

Nutrition Outcomes and Interventions in Older People in Africa: A Systematic Umbrella and Scoping Review

Anthony Muchai Manyara ^{*,1}; Tadios Manyanga²; Shane Naidoo³; Kate Mattick^{2,4}; Rudo Chingono²; Grace M.E. Pearson ^{1,5}; Opeyemi Babatunde ⁶; Niri Naidoo⁷; Kate A. Ward ^{8,9}; Celia L. Gregson^{1,2}

¹Global Health and Ageing Research Unit, Bristol Medical School, University of Bristol, Bristol BS10 5NB, United Kingdom; ²The Health Research Unit Zimbabwe, Biomedical Research and Training Institute, Harare, Zimbabwe; ³Health and Rehabilitation, University of Cape Town, Rondebosch, Cape Town, South Africa; ⁴Brighton and Sussex Medical School, Brighton BN1 9PX, United Kingdom; ⁵Older Persons Unit, Royal United Hospitals Bath NHS Foundation Trust, Bath BA1 3NG, United Kingdom; ⁶School of Medicine, Primary Care Centre Versus Arthritis, Keele University, Keele ST5 5BG, United Kingdom; ⁷Division of Physiotherapy, Department of Health and Rehabilitation Sciences, University of Cape Town, Cape Town, South Africa; ⁸MRC Unit The Gambia, London School of Hygiene and Tropical Medicine, Banjul, The Gambia; ⁹MRC Lifecourse Epidemiology Centre, Human Development and Health, University of Southampton, Southampton SO17 1BJ, United Kingdom

*Corresponding Author: Anthony Muchai Manyara, Global Health and Ageing Research Unit (c/o MRU), University of Bristol, Learning and Research Building (Level 1), Southmead Hospital, Bristol BS10 5NB, United Kingdom (Anthony.Manyara@bristol.ac.uk).

Africa's older population is rapidly increasing, necessitating the development of healthy aging interventions. Nutrition is a key component of healthy aging. Evidence synthesis on nutrition outcomes of older adults in Africa is emerging but a synthesis on interventions is lacking. The aim was to synthesize evidence from reviews on older people in Africa to determine the prevalence of nutrition outcomes and associated factors (phase 1) and implemented interventions (phase 2). Literature searches using Medline, EMBASE, Web of Science, African Index Medicus, and African Journals Online were conducted up to May 9, 2024. After screening, 25 reviews (for phase 1) and 22 articles (for phase 2) were selected for inclusion. Most reviews (n = 16; 64%) were systematic, with 8 having a meta-analysis, and published between 2020 and 2023 (n = 20; 80%). The pooled prevalence of malnutrition (being underweight) was 21% (evidence from 5 reviews), 26% for sarcopenia (1 review), 27% for obesity (3 reviews), 32% for constipation (1 review), 39% for food insecurity (2 reviews), 49% for dental caries (1 review), and 64% for vitamin D insufficiency and deficiency (2 reviews). The 22 articles on nutritional interventions represented only 6 countries, mostly South Africa (64%; 14/22), evaluated using randomized trials (n = 10; 45%) and educational interventions (n = 10; 45%). Reported interventions were not typically underpinned by supporting systematic reviews or a contextual evidence base, did not account for the minimally important clinical difference, lacked evidence of community engagement, and were not reported transparently. Nutritional research is needed on older adults outside of South Africa and beyond malnutrition. Future nutritional interventions (ideally, multicomponent) for older people in Africa should consider targeting the multiple nutritional and practical needs (eg, dietary counseling, supplementation) of older adults. Intervention development should be evidence-based, include engagement with older people, and follow complete and transparent reporting.

Key words: nutrition, Africa, malnutrition, older people, healthy aging, obesity, vitamin D.

© The Author(s) 2025. Published by Oxford University Press on behalf of the International Life Sciences Institute.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited.

<https://doi.org/10.1093/nutrit/nuaf109>

Nutrition Reviews® Vol. 00(00):1–19

INTRODUCTION

The number of older Africans (≥ 60 years) is projected to triple by 2050.^{1,2} This will result in increased multimorbidity and disability necessitating interventions³ that maximize healthy aging—that is, sustaining physical and mental capacities for people across the life course, to improve well-being in older age.⁴ Lifestyle factors (eg, physical activity, diet) are important determinants of morbidity, disability, healthy aging, and mortality. A recent scoping review has synthesized physical activity interventions among older people in Africa.⁵ Apart from physical activity, diet is an important determinant of aging.^{6–8} Healthy diets (eg, high in fiber and healthy oils and fats) are associated with longevity and better cardiometabolic, musculoskeletal, and cognitive health,⁹ while less-healthy diets (eg, high in sugar and salt, low in fiber) are important risk factors for noncommunicable diseases, including cancer and cardiovascular diseases.¹⁰ The nutritional needs of older people are different from those of the general population, and interventions must target a range of issues, including increasing overall food intake, protein intake, and micronutrient supplementation.^{11,12} Older adults' opinions should inform such interventions about their nutritional needs,¹³ as well as local and contextual evidence to ensure cost-effectiveness.¹⁴

Understanding the nutritional needs of older African adults and interventions already implemented can inform future healthy aging interventions. However, to date, nutrition interventions in Africa have mainly focused on maternal and childhood nutrition. For example, a recent scoping review on barriers and facilitators to the implementation of nutrition interventions in Africa only included articles that focused on maternal and childhood nutritional interventions or general population nutritional interventions, with no consideration of nutrition interventions for vulnerable older adults.¹⁵ The skewed focus on maternal and childhood nutrition interventions was highlighted in an early narrative review published in 2001 on nutrition among older adults in Africa.¹⁶ More recently, emerging evidence has been published on the nutritional needs of older adults in Africa, including recent evidence syntheses on malnutrition,^{17,18} factors associated with nutrition,¹⁹ and food insecurity.²⁰ These reviews have all called for urgent nutritional interventions for older people. With these emerging evidence syntheses, it is important and timely to review what has been reported to date; describe the prevalence of nutrition outcomes, dietary behavior and associated factors, and interventions already designed or evaluated; and identify gaps in the empirical research and inform future intervention development. Therefore, this article presents 2

interlinked evidence synthesis phases, both nutrition-specific (eg, supplementation) and nutrition-sensitive (eg, cash transfers), in older adults in Africa.

METHODS

This review was preregistered in Open Science Framework,²¹ with the protocol published.²² It is reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews²³ (see [File S1](#)). The review had 2 phases—phase 1: a review of reviews on nutrition in older people in Africa; and phase 2: a review of nutrition interventions in older people in Africa. We defined older adults as people aged 50 years and older. Studies were included if the mean age or 70% of the study population (signifying a sufficient majority) was 50 years or older. This age threshold reflects the lower life expectancy in Africa compared with high-income countries, where older adults are often defined using a higher age threshold.²⁴

Literature Search and Selection

For both review phases, 5 databases—Medline and EMBASE (via Ovid), Web of Science, African Index Medicus, and African Journals Online—were searched between November 28, 2023, and May 9, 2024. Searches were supplemented with Google Scholar searches for gray literature. Search strategies for both review phases were developed in consultation with an experienced systematic reviewer and librarian (see [File S2](#)). Search results from the Ovid and Web of Science databases were exported to EndNote for duplicate removal and then uploaded into Rayyan (Qatar Computing Research Institute, Doha, Qatar)²⁵ for title, abstract, and full-text screening, which was conducted independently by 2 reviewers from a team of 4 (A.M.M., T.M., K.M., S.N.). Disagreements were resolved through group discussion. For efficiency, record screening in website-like databases, African Journals Online, African Index Medicus, and Google Scholar was conducted by the lead author (A.M.M.) using title and content text and, if needed, by accessing full texts.²⁶ For phase 1, articles were included if they reported a review of any kind of synthesizing evidence on nutrition in older adults living in Africa. This included global reviews on older adults, with studies from Africa, as well as reviews on the general population in Africa that included studies and evidence on older adults. For phase 2, articles were included if they described any aspect of nutritional interventions (eg, type, design, implementation, evaluation) piloted or implemented among older adults in Africa ([Table 1](#)).

Table 1. PICOS Criteria for Inclusion and Exclusion of Studies

Parameter	Inclusion and exclusion criteria
Population	- Older adults who are community-dwelling or residing in any long-term care facilities, such as nursing homes or retirement centers. Older adults are defined as those aged ≥ 50 years.^a - Studies were included if the mean age or 70% of the study population was ≥ 50 years. - The study had to be conducted, entirely or in part, in an African country.
Intervention	- Any nutritional intervention or multicomponent interventions with a nutrition component. - Studies were included if they described any of the findings relevant to the research questions, including intervention development process, piloting, feasibility testing, and evaluation of interventions.
Comparison	Any comparison, if available
Outcomes	Any outcome reported
Study design	- Any study design - Abstracts and theses were excluded

^aAn age of 50 years was used to define an older adult in Africa, given that life-expectancy is lower in the region compared with high-income countries, where an age of 60 or 65 years is traditionally used to define "older."

