.0	44.5	28.9	31.7	46.1	26.5	40.6	13.1	46.2	23.7	32.0	22.9	30.4
80-89	6.5	0.7	20.9	9.1	12.6	19.0	8.7	23.2	3.0	17.7	11.5	12.4	8.3	28.3
90+	0.8	0.0	0.0	3.1	3.9	4.5	3.1	4.7	1.2	3.8	1.0	1.2	1.4	7.5
Economic trade-offs	19.5	76.7	31.9	30.6	35.2	2.7	33.3	28.9	72.5	44.2	40.8	60.8	45.1	74.5
Diagnoses														
Diabetes	18.4	44.7	7.3	9.6	48.6	1.2	30.3	1.7	32.6	30.5	47.3	37.2	28.3	6.4
Stroke	11.1	0.0	18.6	2.8	4.9	3.3	13.1	12.7	12.7	6.7	39.3	0.0	14.3	6.2
CHD	8.2	0.0	16.9	1.1	12.4	26.8	7.1	11.7	21.8	9.0	42.5	4.0	22.4	1.6
COPD	5.8	0.0	26.3	1.7	7.3	1.5	5.9	5.2	20.8	4.4	37.3	1.2	15.7	10.8
Heart Failure	9.2	0.0	16.0	0.6	1.8	3.0	8.8	12.4	22.3	5.0	40.9	1.2	24.1	3.3
Cancer	9.0	0.0	7.3	1.1	4.9	0.0	5.6	2.1	25.8	3.5	46.2	0.8	16.1	1.3
Good/Excellent health	27.9	60.7	78.4	65.7	34.6	4.5	62.8	6.5	48.7	45.9	77.6	78.0	38.8	36.6

the Malawian sample stating they had good or excellent health compared with over 75% of the samples from Ethiopia, South Sudan, and Sudan. It should be noted that there is not an obvious pattern of associations between diagnosis rates and self-reported health.

3.2. Distributions of clinical scales

Table 2 provides distributions of six interRAI scales dealing with mental health, physical health, cognition, and functional status. These scales reveal variations in the type and nature of clinical complexities that are not especially evident when considering age or medical diagnoses alone (Morris et al., 2000; Mofina et al., 2025).

Values of 3–4 on the Self-reported Mood Scale indicate moderate mood disturbance and 5 or more reflect severe problems. Moderate or worse mood scale scores were lowest in the Sudanese sample (14%) and highest in the Malawian sample (about 73%). In 10 of the 14 country samples, rates of moderate or worse mood disturbance exceeded 40% of participants.

The highest rates of worst pain were in the Rwandan sample (about 18%), but none of the Egyptian participants reported that level of pain. In all other country samples except South Africa and Sudan most participants reported experiencing pain.

Moderate to high CHES scores representing health instability were evident in 20% or more of the participants in Benin, Ghana, Kenya, Rwanda, South Sudan, and Uganda. Rates were lowest in the samples from Egypt, Malawi, Nigeria, and Sudan. For context, the age- and sex-adjusted hazard rates for mortality in Canadian home care clients with CHES scores of 3 are about 4 times greater than those with a score of zero (Hirdes et al., 2014). Therefore, these participants can be regarded as having notably high risks of mortality, including more than half of the Rwandan participants.

Scores of three or more on the CPS are associated with moderate or worse cognitive impairment and are typically found in persons in nursing home settings in high resource nations (Guthrie et al., 2016). This level was found in more than one third of the Egyptian and Rwandan samples. Rates were lowest in the samples from Ghana, Kenya, Malawi, South Africa, and Tanzania.

The functional measures in Table 2 deal with both Instrumental Activities of Daily Living (IADLs) and Activities of Daily Living (ADL), based on capacity for IADLs and performance for ADLs. In some of the participants, the level of functional impairment was especially high, most notably in the Ethiopian sample with over half of the sample having moderate or worse functional impairment. On the other hand, disability levels were lowest in the Ghana, South Africa and Tanzania samples.

3.4. Psychometric properties

3.4.1. Scale reliability

Table 3 shows that in only 5 of the 42 reported scale reliabilities were alpha values below 0.70 and each of these were for the three-item self-reported mood scale. The only alpha value that was very low was for the mood scale in South Sudan. On the other hand, all values for IADL and ADL scale reliabilities exceeded the 0.70 threshold and 23 of the 28 estimates exceeded 0.80.