Data Extraction, Charting, and Synthesis

Data were extracted by 1 reviewer (A.M.M.), charted, and analyzed in Microsoft Excel (Microsoft Corporation, Redmond, WA, USA). Extracted data included characteristics of articles (eg, year of publication, country or region of focus, type of article or study design) and evidence that answered the research questions. Quantitative data were analyzed using either medians (and interquartile range) or counts and percentages, while qualitative data were analyzed using simple thematic analysis.²⁷

Phase 1. Systematic reviews reported the prevalence of 7 nutrition and nutrition-related outcomes: malnutrition, obesity, food insecurity, vitamin D deficiency, sarcopenia, constipation, and dental caries. Malnutrition and obesity (including overweight and obese body mass index categories) reviews reported meta-analyses, and the meta-analyzed prevalences of each of these outcomes (ie, malnutrition and obesity) were separately combined as median and interquartile range. Reviews on vitamin D insufficiency (including deficiency), food insecurity, and dental caries did not report a meta-analysis; hence, the prevalences from individual relevant studies were combined as median (and interquartile range). One review each for sarcopenia and constipation had a meta-analysis, and the results were represented (with 95% CIs) without modification. The median (and interquartile range) number of studies included, countries represented, and total sample size of participants reported in meta-analyses and/or reviews were computed. Where only 1 review reported a nutrition outcome, the total number of studies included, countries represented, and the total sample size from individual studies were computed instead of medians. The medians (and interquartile range) were determined using R (version 4.3.1; R Foundation for Statistical

Computing, Vienna, Austria).²⁸ Factors associated with dietary behavior and nutrition outcomes were categorized into individual, social, physical, and macro-environmental factors based on an ecological framework by Story et al.²⁹ To assess the quality of systematic reviews and meta-analyses, the following details were extracted: the proportion including 10 or fewer studies, searching for gray and unpublished literature, performing a quality assessment, using a reporting guideline, and reporting significant publication bias and heterogeneity.³⁰ For reviews that reported outcomes of quality assessment, the median percentage (interquartile range) of studies reporting good or high quality, low bias, or a score equivalent to 80% of the overall quality score were computed.

Phase 2. The included studies were described using the following details: study design, country, participant sample size, sex and age, and intervention type (eg, educational, food aid). Data extracted on unique interventions (ie, considering that 1 intervention can result in multiple publications) included the disease or nutrition area targeted, intervention content and delivery, outcomes measured, what worked well (or did not), and the authors' conclusions. Intervention content included details on components (eg, supplement tablets, educational materials), while delivery included approach (eg, individual/group delivery), follow-up period, intensity (eg, daily intake, weekly intervention), setting (eg, community, health facilities), and personnel involved in the delivery. Outcomes used to evaluate nutrition interventions were extracted verbatim and categorized into biomarkers (eg, blood pressure), behavioral (eg, food intake), intermediate outcomes (eg, body mass index, malnutrition), and patient-important outcomes (eg, morbidity).^{31,32}

Finally, the design, evaluation, and reporting quality of interventions was assessed by checking whether

randomized controlled trials (RCTs) were supported by a cited systematic review,³³ local evidence supporting the intervention was referenced, a theory was used for behavioral interventions, community or patient engagement was reported, minimal clinically important difference (smallest benefit of value to intervention users) was defined,³⁴ and a relevant reporting guideline was used. Each was categorized as yes, no, or partial.

RESULTS

Figures 1 and 2 show the identification, screening, and inclusion criteria of records for phases 1 and 2, respectively. After screening, 25 reviews on nutrition outcomes and 22 articles describing interventions were included.

Phase 1: Review of Reviews

Table 2 shows the characteristics of the 25 included reviews. Sixteen (64%) reviews were systematic, half of which ($n=8$; 32%) included a meta-analysis. Twenty (80%) reviews were published between 2020 and 2023, 10 (40%) focused on Africa or sub-Saharan Africa (SSA), and 17 (68%) explicitly focused on older people. Five (of 16 systematic reviews; 31%) included 10 or

fewer studies. Ten reviews (of 16; 63%) searched for gray or unpublished literature, while 75% ($n=12$) performed a quality assessment. Of the 8 that reported on the outcome of the quality assessment, the median proportion (IQR) of included articles with high quality was 49% (43%–63%). Thirteen reviews (81%) used a reporting guideline, while 7 (44%) assessed publication bias. Of the 7, only 2 reviews (29%) found a significant publication bias. In the 7 meta-analyses that assessed heterogeneity, all found high levels of heterogeneity ($>75\%$).

Table 3 shows the prevalence of nutrition outcomes and sources of evidence. The median prevalence of malnutrition, obesity, food insecurity, dental caries, and vitamin D insufficiency and deficiency was 21% (evidence from 5 reviews), 27% (3 reviews), 39% (2 reviews), 49% (1 review), and 64% (2 reviews), respectively. The pooled prevalence based on a single meta-analysis was 26% for sarcopenia³⁶ and 32% for constipation³⁷ (**Table 3**). The median number of studies included in the reviews ranged from 6 to 28, while the median number of countries represented ranged from 5 to 11 (**Table 3**).

A systematic review in Nigeria, using a meta-regression epidemiologic model accounting for study sample size, study period, and age, estimated the prevalence of obesity to be 55% in people aged 50 years and

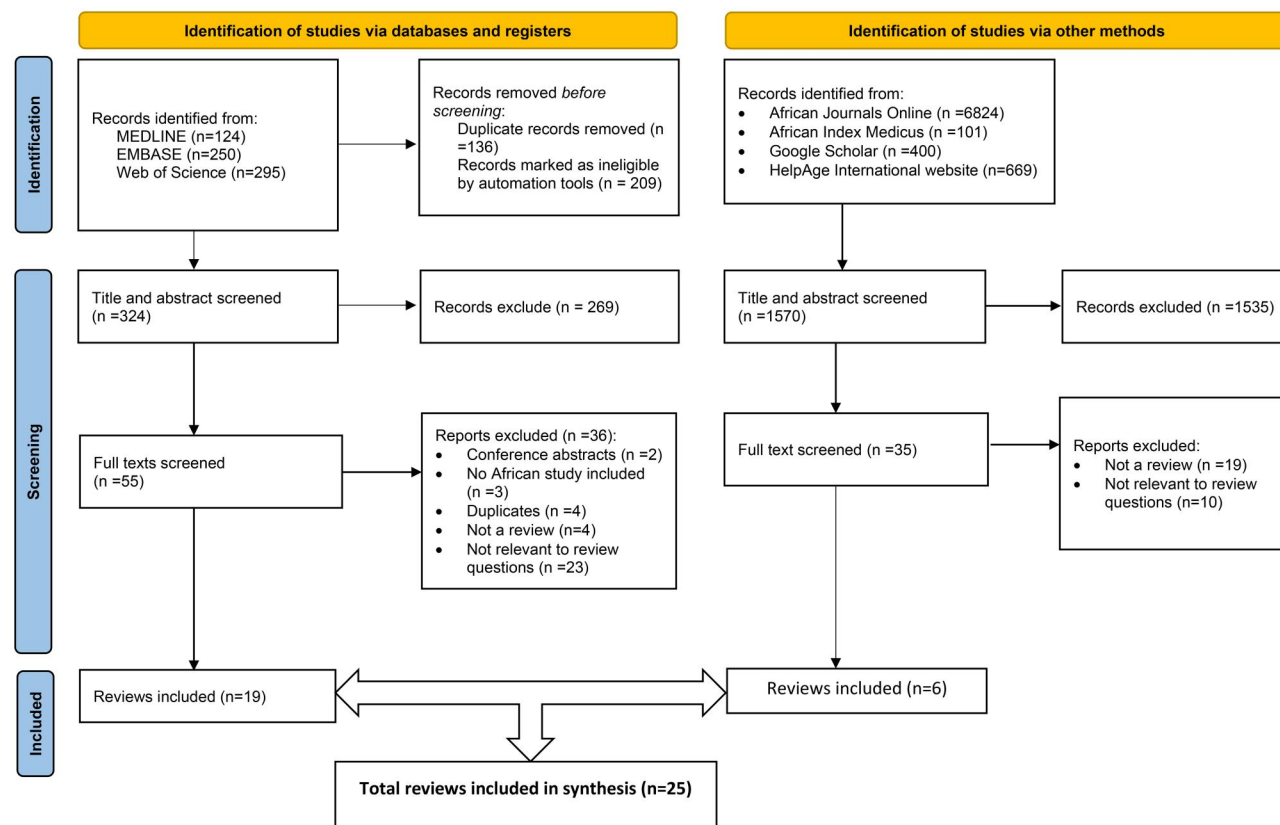


Figure 1. Literature Search and Inclusion Flow Diagram for Phase 1: Review of Reviews on Nutrition in Older People in Africa

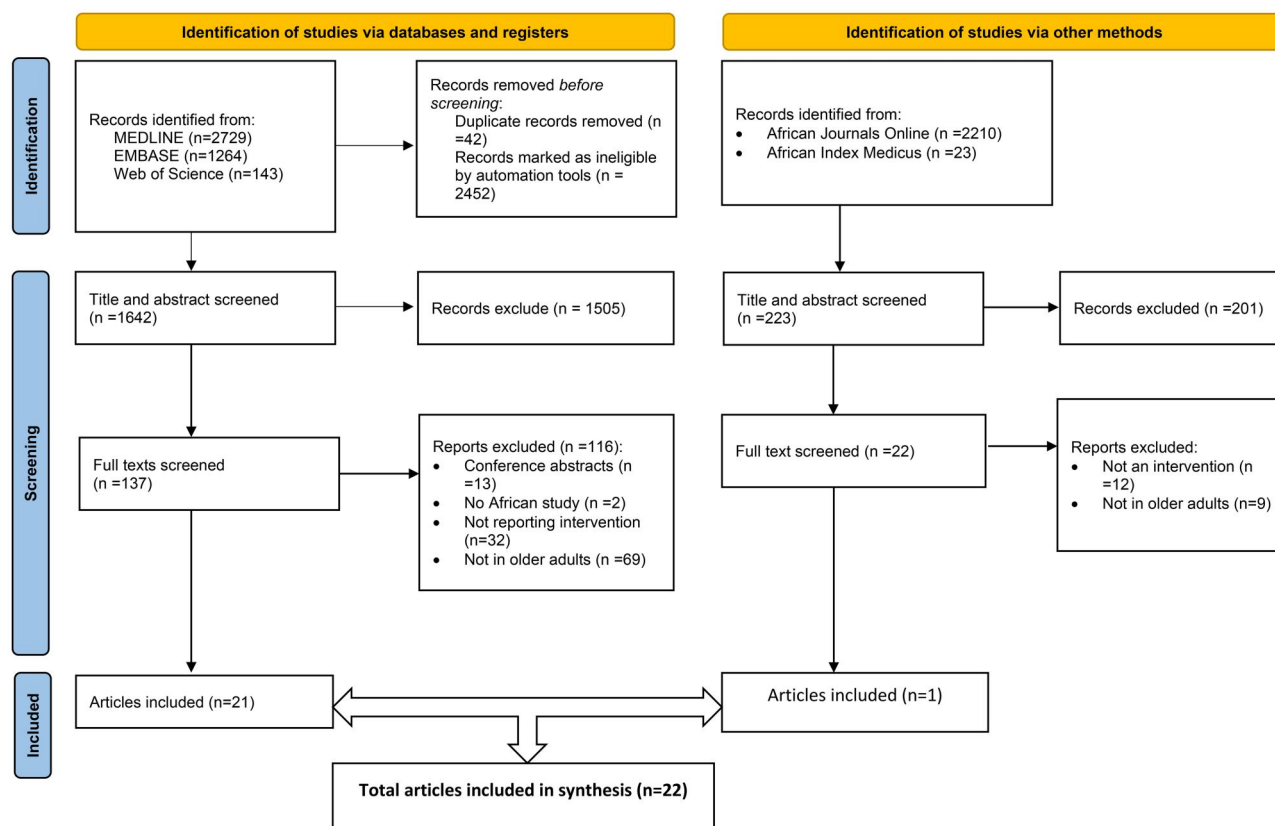


Figure 2. Literature Search and Inclusion Flow Diagram for Phase 2: Review of Nutrition Interventions in Older People in Africa

older.³⁸ A scoping review in Ghana reported the prevalence of underweight and overweight in people aged 50 years and older as 10% and 20%, respectively, with a high central obesity (67%) prevalence in those aged older than 60 years.³⁹

Dietary Behavior. Four (of 25; 8%) reviews reported on dietary behaviors: 1 systematic review⁴⁰ and 3 narrative reviews.^{41–43} One South African review reported that sugar intake was lower in those aged 65 years and older compared with younger age groups, although the authors noted that some older people may be consuming more than the recommended sugar intake.⁴¹ Two South African reviews found that adults aged 55 years and older were less likely to consume high-fat and street foods than those under 55 years.^{40,41} It was uncertain if the South African older adults met the recommended daily fat intake, with authors of 1 review arguing that, although it seemed the older people were within the recommended intake, the diets were generally low in oily fish, nuts, and vegetable oils.⁴¹ Another review noted that fat intake as a proportion of total calories was lowest in older Black people in South Africa.⁴² Fruit and vegetable intakes were reported to be low and below the recommended intake by 2 narrative reviews, based on evidence from SSA⁴² and from South Africa, Ghana,

and Uganda.⁴³ Salt intake was reported to be lower in older adults than in younger adults in South Africa,^{40,41} with 1 review reporting that 58% of those aged 65 years and older had actively lowered their salt intake.⁴¹ According to a narrative review on SSA, protein intake, particularly from dairy and animal sources, was reported to be low.⁴² The same review reported low micronutrient intake (vitamins, calcium, selenium, magnesium, copper, biotin) among Black South Africans.⁴²

Factors Associated With Dietary Behaviors and Nutrition Outcomes. Seven (of 25; 28%) reviews reported on factors associated with dietary behavior and nutrition outcomes: 3 systematic reviews,^{20,44,45} 2 scoping reviews,^{19,46} and 2 narrative reviews.^{43,47} The associated factors were categorized into individual, social, physical, and macro-environment factors. **Figure 3** summarizes these factors and their associations with recommended dietary intake, obesity, food insecurity, and malnutrition. **Table S1** shows the citations supporting the associations. Most of the factors (11/19, 58%) reported were at the individual level. Factors associated with more than 1 behavior or nutrition outcome were socioeconomic status, being female, having digestive problems, and rural/urban living (**Figure 3**).

Table 2. Characteristics of the 25 Reviews Included in Phase 1: Review of Reviews on Nutrition in Older People in Africa

Characteristics	n (%)
Type of review	
Systematic with meta-analyses	8 (32%)
Systematic	8 (32%)
Scoping	3 (12%)
Other ^a	6 (24%)
Publication year	
2008–2019	5 (20%)
2020–2023	20 (80%)
Geographical focus of review	
Africa/SSA	10 (40%)
Region in Africa	3 (12%)
Specific countries in Africa	9 (36%)
Global review with African studies	3 (12%)
Representation of World Bank income category ³⁵	
Low	16 (64%)
Lower middle	18 (72%)
Upper middle	16 (64%)
Review explicitly on older people	
Yes	17 (68%)
No	8 (32%)
Topics covered ^b	
Malnutrition ^c	8 (32%)
Obesity	7 (28%)
Dietary behavior	4 (16%)
Food insecurity	2 (8%)
Factors associated with nutrition	10 (40%)
Micronutrient deficiency ^d	3 (12%)
Nutrition/aging policies	2 (8%)
Constipation	1 (4%)
Dental caries	1 (4%)
Sarcopenia	1 (4%)
Number of topics covered	
1	13 (52%)
≥2	12 (48%)

^aIncludes desk, rapid, and narrative reviews.^bOverlapping proportions.^cMalnutrition in reviews was defined using either the Mini Nutritional Assessment, body mass index, mid-upper arm circumference, or calf circumference.^dVitamin D and zinc.

Abbreviation: SSA, sub-Saharan Africa.

Policies. Two reviews described policies related to older people in Ethiopia⁴⁸ and nutrition and health in Ghana.⁴⁹ Both reviews found that policy documents related to the nutrition of older people had not been written.

Phase 2: Review of Interventions

Table 4 shows the characteristics of the 22 included articles describing nutrition interventions. The studies reported were from only 6 countries, with the majority from South Africa (64%; 14/22). Ten (of 22; 45%) used an RCT study design, with sample sizes ranging from 48 to 1013 participants and a proportion of women of 50% or more. Most of the interventions described were educational (45%; 10/22) (see **Table 4**).

The 22 articles described 15 unique interventions; **Table 5** shows the characteristics of these interventions. Four (of 15; 27%) intervened on hypertension and 4 on nutrition status (eg, malnutrition), 2 (13%) intervened on osteoporosis/arthritis, and 2 on diabetes; and 1 study addressed each of (7%) cardiovascular disease, influenza, and cognition. In the 14 interventions reporting delivery approach and setting, most were delivered at an individual (57%; 8/14) rather than a group level (29%; 4/14). Most were delivered in the community (57%; 8/14) rather than in facilities such as health or care centers (43%; 6/14).

Table 6 shows the intervention aims, outcome measures, and authors' conclusions. Nine of 15 (60%) aimed to prevent disease; only 13% ($n = 2$) evaluated outcomes identified as important to patients; and most (80%, $n = 12$) found the tested intervention to be efficacious, as shown in **Table 6**.

Table 7 shows the design, evaluation, and reporting characteristics of the 15 unique interventions. Most interventions (80%; 12/15) did not cite local supporting

Table 3. Prevalence of Nutrition Outcomes and Source of Evidence in Phase 1: Review of Reviews on Nutrition in Older People in Africa

	Median prevalence, % (IQR)	No. of reviews	Total studies included, median (IQR)	Total countries represented, median (IQR)	Total sample size for each review, median (IQR)
Malnutrition ^a	21% (18%–21%)	5	28 (14–32)	11 (1–13)	9611 (6573–12 804)
Obesity	27% (17%–33%)	3	13 (12–23)	8 (5–11)	375 (222–537)
Vitamin D insufficiency ^b	64% (30%–76%)	2	6 (4–8)	5 (3–6)	957 (615–1298)
Food insecurity ^c	39% (31%–62%)	2	19 ^d	28 ^d	502 (169–1200)
Dental caries	49% (46%–74%)	1	3 ^d	3 ^d	769 ^d
Sarcopenia	26% (19%–33%) ^e	1	6 ^d	5 ^d	10 656 ^d
Constipation	32% (22%–45%) ^e	1	2 ^d	2 ^d	514 ^d

^aMalnutrition in reviews was defined using either the Mini Nutritional Assessment, body mass index, mid-upper arm circumference, or calf circumference.^bIncludes deficiency and insufficiency.^cOne of reviews only had 1 relevant study so the number of studies and countries represented is a sum from the 2 reviews rather than median.^dTotal number rather than median.^ePooled prevalence (95% CIs) taken directly from reviews.