When observations were combined for all African sites, the alpha values for all three scales exceeded 0.70. Given that the South African data and about 300 Nigerian observations were obtained from an earlier time period, a sensitivity analysis was completed to determine whether the overall African sample reliabilities were affected by their inclusion. When those observations were dropped there were marginal increases in the reliabilities for the mood and ADL scales for the combined African sites.

3.4.2. Convergent validity

Table 4 reports Pearson correlation coefficients for factors expected

to be associated with self-reported health, mood, and cognitive impairment. Mood, pain, and CHES scores were consistently associated with self-reported health scores (higher scores indicate worse health). The correlations of self-reported mood and health generally ranged between 0.21 and 0.55 with the only exceptions of Malawi and South Sudan. Similarly, pain and self-rated health had values between 0.24 and 0.56 with Malawi and South Sudan as exceptions. CHES scores had the strongest correlations with self-rated health with values between 0.24 and 0.61, except for South Sudan. On the other hand, the associations of age with self-rated health were much more variable between countries.

Pain and CHES scores were also moderately to strongly associated with self-reported mood scores across all countries except for pain in South Sudan. Age generally had weaker associations with self-reported mood with more inconsistent associations across country samples. Finally, cognitive impairment based on higher CPS scores was consistently associated with increased functional impairment in ADLs and IADLs. Age was also positively associated with functional impairment but usually not as strongly as CPS.

When the abovementioned sensitivity analyses were done for these tests of convergent validity there were marginal increases in the correlations between the variables of interest. However, for self-reported health, mood, and cognition the correlations with age improved in a more pronounced way. For example, excluding South Africa and the early Nigeria data improved the correlation of ADL with age from 0.23 to 0.31.

3.5. Other findings related to feasibility

3.5.1. Practicality of implementation

The only study site able to track completion of the interRAI CUSR in electronic form was the initial Nigerian site with 318 participants. The interRAI CUSR took an average of 21.7 minutes (SD: 17.0) to complete with a median time of 15.4 minutes (IQR: 10.2 – 25.5). This is a shorter time to complete than noted in other studies where reported completion ranged between 28–33 minutes on average (Iheme et al., 2022; Hikaka et al., 2026; Geffen et al., 2020).

The participation rate in the study was very high in every organization from every participating country. Ten of the countries had no refusals by persons approached to participate in the study. South Sudan and Ghana had 4 and 5 refusals, respectively. Benin did not document the number of refusals, but the lead investigator stated that there were “almost none”. The South African data came from various sub-projects and mixed contexts. Those done in community organizations had no refusals, and the lead investigator reported that the refusal rate in door-to-door studies was “below 5%”.

Item non-response and out-of-range values for 88 clinical variables were analyzed for the overall study sample and were also considered within each country. The identifier variables were not considered because these would vary between countries and many were suppressed for privacy reasons. For the total sample 56.8% of the CUSR clinical items had missing rates below 1%. An additional 34.0% of items had missing rates between 1–2%. Only 1 item (falls more than 91 days ago) had missing rates of over 5%. Among the participating country sites, the South Sudan sites were typically more likely to have higher missingness rates than sites in other countries.

3.5.2. Focus group feedback

A focus group of 17 African country leads and team members was used to summarize qualitative feedback from the study sites after data were collected in 11 of the participating countries. In addition, an earlier focus group with lay health workers in one of the Uganda sites provided further information regarding the assessment experience (Kroetsch, 2022). Based on this feedback, it was recommended to drop items related to aphasia, falls prior to 91 days ago, driving a car, and influenza vaccination. There were also recommendations to add items related to

Table 2
Distributions of clinical scales among PAULAS study participants, by country site.