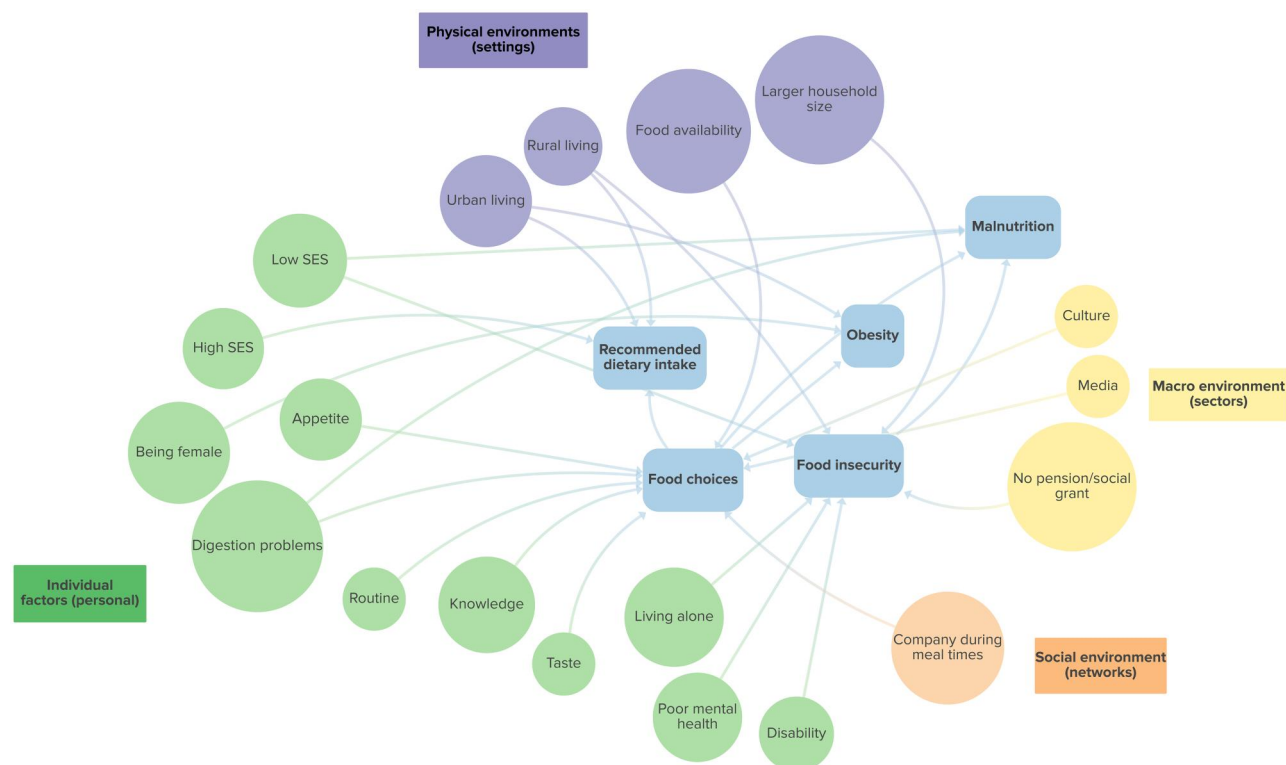


Figure 3. Factors Associated With Dietary Practices and Nutrition Outcomes Reported in 7 Reviews (Phase 1: Review of Reviews of Nutrition in Older Adults in Africa) Categorized Using an Ecological Framework by Story et al.²⁹ Abbreviation: SES, socioeconomic status

evidence, while the majority of RCTs (56%; 5/9) did not cite a systematic review to justify the development of their intervention. Five of the 9 (56%) behavioral interventions used a theory for intervention development. Few studies (27%; 4/15) reported on community or patient engagement. Most did not use a minimally clinically important difference (80%; $n = 12$) or a reporting guideline (87%; $n = 13$) (see [Table 7](#)).

Table 8 presents process evaluation findings from 5 interventions. All were from South Africa and used focus group discussions, with 3 supplemented by literature reviews, stakeholder discussions, questionnaires, and/or in-depth interviews. What worked well included fast delivery (ie, no need to wait in line to receive low-sodium salt and health education on hypertension at pension pay points, compared with waiting in line for services in health facilities)⁵⁹; easy-to-follow education materials, group discussions, appropriate number and duration of education sessions, and reimbursement to attend sessions for an educational intervention⁵⁵; and provision of inexpensive and tasty meals for a food aid intervention.⁷⁰ Recommendations included the translation of educational materials into local languages,^{55,60,61} use of peer trainers,⁶⁹ and family members of patients joining educational sessions.⁶⁹

DISCUSSION

This article presents a comprehensive synthesis of nutritional evidence on older adults in Africa, including the nutritional interventions that have been evaluated. Evidence synthesis of nutrition in older adults in Africa has increased in the last 4 years. The pooled prevalence of malnutrition in older adults was 21% based on 5 reviews, 26% for sarcopenia (1 review), 27% for obesity (3 reviews), 32% for constipation (1 review), 39% for food insecurity (2 reviews), 49% for dental caries (1 review), and 64% for vitamin D insufficiency (2 reviews). Dietary behavior and nutritional outcomes (malnutrition and obesity) were associated with individual factors (eg, gender, socioeconomic status), the physical environment (eg, rural/urban living), social environment (eg, company during meals), and macro-environment (eg, culture, media, pension grants). Most nutritional interventions have been educational, implemented in South Africa, evaluated using RCTs, targeted towards specific diseases (eg, hypertension, diabetes, arthritis), and delivered using an individualized approach in community settings. Only a few interventions have been evaluated using patient-centered outcomes, supported by systematic reviews or local-level

Table 4. Characteristics of 22 Included Articles in Phase 2: Review of Nutrition Interventions in Older People in Africa

Study, year of publication	Study country	Study design	Sample size, age, and study setting	Type of intervention
1. Cappuccio et al, 2006 ⁵⁰	Ghana	RCT	• 1013 Participants (62% female) • Mean age 55 y from rural and semi-urban settings	Educational
2. Charlton et al, 2008 ⁵¹	South Africa	RCT	• 92 Participants (84% female) • Mean age 62 y, from an urban setting	Dietary modification and supplementation
3. Oldewage Theron and Kruger, 2009 ⁵²	South Africa	Cohort intervention study	• 140 Older participants from an urban setting	Food aid
4. Bhurosy and Jeewon, 2013 ⁵³	Mauritius	RCT	• 189 Participants (52% female) • ≥82% Aged >50 y from urban settings	Educational
5. van Velden et al, 2015 ⁵⁴	South Africa	RCT	• 100 Participants • Mean age 65 y from an urban setting	Dietary supplementation
6. Muchiri et al, 2016 ⁵⁵	South Africa	Qualitative process evaluation	• 41 Participants (88% female) • Mean age 59 y from a rural setting	Educational
7. Muchiri et al, 2016 ⁵⁶	South Africa	RCT	• 82 Participants (87% female) • Mean age 59 y from a rural setting	Educational
8. Muchiri et al, 2016 ⁵⁷	South Africa	RCT	• 82 Participants (87% female) • Mean age 59 y from a rural setting	Educational
9. Shalaby et al, 2016 ⁵⁸	Egypt	Quasi-experiment	• 115 Participants (53% female) • Mean age 66 y from a rural setting	Educational
10. Lloyd-Sherlock et al, 2018 ⁵⁹	South Africa	Pilot intervention and qualitative evaluation	• 20 Participants (% female not reported) • 60+ y in rural settings	Dietary modification and educational
11. Napier et al, 2021 ⁶⁰	South Africa	Qualitative case study	Phase 1:	Dietary guidelines
12. Napier et al, 2018 ⁶¹			• 86 Older adults (67% female) • Mean age 67 y from rural and urban settings	
			Phase 2:	
			• 123 Older adults (67% female) • Mean age 69 y from rural and urban settings	
13. Charlton et al, 2021 ⁶²	South Africa	Pre-post impact evaluation	• 1298 Participants (76% female) • Mean age 54 y from rural and urban settings	Legislation
14. Muchiri et al, 2021 ⁶³	South Africa	RCT	• 77 Participants (87% female) • Mean age 57 y from an urban setting	Educational
15. Elsaid et al, 2021 ⁶⁴	Egypt	RCT	• 80 Participants (50% female) • 55+ y from an urban setting	Dietary supplementation
16. Kandhari et al, 2021 ⁶⁵	Tanzania	RCT	• 48 Participants (81% female) • Mean age 61 y from a rural setting	Dietary supplementation
17. Kuhn et al, 2022 ⁶⁶	South Africa	RCT	• 57 (74% female) • Mean age: 73 y in an urban setting	Dietary supplementation
18. Grobler et al, 2022 ⁶⁷	South Africa	Quasi-experimental	• 104 Participants • 60+ y from an urban setting	Dietary supplementation
19. Fouad et al, 2022 ⁶⁸	Egypt	Quasi-experimental	• 60 Participants • 60+ y from a rural setting	Educational
20. Muchiri et al, 2023 ⁶⁹	South Africa	Qualitative process evaluation	• 50 participants (80% female) • Mean age 57 y from an urban setting	Educational

(continued)

Table 4. Continued

Study, year of publication	Study country	Study design	Sample size, age, and study setting	Type of intervention
21. Nkurunziza et al, 2023 ⁷⁰	South Africa	Qualitative case study	• 10 Older adults (90% female) • Mean age 77 y from an urban setting	Food aid
22. Seid and Babbel, 2023 ⁷¹	Ethiopia	Quasi-experiment	• 271 Participants (55% female) • Mean age 73 y from an urban setting	Educational
Summary				
Country	Study design		Intervention types	
• South Africa (64%; 14/22) • Egypt (14%; 3/22) • Ethiopia (5%; 1/22) • Ghana (5%; 1/22) • Mauritius (5%; 1/22) • Tanzania (5%; 1/22)	• RCT (45%; 10/22) • Qualitative studies (23%; 5/22) • Quasi-experimental (18%; 4/22) • Other evaluation studies (14%; 3/22)		• Educational (45%; 10/22) • Dietary modification/supplementation (27%; 6/22) • Food aid (9%; 2/22) • Dietary guidelines (9%; 2/22) • Educational and dietary modification (9%; 2/22) • Legislation (5%; 1/22)	
World Bank income category ³⁵ :				
Low-income (5%; 1/22)				
Lower-middle (23%; 5/22)				
Upper-middle (73%; 16/22) _				

Abbreviation: RCT, randomized controlled trial.

evidence, and involved patient and community engagement in their design and/or conduct. Furthermore, none were reported using a suitable reporting guideline.

Compared with global meta-analyses that have included older adults, the pooled prevalences reported in this review are as follows: higher for malnutrition (21% vs 17%)⁷² and constipation (32% vs 19%),³⁷ similar for sarcopenia (26% vs 10%–27%)^{73,74} and dental caries (49% vs 45%–49%),^{75,76} and lower for vitamin insufficiency (64% vs 74%)⁷⁷ and obesity (27% vs 40%).⁷³ Furthermore, the pooled prevalence of food insecurity identified in our review is higher than the pooled analysis of World Health Organization (WHO) Study on global AGEing and adult health (SAGE) data (from China, Ghana, India, Mexico, Russia, and South Africa)—39% vs 12%.⁷⁸ The prevalence comparisons must be interpreted with caution given that data for vitamin D insufficiency, sarcopenia, dental caries, and constipation are each based on fewer than 10 studies. Furthermore, only 49% of included articles were rated to be of high quality and with low risk of bias, only 44% of the systematic reviews assessed publication bias, and all of the meta-analyses found high levels of heterogeneity. Notwithstanding, these findings imply the need for more research and evidence synthesis on other nutrition aspects beyond malnutrition, the latter having been the subject of 5 reviews published between 2022 and 2023. Furthermore, these findings suggest that nutritional interventions for older adults in Africa should be multi-component and aimed at the following: promoting food security, healthy diets, healthy body weight, dietary supplementation, micronutrient sufficiency, and oral

health. However, findings from synthesis of implemented interventions (phase 2 of this review) showed that most interventions were only educational and targeted specific diseases (eg, hypertension, diabetes, arthritis), showing a mismatch between local and current evidence on older adults' nutritional needs and intervention development. Furthermore, there are no policy documents on nutrition in older adults in Africa to guide practice.

Intervening through education alone ignores the wider social and environmental determinants of health outcomes and behavior,^{8,79} such as the high prevalence of food insecurity observed in the current review. Furthermore, there is conflicting evidence on the effectiveness of nutrition educational interventions in older adults. A meta-analysis on this topic found that supplementation, environmental, and organizational interventions (to provide and improve food intake) rather than educational interventions were associated with improved nutritional and functional outcomes and prevention of fractures and falls,⁸⁰ while another review found that supplementing nutrition education with other interventions, such as exercise and/or social skills, was associated with improved functional outcomes in older adults.⁸¹ Moreover, a pooled analysis of data in 9 RCTs found that dietary counseling combined with oral nutrition supplements was the most effective intervention for older adults at risk of malnutrition.⁸² Taken together, these findings imply the need for multicomponent interventions that combine various nutritional components (eg, dietary counseling, supplementation) and non-nutritional components, such as exercise. Such interventions should target multiple

Table 5. Description of the 15 Unique Tested Interventions in Phase 2: Review of Nutrition Interventions in Older People in Africa

Study, year of publication, country, study design	Type of intervention	Disease/nutrition area targeted	Intervention description	Intervention delivery approach, intensity, duration, and follow-up period	Setting delivered and personnel delivering
Cappuccio et al, 2006, Ghana, RCT ⁵⁰	Educational	Hypertension	1-h education session using flip charts	- Group sessions - Daily first week of the study and once weekly thereafter	- Community - Community health workers
Charlton et al, 2008, South Africa, RCT ⁵¹	Dietary modification/supplementation	Hypertension	- Brown bread, margarine, stock cubes, soup mixes and aromatic flavor enhancer with modified sodium, potassium, magnesium, and calcium content - A salt replacement (Solo, Low Sodium Sea Salt Company Limited, Kent, UK) and 500 mL of maas (fermented milk commonly eaten)	- Individual intervention daily 8-wk follow-up	- Community - Field workers
Oldewage Theron and Kruger, 2009, South Africa, cohort intervention study ⁵²	Food aid	Nutrition status	Provision of breakfast and lunch meals based on a culturally acceptable meal plan drawn up by the research team	- Group provision of food 5 days weekly 2-y follow-up	- Care center 12 Volunteers
Bhurosy and Jeewon, 2013, Mauritius, RCT ⁵³	Educational	Osteoporosis	2-h session consisting of: - Presentations and discussions - Participants experience sharing - Use of posters/pamphlets - Writing down calcium sources and action points - Demonstration of simple exercises	- Group sessions - Six sessions 2-mo follow-up	- Community - Personnel delivering not reported
van Velden et al, 2015, South Africa, RCT ⁵⁴	Dietary supplementation	Osteoarthritis	7.5-g Supplement containing magnesium hydrogen phosphate 244 mg, calcium citrate 145 mg, potassium bicarbonate 783 mg, magnesium citrate 315 mg, potassium citrate 870 mg, di-calcium-phosphate 2-hydrate 973 mg, organic plant calcium, acerola extract and mannitol, and delivers ~250 mg of elemental calcium	- Individual - Twice-daily intake 56-d follow-up with crossover on day 28	- Community - Physicians
Muchiri et al, 2016 ⁵⁶ Muchiri et al, 2016 ⁵⁷ South Africa, RCT	Educational	Diabetes	- Educational materials (pamphlet and wall/fridge poster) - Educational sessions - Discussions and reflections - Food displays and meal tasting - Meal planning and goal setting - Costing meals - Portion size demonstration and practice - Cooking demonstration and group cooking - Vegetable gardening demonstration - Counseling sessions	Group sessions: 8 weekly 2-2.5-h sessions 4 monthly 1.5-h follow-up sessions 2 bimonthly 1.5-h follow-up sessions - Total 26.5 h contact time per group 12-mo follow-up - Details not reported	- Health facility - Team of 3 dietitians and a horticulture officer
Shalaby et al, 2016, Egypt, quasi-experimental ⁵⁸	Educational	Nutrition status			Not reported
Muchiri et al, 2021, South Africa, RCT ⁶³	Educational	Diabetes	Educational materials (pamphlet and wall/fridge poster) and workbook	Group and individual sessions:	- Health facility 2 Dietitians

(continued)

Table 5. Continued

Study, year of publication, country, study design	Type of intervention	Disease/nutrition area targeted	Intervention description	Intervention delivery approach, intensity, duration, and follow-up period	Setting delivered and personnel delivering
Kandhari et al, 2021, Tanzania, RCT ⁶⁵	Dietary supplementation	Hypertension	- Self-evaluation of laboratory results - Educational sessions - Discussions and reflections - Food displays and meal tasting - Group discussions - Costing meals - Portion-size demonstration and practice - Individual counselling and goal setting - Nitrate-rich beetroot juice and/or folate capsule	7-monthly 2-2.5-h group training sessions 1 Individual 15-30 min counseling and goal-setting session - Bimonthly group follow-up sessions 12-mo follow-up - Individual - Daily intake 60-d follow-up - Individual - Biobran/MGN-3 (supplement) 500 mg/d 3-mo follow-up - Group (population) level 3-y follow-up	- Community - Research team
Elsaid et al, 2021, Egypt, RCT ⁶⁴	Dietary supplementation	Influenza	Natural arabinoxylan rice bran product called Biobran/MGN-3, which is an immunomodulator	- Individual - Biobran/MGN-3 (supplement) 500 mg/d 3-mo follow-up	- Health facility - Health workers
Charlton et al, 2021, South Africa, pre-post impact evaluation ⁶²	Legislation	Hypertension	Legislation for mandatory maximum sodium levels in processed-food categories (eg, bread, cereal, salty snacks, processed meat)	- Group (population) level 3-y follow-up	- Community - Government and industry
Fouad et al, 2022, Egypt, quasi-experimental ⁶⁸	Educational	Nutrition status	Nutrition booklet	- Individual - Duration and intensity not reported	- Community - Personnel not reported
Grobler et al, 2022, South Africa, quasi-experimental ⁶⁷	Dietary supplementation	Cardiovascular disease	Supplement containing > 125% RDA of vitamin B₁₂ (25 µg), vitamin B₆ (50 mg), and folate (400 µg)	- Individual - Daily intake 6-mo follow-up	- Day care center - Fieldworkers
Kuhn et al, 2022, South Africa, RCT ⁶⁶	Dietary supplementation	Cognition	Two 410-g cans of pilchards and 75 g of fish paste	- Individual - Weekly intake 12-wk follow-up	- Retirement center - Research team
Seid and Babbel, 2023, Ethiopia, quasi-experimental ⁷¹	Educational	Nutrition status	- Flyers as a reminder to lead healthy lifestyle - Nutrition counseling	- Individual counseling 45-60-min sessions once per week 2-mo follow-up	- Community 8 Trained nurses
Totals					
Intervention target			Delivery approach		
Hypertension (27%; 4/15)			Individual (57%; 8/14)		
Nutrition status (27%; 4/15)			Group sessions (29%; 4/14)		
Osteoporosis/arthritis (13%; 2/15)			Population level (7%; 1/14)		
Diabetes (13%; 2/15)			Individual and group (7%; 1/14)		
Cardiovascular disease (7%; 1/15)					
Influenza (7%; 1/15)					
Cognition (7%; 1/15)					
			Community (57%; 8/14)		
			Health facility (21%; 3/14)		
			Care/retirement centers (21%; 3/14)		

Abbreviations: RCT, randomized controlled trial; RDA, Recommended Dietary Allowance.