Clinical Scale	Benin (n=383)	Egypt (n=300)	Ethiopia (n=301)	Ghana (n=353)	Kenya (n=334)	Malawi (n=332)	Nigeria (n=1,274)	Rwanda (n=298)	Sierra Leone (n=427)	South Africa (n=2,678)	South Sudan (n=296)	Sudan (n=250)	Tanzania (n=288)	Uganda (n=628)
Mood Scale														
0	24.4	78.0	43.5	28.4	37.2	3.3	31.6	34.4	18.3	39.9	9.3	70.0	42.5	16.1
1-2	40.7	0.0	15.6	27.6	20.1	23.5	16.5	16.2	16.2	23.9	24.2	15.2	15.0	25.0
3-4	22.8	11.0	16.3	22.4	13.8	34.3	24.7	17.5	41.7	18.3	36.7	8.0	16.4	29.1
5-9	12.1	11.0	24.6	21.6	28.8	38.9	27.2	32.0	23.9	17.9	29.9	6.8	26.2	29.8
Pain Scale														
0	29.7	92.7	20.6	30.1	30.2	12.7	45.6	28.2	7.7	51.7	36.6	63.6	35.3	23.7
1-2	65.3	7.3	70.8	62.8	59.8	81.0	50.9	53.6	77.3	34.6	60.2	32.0	48.6	70.5
3-4	5.0	0.0	8.6	7.1	10.0	6.3	3.5	18.2	15.0	13.7	3.1	4.4	16.1	5.7
CHESS Scale														
0	17.9	63.3	30.9	22.7	2.1	7.5	27.7	6.2	25.3	32.5	10.1	55.6	34.3	21.5
1-2	62.1	36.7	52.2	48.6	63.1	85.5	65.7	36.5	67.5	56.7	64.3	37.6	47.6	51.1
3-5	20.0	0.0	16.9	28.7	34.8	6.9	6.6	56.4	7.3	10.8	25.6	6.8	18.2	27.4
CPS Scale														
0	34.2	44.0	39.2	42.1	57.2	13.0	36.3	26.1	25.1	41.3	21.8	68.0	49.3	27.1
1-2	59.5	21.3	45.5	54.6	35.3	80.7	53.5	34.4	63.9	54.5	58.8	18.4	44.4	62.9
3-6	6.3	34.7	15.3	3.4	7.5	6.3	10.3	39.5	11.0	4.3	19.4	13.6	6.3	10.0
IADL Capacity														
0	37.0	14.0	9.0	73.3	68.9	39.5	41.5	34.4	24.1	75.3	22.8	61.2	65.7	49.4
1-2	29.9	19.0	22.9	13.9	14.8	33.1	24.7	26.5	23.2	13.8	43.7	10.4	21.0	27.7
3-4	17.9	23.3	46.5	7.1	6.7	15.4	22.1	20.2	31.6	4.0	21.2	7.2	10.1	8.4
5-6	15.2	43.7	21.6	5.7	9.7	12.1	11.7	18.9	21.1	7.0	12.3	21.2	3.2	14.5
ADL Hierarchy														
0	82.9	68.7	43.7	94.3	81.4	60.5	75.4	85.6	52.9	90.8	75.1	81.2	93.7	83.4
1-2	6.3	2.7	34.7	2.3	5.7	29.8	10.4	4.1	32.8	2.5	11.7	2.4	2.1	5.1
3-6	10.8	28.7	21.7	3.4	12.9	9.6	14.3	10.3	14.3	6.7	13.2	16.4	4.2	11.5

Table 3
Cronbach's alpha values for selected interRAI scales by country site.

Scale	All African Sites (n=8,142)	Benin (n=383)	Egypt (n=300)	Ethiopia (n=301)	Ghana (n=353)	Kenya (n=334)	Malawi (n=332)	Nigeria (n=1,274)	Rwanda (n=298)	Sierra Leone (n=427)	South Africa (n=2,678)	South Sudan (n=296)	Sudan (n=250)	Tanzania (n=288)	Uganda (n=628)
Self-reported Mood	0.73	0.72	0.81	0.80	0.66	0.76	0.66	0.82	0.85	0.81	0.68	0.30	0.72	0.84	0.62
IADL Capacity	0.90	0.87	0.85	0.87	0.89	0.95	0.89	0.91	0.90	0.88	0.88	0.78	0.94	0.83	0.91
ADL Hierarchy	0.84	0.89	0.77	0.90	0.82	0.87	0.75	0.86	0.78	0.87	0.81	0.69	0.90	0.79	0.80

Table 4
Evidence of convergent validity based on correlations of selected measures, by country site.