Table 6. Description of Intervention Types, Outcomes Measured, and Conclusions From the 15 Tested Interventions in Phase 2: Review of Nutrition Interventions in Older People in Africa

Study, year of publication, country, study design	Type of intervention and target	Intervention aim	Type of outcome measured	Outcomes measured	Authors' conclusions
Cappuccio et al, 2006, Ghana, RCT ⁵⁰	Educational for hypertension	Prevention	Biomarkers	Urinary sodium excretion and blood pressure levels	Intervention resulted in small reduction in both systolic and diastolic blood pressure but no effect on urinary sodium excretion
Charlton et al, 2008, South Africa, RCT ⁵¹	Dietary modification/supplementation for hypertension	Treatment	Biomarkers	- Resting office blood pressure level (primary) - Average 24-h ambulatory systolic and diastolic blood pressure and awake and asleep blood pressure (secondary)	Intervention lowered blood pressure by a clinically significant magnitude
Oldewage Theron and Kruger, 2009, South Africa, Cohort intervention study ⁵²	Food aid for nutrition status	Prevention	Behavioral	Dietary diversity using dietary diversity scoring, food variety scoring and nutrient adequacy ratios	Intervention effective to improve short-term nutrition through improved the level of dietary diversity
Bhurosy and Jeewon, 2013, Mauritius, RCT ⁵³	Educational for osteoporosis	Prevention	Biomarkers and behavioral	Calcium intake, Health Belief scale scores, knowledge scores, and physical activity level (PAL)	Intervention effective in improving the dietary calcium intake, knowledge, self-efficacy, and PAL
van Velden et al, 2015, South Africa, RCT ⁵⁴	Dietary supplementation for osteoarthritis	Treatment	Patient-important outcome	Clinical signs and symptoms of osteoarthritis, ie, pain, tenderness, and stiffness of interphalangeal and metacarpophalangeal joints of the hand	Intervention efficacious and safe as sole therapeutic intervention, significantly reducing signs and symptoms of the hands
Shalaby et al, 2016, Egypt, quasi-experimental ⁵⁸	Educational for nutrition status	Prevention	Behavioral	Knowledge, attitudes, and dietary practices	Intervention effective in improving knowledge and changing attitudes to leading to improvements in dietary practices
Muchiri et al 2016 ⁵⁶ Muchiri et al 2016 ⁵⁷ South Africa, RCT	Educational for diabetes	Treatment	Biomarkers, intermediate, and behavioral	- HbA1c (primary outcomes) - BMI, blood pressure, blood lipids, changes in diabetes knowledge and the attitudes towards diabetes and its treatment (secondary outcomes)	Intervention not efficacious on HbA1c but improved specific dietary behaviors
Muchiri et al, 2021, South Africa, RCT ⁴³	Educational for diabetes	Treatment	Biomarkers, intermediate, and behavioral	- HbA1c (primary outcomes) - BMI, blood pressure, blood lipids, changes in dietary behaviors, knowledge, and diabetes management self-efficacy (secondary outcomes)	Intervention had limited effects on HbA1c, targeted dietary behaviors and behavior mediators but had positive effects on blood pressure
Kandhari et al, 2021, Tanzania, RCT ⁶⁵	Dietary supplementation for hypertension	Treatment	Biomarkers	- Plasma nitrate and folate concentrations (primary outcomes) - Changes in 24-h ambulatory blood pressure, whole-body nitric oxide production, serum homocysteine, C-reactive protein, nitro-tyrosine and salivary nitrite (secondary outcomes)	Acceptability of the intervention was high; self-reported compliance to the interventions was >90%

(continued)

Table 6. Continued

Study, year of publication, country, study design	Type of intervention and target	Intervention aim	Type of outcome measured	Outcomes measured	Authors' conclusions
Charlton et al, 2021, South Africa, pre-post impact evaluation ⁶²	Legislation for hypertension	Prevention	Biomarkers and behavioral	- Urinary sodium excretion and blood pressure - Salt intake	Intervention significantly reduced overall salt intake by 1.15 g/d
Elsaid et al, 2021, Egypt, RCT ⁶⁴	Dietary supplementation for influenza	Prevention	Patient-important outcome	- Incidence of infection (primary) - Incidence of any clinically reported or laboratory-observed adverse effect (secondary)	Intervention enhanced the innate immune response and reduced influenza incidence
Fouad et al, 2022, Egypt, quasi-experimental ⁶⁸	Educational for nutrition status	Prevention	Intermediate and behavioral	Nutritional status was measured by the Mini-Nutritional Assessment (MNA) and dietary practices	Intervention effective in improving dietary habits and nutritional status
Grobler et al, 2022, South Africa, quasi-experimental ⁶⁷	Dietary supplementation for CVD	Treatment	Biomarkers and behavioral	Serum homocysteine, vitamins B₆ and B₁₂, folate levels, red blood cell count, mean cell volume, hemoglobin, hem-atocrit, and the nutritional intake of vitamin B₆ and B₁₂ and folate	Intervention reduced hyper-homocysteinemia translating to reduction in CVD risk
Kuhn et al, 2022, South Africa, RCT ⁶⁶	Dietary supplementation for cognition	Prevention	Intermediate	Cognition using the Cognitive Abilities Screening Instrument (CASI)	Intervention may improve the cognition of cognitively intact, resource-limited older people.
Seid and Babbel, 2023, Ethiopia, quasi-experimental ⁷¹	Educational for nutrition status	Prevention	Intermediate and behavioral	Nutritional status was measured using a validated Mini Nutritional Assessment tool and dietary practices using the 24-h dietary recall, meal frequency, and dietary diversity score	Intervention could promote perception, diversify dietary consumption, and reduce the risk of undernutrition
Summary					
Intervention aim		Summary of results			
Prevention (60%; 9/15) Treatment (40%; 6/15)		Positive intervention effects (80%; 12/15) Null intervention effects on some outcomes (20%; 3/15)			
Abbreviations: BMI, body mass index; CVD, cardiovascular disease; HbA1c, glycated hemoglobin; RCT, randomized controlled trial.					

Table 7. Design and Reporting of the 15 Interventions in Phase 2: Review of Nutrition Interventions in Older People in Africa

Study, year of publication, country, study design	Systematic review cited for RCTs	Local evidence cited	Behavioral theory used	Community/patient engagement reported	MCID used or reported	Reporting guideline used
Cappuccio et al, 2006, Ghana, RCT ⁵⁰	No	Yes	No	Yes	No	No
Charlton et al 2008, South Africa, RCT ⁵¹	No	No	NA	No	No	No
Oldewage Theron and Kruger, 2009, South Africa, cohort intervention study ⁵²	NA	Yes	Yes	Yes	Partially	No
Bhurosy and Jeewon, 2013, Mauritius, RCT ⁵³	Yes	No	Yes	No	No	No
van Velden et al, 2015, South Africa, RCT ⁵⁴	No	No	No	No	No	No
Shalaby et al, 2016, Egypt, quasi-experimental ⁵⁸	NA	No	Yes	No	No	Yes
Muchiri et al 2016 ⁵⁶	Partially	No	Yes	Yes	No	No
Muchiri et al 2016 ⁵⁷						
South Africa, RCT						
Muchiri et al, 2021, South Africa, RCT ⁶³	Yes	No	Yes	Yes	No	No
Charlton et al, 2021, South Africa, pre-post impact evaluation ⁶²	NA	No	NA	No	No	No
Elsaid et al, 2021, Egypt, RCT ⁶⁴	No	Yes	NA	No	Partially	No
Kandhari et al, 2021, Tanzania, RCT ⁶⁵	Yes	No	NA	No	No	Partially
Fouad et al, 2022, Egypt, Quasi-experimental ⁶⁸	NA	No	No	No	No	No
Grobler et al, 2022, South Africa, Quasi-experimental ⁶⁷	NA	No	NA	No	No	No
Kuhn et al, 2022, South Africa, RCT ⁶⁶	No	No	NA	No	Yes	No
Seid and Babbel, 2023, Ethiopia, Quasi-experiment ⁷¹	NA	No	No	No	No	NA
Total	No (56%; 5/9) Partially (11%; 1/9) Yes (33%; 3/9)	No (80%; 12/15) Yes (20%; 3/15)	No (44%; 4/9) Yes (56%; 5/9)	No (73%; 11/15) Yes (27%; 4/15)	No (80%; 12/15) Partially (13%; 2/15) Yes (7%; 1/15)	No (87%; 13/15) Partially (7%; 1/15) Yes (7%; 1/15)

Abbreviations: MCID, minimal clinically important difference; NA, not applicable; RCT, randomized controlled trial.

Table 8. Process Evaluation Themes of 5 Interventions in Phase 2: Review of Nutrition Interventions in Older People in Africa

Study, publication year, country	Intervention description and data-collection methods	What worked well?	What did not work well?	Recommendations
Muchiri et al, 2016, ⁵⁵ South Africa	- Nutrition education for diabetes patients including the provision of education materials, demonstrations, and education sessions - Self-administered, open-ended questionnaire and 5 focus-group discussions	- Participants enjoyed perceived benefits, and satisfied with its content and delivery - Education materials (wall or fridge poster, pamphlet) useful reminder for positive behavior for whole family - Facilitators respectful approach - Reimbursement of transport cost for meetings	—	- Education materials should both be available in both English and the local language - Open education sessions to family members - Repeat all or some topics that were taught
Lloyd-Sherlock et al, 2018, ⁵⁹ South Africa	- Provision of monthly low-sodium salt at pension delivery points and education about hypertension, blood pressure measurement, referral to primary care services 2 Focus-group discussions	- High retention and continued engagement with intervention - Fast delivery: intervention delivered at pension points meant no need to queue for long hours like in health center - Stakeholders in support of intervention and open to working together - Translated guidelines were understood by the majority	- Participants could not find or afford fresh fruits and vegetables despite knowledge on their health benefits - Ethical concerns on sustainability of the intervention leading to withdrawal of provision of free low-sodium salt	Work with local businesses to supply affordable low-sodium salt
Napier et al, 2018 ⁶¹ Napier et al, 2021 ⁶⁰ South Africa	- Food-based dietary guidelines for the elderly in South Africa - Literature review, stakeholder discussions, expert panel input, and focus-group discussions	- Participants enjoyed the intervention, gained knowledge and skills, and perceived benefits - Participants satisfied with education materials, meeting and education session frequency and length	English guidelines were only understood by English-speaking participants	- Guidelines should be available in all South African official languages - Strategy for implementation and evaluation of guidelines should be developed - Guidelines should be used in the Integrated Nutrition Programme and form basis for nutrition education for elderly in South Africa - Peer trainers for future interventions - Reinforce information through revised content - Family members to join some sessions - Incorporate more medical content in sessions
Muchiri et al, 2023, ⁶⁹ South Africa	- Adapted nutrition for diabetes patients including the provision of education materials, demonstrations, and education sessions 5 Focus-group discussions	- Participants enjoyed the intervention, gained knowledge and skills, and perceived benefits - Participants satisfied with education materials, meeting and education session frequency and length	Diabetes medication not addressed in education sessions	Extending the intervention to all South African demographics to alleviate food insecurity in older adults
Nkurunziza et al, 2023, ⁷⁰ South Africa	- Meals on Wheels Community Service (MOWCS) provides readymade home meal deliveries for older people 10 Semi-structured interviews and 1 focus-group discussion	- Access to inexpensive, healthy, and balanced meals that were well prepared and tasteful - Good service from trained chefs and cooks	- Taste was bland for some participants - Financial and operation challenges, eg, short staffing and lack of kitchen and service delivery equipment - Only social service operating in a vast area - Relies on volunteers whose service can be unreliable - Inability to expand intervention to wider community as it served mainly White women	

Recommendations

- Nutritional intervention development informed by local and current evidence on older adults' nutritional needs
- Develop multicomponent interventions that combine various nutritional components (eg, dietary counseling, supplementation) and non-nutritional components such as exercise
- Interventions evaluated using patient-centered outcomes
- Consider delivery of intervention through using peers rather than health workers, where appropriate
- Pay attention to intervention design, development process, and reporting to ensure effectiveness, uptake, replicability, and reduced research waste.
- Development of policy documents for nutrition in older adults
- More nutrition research on older adults outside of South Africa and beyond malnutrition

nutritional needs of older adults rather than specific health conditions, providing a more comprehensive and holistic intervention for older adults who seldom have just 1 isolated health condition.

With regard to intervention delivery, this review found that most interventions were delivered using an individual approach. While individual delivery approaches are justified for some interventions, such as food aid or supplementation, incorporation of group delivery may be ideal for educational interventions, or for changing cooking habits for a household. In the current review, half of the educational interventions were delivered through group sessions, with one using both group and individual approaches. Such a combined delivery allows for multicomponent interventions and leverages the benefits of an individual approach, such as personal goal setting,^{83,84} while group sessions allow for older people to learn from and support each other and form social bonds, among other benefits.^{8,85} Delivery of multicomponent interventions with group and individual sessions may be costly, financially and in terms of human resources, and could be made more efficient through using peers, rather than health workers, as stated in one of the recommendations arising from a process evaluation.⁶⁹

Finally, and unfortunately, only a few interventions included in this review were evaluated using patient-centered outcomes, supported by relevant systematic review or local evidence, including patient and community engagement, and used a relevant reporting structure, while almost half of behavioral interventions used a relevant theory. These findings are consistent with those of a recent global review on group-based nutritional interventions in older adults, which found that most reported interventions had a high or unclear risk of bias and were not informed by a behavioral theory.⁸⁵ Reference to systematic review evidence by RCTs provides a scientific and ethical justification for the intervention,³³ while citation of relevant local evidence ensures contextual relevance, maximizing

potential future scalability¹⁴—with both reducing research waste. Use of patient-centered outcomes³¹ and minimal clinically important differences³⁴ ensure that interventions are beneficial to users, while utilizing behavioral theories and standardized reporting guidelines, such as the Template for Intervention Description and Replication (TIDieR)⁸⁶ and CONSORT (Consolidated Standards of Reporting Trials),⁸⁷ enable study replication and standardization.^{84,85, 88} Participant and community engagement and involvement in research have multiple benefits, including improving the contextual relevance of research questions and study design, increasing participant recruitment and research impact.^{13, 89–91} Therefore, it is important that all stakeholders, including researchers, funders, journal editors, and peer reviewers, pay attention to intervention outcomes, design, development process, and reporting to ensure effectiveness, uptake, replicability, and reduced research waste.

The strength of this review lies in its comprehensive synthesis of all available evidence on nutrition (and related concepts, such as oral health and sarcopenia) in older adults in Africa, including evaluated interventions. However, the diversity in the African continent and the low numbers of studies included in some reviews (phase 1) and only 6 countries represented in the evaluated interventions (phase 2) limit the generalizability of findings to the African region. In particular, for phase 2, there was low representation from low-income and lower-middle-income countries based on the World Bank income categories.³⁵ Further, some prevalences, such as sarcopenia, may have been underestimated, given that there is no validated African definition.

CONCLUSION

There is a high prevalence of malnutrition, sarcopenia, obesity, constipation, food insecurity, dental caries, and vitamin D insufficiency among older adults in Africa.

Of the few nutritional interventions researched in this population, most have been educational, from South Africa, evaluated using RCTs, targeted individual diseases (eg, hypertension, diabetes, arthritis), and delivered using an individual approach in community settings. Few intervention studies have been optimally developed and reported. Future nutritional interventions in older people in Africa should be multicomponent, combining various nutritional components (eg, dietary counseling, supplementation) and non-nutritional components such as exercise to target the multiple nutritional and functional needs of older adults and ideally delivered using individual- and group-based approaches. The development of these interventions should be evidence-based and include older people and communities in the design and conduct of the research, with results reported following standardized reporting guidelines. Finally, there is a need for nutrition research on older adults beyond South Africa and beyond addressing malnutrition.

Acknowledgments

The authors thank the systematic reviewers at the Musculoskeletal Research Unit, Bristol Medical School, Jane Dennis and Andrew Beswick, for their help in the development of the search strategy.

Author Contributions. Conceptualization: A.M.M., C.L.G.; funding acquisition: C.L.G.; investigation: A.M.M., T.M., S.N., K.M.; methodology; all authors; writing—original draft: A.M.M.; writing—review and editing: all authors.

Supplementary Material

Supplementary Material is available at *Nutrition Reviews* online.

Funding. This work was supported by the National Institute for Health Research (NIHR) (using the UK's Official Development Assistance [ODA] Funding). C.L.G., A.M.M., T.M., R.C., and G.M.E.P. are funded via NIHR 302394. The views expressed are those of the authors and not necessarily those of the NIHR or the Department of Health and Social Care. For the purpose of Open Access, the author has applied a CC-BY public copyright license to any author accepted manuscript version arising from this submission. The funders have no role in study design, data collection, and analysis; the decision to publish; or the preparation of the manuscript.

Conflicts of Interest

None declared.

Data Availability

All data is provided in the results or [supplementary material](#).