Scale	All African Sites (n=8,142) ¹	Benin (n=383)	Egypt (n=300)	Ethiopia (n=301)	Ghana (n=353)	Kenya (n=334)	Malawi (n=332)	Nigeria (n=1,274)	Rwanda (n=298)	Sierra Leone (n=427)	South Africa (n=2,678)	South Sudan (n=296)	Sudan (n=250)	Tanzania (n=288)	Uganda (n=628)
Correlations with Self-reported Health															
Mood	.32	.38	.46	.55	.32	.44	.11	.21	.56	.47	.29	.15	.39	.30	.31
Pain	.30	.43	.30	.53	.39	.35	.05	.25	.55	.24	.27	.11	.29	.42	.33
CHESS	.40	.38	.61	.53	.35	.48	.25	.24	.52	.54	.35	.19	.59	.42	.41
Age	.20	.09	.24	.31	.10	.31	.09	.24	.26	.28	.05	-.08	.36	.24	.27
Correlations with Self-reported mood															
Pain	.31	.28	.64	.59	.32	.29	.22	.37	.62	.11	.26	.15	.23	.36	.13
CHESS	.47	.40	.51	.68	.50	.46	.28	.49	.60	.42	.37	.29	.35	.50	.52
Age	.15	.31	.38	.43	.07	.34	.21	.18	.30	.16	.05	-.02	.12	.23	.26
Correlations with Cognitive Performance Scale															
ADL	.48	.55	.48	.47	.37	.63	.39	.62	.41	.36	.36	.16	.65	.35	.54
IADL	.56	.55	.57	.62	.48	.66	.33	.57	.65	.55	.47	.43	.62	.47	.55
Age	.23	.43	.29	.52	.29	.51	.32	.35	.37	.28	.15	.29	.39	.33	.37

¹ N values may vary due to missing values for some variables. Pairwise deletion is used for correlations.

tuberculosis, malaria, and HIV; however, it was noted that including HIV items might inflate refusals rates. In addition, the Ugandan focus group recommended expansion of the economic status items to better track effects of poverty. There were also recommendations to change terminology for a few items from more formal to lay usage (e.g., “physician” changed to “doctor”). In some countries there were concerns about tracking living arrangement and marital status due to cultural norms regarding permissible combinations of the two variables (e.g., for unmarried women living with non-family members).

The most important qualitative feedback related to feasibility related to information technology (IT) requirements for data collection. Two important IT issues were off-line capabilities and security considerations (e.g., risk of theft) – both led to use of paper-based forms for the initial assessment to be transcribed to electronic format later. This is a serious concern for scalability and clinical use since the interpretation of CUSR findings requires computation of clinical scales and algorithms for outcome measurement and care planning that are not easily done manually.

4. Discussion

The findings reported provide support for the potential to obtain high quality health information about older adults in Africa using self-reported assessment systems with lay health workers. These results point to the value of using the interRAI CUSR as a comprehensive assessment system to meet the United Nations Decade of Healthy Aging target of conducting annual health assessments on older adults.

These results provide clear evidence of the reliability and validity of the CUSR data gathered by predominantly lay health workers. Regarding scale reliability, given the number of comparisons made in Table 3, one would expect at least two alpha values to be lower than expected simply due to chance. In fact, these results point to consistent good to excellent results across country samples comprised of heterogeneous participants with respect to demographic, health, and functional characteristics.

Our findings also suggest that the assessments can be completed in a reasonable time frame (less than 30 minutes), with high participation rates and low item non-response rates. The qualitative feedback we obtained pointed to a modest number of modifications but suggested the instrument was culturally acceptable and applicable to the participating sites. Of course, the participating organizations may have been highly motivated, so larger scale implementations into routine practice may differ.

Although the balance of evidence in these analyses supports the reliability and convergent validity of the CUSR in these diverse care settings, the results for South Sudan stand out. In particular, the alpha value for the mood scale was well below standard cut-offs (although IADL and ADL results were reasonable). In addition, the associations of mood and self-rated health with other covariates were notably weaker than seen in other country samples. This was not the product of an attenuated distribution because mood scale scores were well-dispersed in the South Sudan sample. Self-rated health scores were more positive than in other samples, which is surprising given that the CHES scale scores suggest this was a sample with rather high health instability. While methodological explanations may be relevant, the extreme contextual factors of civil conflict, economic collapse, and pervasive despair may affect how older persons appraise their own health and well-being during pronounced social strife and tenuous survival. The programmatic implications of that are unclear because age-related health concerns are not irrelevant in the context of societal upheaval and the health human resources to respond to those concerns may be even more limited.

The reported Cronbach's alpha values and Pearson correlation coefficients for patterns of associations are also entirely consistent with results obtained in a high-income nation (Canada) from trained health professionals conducting clinician-led assessments in publicly funded

home care programs (Hogeveen et al., 2017). This is extremely important because it means that expensive health human resources are not required to complete these assessments in low- and middle-income nations. This of course also applies to well-resourced and underserved areas of wealthier nations. The key attributes of the lay health assessors participating in our study were good literacy levels and interpersonal skills, but there was no need for advanced clinical training. While lay health workers should certainly be paid fair wages for their work, the training and reimbursement levels required would be dramatically lower than approaches requiring nurses, allied health professionals, or physicians. Moreover, the use of the CUSR could allow highly trained health professionals to concentrate efforts on their full scope of practice.

Our results demonstrate that the CUSR provided a rich clinical profile of older persons in the participating agencies that is more informative than what one could glean from demographic or diagnostic information alone. For example, most participants did not report having major comorbidities like cancer, heart failure, stroke, or COPD; however, rates of serious mood disturbance, pain, health instability, cognitive impairment, and functional impairment affected over half the participants in some countries. This is particularly illustrated by the results for Egypt and Sudan where less than 5% of respondents reported having a diagnosis other than diabetes. In those countries, more than 15% had serious mood disturbances, more than one third had elevated CHES scores, between 14 and 35% had moderate or worse cognitive impairment, and between 16 and 44% had signs of moderate or worse functional impairment. The lack of diagnosis may be a proxy for lack of access to a primary care provider (Starfield et al., 2005). Thus, the CUSR could be used as a first level assessment to prioritize access to limited clinical services in low resource environments. For example, the participants scoring high in mood disturbance, health instability, pain, cognitive or functional impairment should certainly be prioritized for access to more intensive health services. Indeed, these data could also be used to inform telehealth interactions with specialized geriatrics services in low resource or remote environments.

An important feature of the CUSR is that it included both standardized health measures comprising a comprehensive geriatric assessment as well as embedded decision-support tools for care planning and clinical scales to measure changes in the severity of outcomes over time. In other words, this single source of data can yield information that can support person-level clinical decisions as well as performance management, resource allocation, need analysis, and policy development at the population levels. These applications have been demonstrated with the clinician led assessment data from other interRAI assessments (Heckman et al., 2013; Carpenter & Hirdes, 2013; Heckman & Jönsson, 2017) and the data from the CUSR have been shown here to have similar patterns of association.

The PAULAS research team is currently undertaking further cross-sectional analyses of these data to examine substantive issues related to risk factors for mood disturbance, pain, self-rated health, falls, nutrition, caregiver distress, and poverty among older adults in Africa. Our next stage of research is to expand our approach to include longitudinal data collection to establish standard methodologies for follow-up assessment and tracking persons who may not have fixed living arrangements or standardized health identifiers. This longitudinal research is also needed to determine the rates of change likely to be evident in the study populations to establish recommendations for follow-up times. Having established the psychometric feasibility of completing the CUSR in African settings, the next step is undertaking pragmatic trials to establish the clinical utility of the system to respond to the complex health needs demonstrated in the participant in this study.

The United Nations recommendation is for annual health checks; however, the complexity of some of the persons assessed in the PAULAS study points to the need for a more rapid follow-up period. A further step will be to determine the system level adaptations required to integrate the use of the CUSR into normal clinical practice in African settings. This

will involve training clinicians to interpret and respond to CUSR results, developing scalable training protocols for lay health assessors, establishing robust and reliable information technology systems to support the use of CUSR data in electronic health records, and training managers and policy makers in the health system applications of CUSR data.

Finally, it is worth considering how the CUSR and other interRAI assessment systems relate to the WHO ICOPE framework (Tavassoli et al., 2022). This framework calls for a four-step pathway of basic assessment, in-depth assessment, personalized care planning, and periodic reassessment to track outcomes, which is entirely compatible with the interRAI approach to stepped assessment (Sinn et al., 2022). The framework includes an emphasis on intrinsic capacity operationalized with measures of locomotion, cognition, vitality/nutrition, vision, hearing, and psychological well-being (Cesari et al., 2026). In addition, it considers the person's functional ability based on their capacity and their environment. The CUSR is a psychometrically sound basic assessment that can support care planning as other interRAI instrument have done (Schumacher et al., 2023). It includes measures of all aspects of intrinsic capacity and functional ability in the ICOPE framework, and it is integrated with interRAI's more comprehensive clinician led assessment to provide in-depth assessment of persons with highest levels of complexity and need. In that sense, the CUSR represents a promising approach to meeting the UN recommendations in a manner that is complementary to the ICOPE framework.

4.1. Limitations

The current study does have some limitations. For example, the cross-sectional nature of the data means that they can be used to detect associations but not to make causal inferences. More importantly, the study samples were meant to obtain heterogeneous information about diverse care settings, but not to make national epidemiological estimates of health indicators. Future research could use the CUSR with representative samples to provide such estimates that would be more generalizable to the general population. Readers should also consider the unique settings where data were collected (e.g., community-based, primary care, seniors' clubs) when interpreting and comparing results since these were mostly obtained from health and social service settings rather than the general population. In addition, the tests of validity in this study did not expand on previous studies of criterion validity and the absence of longitudinal data made it impossible to test predictive validity.

4.2. Next steps

The focus of this study was to determine whether the interRAI CUSR could be used in an African context to respond to the UN Decade of Health Aging call for annual assessment of the health and social needs of older adults. It was not the intent to determine whether such an assessment intervention would yield significant changes in health outcomes – that is not a requirement of the UN's indicator. That said, an important future intervention study will be to determine the effectiveness of using the interRAI CUSR to identify and respond to the health needs of older adults in Africa compared with regular practice.

Recruitment of additional country sites for cross-sectional data collection using the interRAI CUSR for the PAULAS study is ongoing. Our team is also currently working to secure additional funding to support the longitudinal implementation of the CUSR and continued clinical use. Future research should also be undertaken to compare the CUSR with domain-specific gold standard measures to further establish criterion validity with clinician rated measures of cognition, mood, frailty, functional status, and intrinsic capacity in the African context.

5. Conclusions

The results of this work suggest that the interRAI CUSR assessment

provides a psychometrically sound assessment of older adults as called for in the United Nations Decade of Healthy Aging indicator guidelines. Observations from these assessments can be used to respond to calls for improved data systems for primary care in Africa to support enhancements in the quality of care (Maher et al., 2010).

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CRediT authorship contribution statement

John P Hirdes: Conceptualization, Methodology, Validation, Formal analysis, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition. **Brittany Ellis:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Sospeter Gatobu:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Project administration. **Oluwakemi Aderibigbe:** Writing – review & editing, Project administration. **Roberta Adutwumwaah Ntem:** Writing – review & editing, Project administration. **Emmanuel Bagaragaza:** Conceptualization, Writing – review & editing, Project administration. **Festo Bali Christopher:** Writing – review & editing, Project administration. **Aynie Gebrekidan:** Conceptualization, Writing – review & editing, Project administration. **Enock Chisati:** Conceptualization, Writing – review & editing, Project administration. **Bonaventure Egbujie:** Conceptualization, Methodology, Writing – review & editing, Project administration, Funding acquisition. **Desderius Haufiku:** Writing – review & editing, Project administration. **Yohana J Mashalla:** Conceptualization, Writing – review & editing, Project administration. **Reem T. Mulla:** Conceptualization, Writing – review & editing, Project administration, Funding acquisition. **Moussiliou Noël Paraïso:** Conceptualization, Writing – review & editing, Project administration. **Osman Sankoh:** Writing – review & editing, Project administration. **Emmanuel Sendaula:** Conceptualization, Methodology, Writing – review & editing, Project administration. **Benoite Umubyeyi:** Writing – review & editing, Project administration. **George Aidoo:** Writing – review & editing. **Yassine Benhajali:** Writing – review & editing, Project administration. **Ezeala-Adikaibe Birinus:** Writing – review & editing. **Marie Claire Gasanganwa:** Writing – review & editing. **Darius Gishoma:** Writing – review & editing. **Finn Hartwell-Kinnear:** Writing – review & editing. **Esther Jiya:** Writing – review & editing. **Veronica Kiondo:** Writing – review & editing. **Zahra Morawej:** Writing – review & editing. **Justine Nagawa:** Writing – review & editing. **Christopher Perlman:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition. **George A Heckman:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition. **Leon Geffen:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition.

Declaration of competing interest

The authors declare that there are no financial competing interests for this work. JPH, LG, GH, CP, BE, RM, SG, AB, YM, MNP, EB, EC, and DG are interRAI Fellows, and interRAI provide part of the financial support as a grant for this project.

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Supplementary materials

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