REFERENCES

1. He W, Aboderin I, Adjaye-Gbewonyo D. Africa aging 2020. International Population Reports. 2020. Accessed March 20, 2024. https://www.census.gov/content/dam/Census/library/publications/2020/demo/p95_20-1.pdf
2. United Nations Department of Economic and Social Affairs, Population Division. World population ageing. 2017. Accessed September 27, 2024. https://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017_Report.pdf
3. The Lancet Public Health. Ageing: a 21st century public health challenge? *Lancet Public Health*. 2017;2:E297. [https://doi.org/10.1016/s2468-2667\(17\)30125-1](https://doi.org/10.1016/s2468-2667(17)30125-1)
4. World Health Organization. UN decade of healthy ageing: plan of action, 2021–2030. World Health Organization; 2020. Accessed June 27, 2025. <https://www.who.int/publications/m/item/decade-of-healthy-ageing-plan-of-action>
5. Naidoo S, Otoo S, Naidoo N. Physical activity interventions implemented for older people in sub-Saharan Africa: a scoping review. *BMJ Open*. 2024;14:e079503. <https://doi.org/10.1136/bmjopen-2023-079503>
6. Abud T, Kounidas G, Martin KR, Werth M, Cooper K, Myint PK. Determinants of healthy ageing: a systematic review of contemporary literature. *Aging Clin Exp Res*. 2022;34:1215–1223. <https://doi.org/10.1007/s40520-021-02049-w>
7. Kalache A, de Hoogh AI, Howlett SE, et al. Nutrition interventions for healthy ageing across the lifespan: a conference report. *Eur J Nutr*. 2019;58:1–11. <https://doi.org/10.1007/s00394-019-02027-z>
8. Owusu-Addo E, Ofori-Asenso R, Batchelor F, Mahtani K, Brijnath B. Effective implementation approaches for healthy ageing interventions for older people: a rapid review. *Arch Gerontol Geriatr*. 2021;92:104263. <https://doi.org/10.1016/j.archger.2020.104263>
9. Kieffe-de Jong JC, Mathers JC, Franco OH. Nutrition and healthy ageing: the key ingredients. *Proc Nutr Soc*. 2014;73:249–259. <https://doi.org/10.1017/S0029665113003881>
10. GBD 2017 Diet Collaborators. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2019;393:1958–1972. [https://doi.org/10.1016/s0140-6736\(19\)30041-8](https://doi.org/10.1016/s0140-6736(19)30041-8)
11. Gielen E, Beckwée D, Delaere A, et al. Sarcopenia Guidelines Development Group of the Belgian Society of Gerontology and Geriatrics (BSGG). Nutritional interventions to improve muscle mass, muscle strength, and physical performance in older people: an umbrella review of systematic reviews and meta-analyses. *Nutr Rev*. 2021;79:121–147. <https://doi.org/10.1093/nutrit/nuaa011>
12. Clegg ME, Williams EA. Optimizing nutrition in older people. *Maturitas*. 2018;112:34–38. <https://doi.org/10.1016/j.maturitas.2018.04.001>
13. Castro PD, Reynolds CME, Kennelly S, et al. An investigation of community-dwelling older adults' opinions about their nutritional needs and risk of malnutrition; a scoping review. *Clin Nutr*. 2021;40:2936–2945. <https://doi.org/10.1016/j.clnu.2020.12.024>
14. Wight D, Wimbush E, Jepson R, Doi L. Six steps in quality intervention development (6SQulD). *J Epidemiol Community Health*. 2016;70:520–525. <https://doi.org/10.1136/jech-2015-205952>
15. Ezezika O, Gong J, Abdirahman H, Sellen D. Barriers and facilitators to the implementation of large-scale nutrition interventions in Africa: a scoping review. *Glob Implement Res Appl*. 2021;1:38–52. <https://doi.org/10.1007/s43477-021-00007-2>
16. Charlton KE, Rose D. Nutrition among older adults in Africa: the situation at the beginning of the millennium. *J Nutr*. 2001;131:2424s–2428s. <https://doi.org/10.1093/jn/131.9.2424s>
17. Ewunie TM, Hareru HE, Dejene TM, Abate SM. Malnutrition among the aged population in Africa: a systematic review, meta-analysis, and meta-regression of studies over the past 20 years. *PloS One*. 2022;17:E0278904.
18. Seid AM, Fentahun N. Prevalence of malnutrition among old people in Africa: systematic review and meta-analysis. *BMJ Open*. 2022;12:E065197.
19. Obeng P, Kyereh HK, Sarfo JO, Ansah EW, Attafuah PYA. Nutritional status and associated factors of older persons in sub-Saharan Africa: a scoping review. *BMC Geriatr*. 2022;22:416. <https://doi.org/10.1186/s12877-022-03062-y>
20. Saha S, Behnke A, Oldewage-Theron W, Muhtasim N, Miller M. Prevalence and factors associated with food insecurity among older adults in sub-Saharan Africa: a systematic review. *J Nutr Gerontol Geriatr*. 2021;40:171–196. <https://doi.org/10.1080/21551197.2021.1988027>

21. Manyara AM, Manyanga T, Chingono R, et al. Types, design, implementation, and evaluation of nutrition interventions in older people in Africa. *OSF*. 2024. Accessed June 27, 2025. <https://doi.org/10.17605/OSF.IO/FH74T>
22. Manyara A, Manyanga T, Chingono R, et al. Types, design, implementation, and evaluation of nutrition interventions in older people in Africa: a scoping review protocol. *PLoS One*. 2024;19:E0313036.
23. Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169:467-473.
24. Cao X, Hou Y, Zhang X, et al. A comparative, correlate analysis and projection of global and regional life expectancy, healthy life expectancy, and their GAP: 1995-2025. *J Glob Health*. 2020;10:020407. <https://doi.org/10.7189/jogh.10.020407>
25. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Syst Rev*. 2016;5:210-210.
26. Manyara AM, Davies P, Stewart D, et al. Scoping and targeted reviews to support development of SPIRIT and CONSORT extensions for randomised controlled trials with surrogate primary endpoints: protocol. *BMJ Open*. 2022;12:E062798.
27. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3:77-101. <https://doi.org/10.1191/1478088706qp0630a>
28. R Development Core Team. R: a language and environment for statistical computing. R Foundation for Statistical Computing; 2010.
29. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: policy and environmental approaches. *Annu Rev Public Health*. 2008;29:253-272. <https://doi.org/10.1146/annurev.publhealth.29.020907.090926>
30. Ayorinde AA, Williams I, Mannion R, et al. Assessment of publication bias and outcome reporting bias in systematic reviews of health services and delivery research: a meta-epidemiological study. *PLoS One*. 2020;15:E0227580. <https://doi.org/10.1371/journal.pone.0227580>
31. Kersting C, Kneer M, Barzel A. Patient-relevant outcomes: what are we talking about? A scoping review to improve conceptual clarity. *BMC Health Serv Res*. 2020;20:596. <https://doi.org/10.1186/s12913-020-05442-9>
32. Ciani O, Manyara AM, Davies P, et al. A framework for the definition and interpretation of the use of surrogate endpoints in interventional trials. *eClinicalMedicine*. 2023;65:102283. <https://doi.org/10.1016/j.eclim.2023.102283>
33. Clarke M, Hopewell S, Chalmers I. Clinical trials should begin and end with systematic reviews of relevant evidence: 12 years and waiting. *Lancet*. 2010;376:20-21. [https://doi.org/10.1016/S0140-6736\(10\)61045-8](https://doi.org/10.1016/S0140-6736(10)61045-8)
34. McGlothlin AE, Lewis RJ. Minimal clinically important difference: defining what really matters to patients. *JAMA*. 2014;312:1342-1343. <https://doi.org/10.1001/jama.2014.13128>
35. World Bank. World Bank income groups. Accessed November 12, 2024. <https://ourworldindata.org/grapher/world-bank-income-groups?region=Africa>
36. Yene BVM, Lee SY, Park KS, Kang YJ, Seo SH, Yoo JI. Prevalence of sarcopenia in Africa: a systematic review. *Clin Interv Aging*. 2023;18:1021-1035. <https://doi.org/10.2147/cia.S407917>
37. Salari N, Ghasemianrad M, Ammari-Allahyari M, Rasoulpoor S, Shohaimi S, Mohammadi M. Global prevalence of constipation in older adults: a systematic review and meta-analysis. *Wiener Klinische Wochenschrift*. 2023;135:389-398. <https://doi.org/10.1007/s00508-023-02156-w>
38. Adeboye D, Ige-Elegbede JO, Ezejimofor M, et al. Estimating the prevalence of overweight and obesity in Nigeria in 2020: a systematic review and meta-analysis. *Ann Med*. 2021;53:495-507.
39. Coomson JB, Aryeetey R. Scoping review of diet-related health outcomes and associated risk factors in Ghana. *Afr J Food Agric Nutr Dev*. 2022;22:19496-19524.
40. Micklesfield LK, Kolkenbeck-Ruh A, Mukoma G, et al. The Healthy Aging Adult South Africa report card: a systematic review of the evidence between 2013 and 2020 for middle-aged South African men and women. *Cardiovasc J Afr*. 2022;33:200-219. <https://doi.org/10.5830/cvja-2022-015>
41. Jamshidi-Naeini Y, Moyo G, Napier C, Oldewage-Theron W. Food and beverages undermining elderly health: three food-based dietary guidelines to avoid or delay chronic diseases of lifestyle among the elderly in South Africa. *S Afr J Clin Nutr*. 2021;34:S27-S40. <https://doi.org/10.1080/16070658.2021.1947039>
42. Kimokoti RW, Hamer DH. Nutrition, health, and aging in sub-Saharan Africa. *Nutr Rev*. 2008;66:611-623. <https://doi.org/10.1111/j.1753-4887.2008.00113.x>
43. Kyomuhendo C, Adeola R. Green and grey: nutritional lifestyle and healthful ageing in rural and urban areas of three sub-Saharan African countries. *Bus Strat Dev*. 2021;4:22-33. <https://doi.org/10.1002/bsd2.153>
44. Mezgebu GS, Petros L, Alemayew E, Abebaw G, Feleke FW. Magnitude of under-nutrition and its association with dietary diversity among older persons in Ethiopia: a systematic review and meta-analysis. *J Nutr Sci*. 2023;12:E102.
45. Yisak H, Zemene MA, Arage G, et al. Undernutrition and associated factors among older adults in Ethiopia: systematic review and meta-analysis. *BMJ Open*. 2023;13:E062845.
46. Shahrin FIM, Omar N, Daud ZAM, Zakaria NF. Factors associated with food choices among elderly: a scoping review. *Malays J Nutr*. 2019;25:185. Accessed June 17, 2025. <https://doi.org/10.31246/mjn-2018-0133>
47. Lokuruka MN. Role of zinc in human health with reference to African elderly: a review. *Afr J Food Agric Nutr Dev*. 2012;12:6646-6664.
48. Seid AM, Babbel NF. Ethiopian aging policy: a review of existing frameworks in relation to the Madrid International Plan of Action on Aging. *Public Health Pract*. 2023;6:100432.
49. Aryeetey R, Coomson J. A rapid review of key policies and programs linked with nutrition and health in Ghana. *Afr J Food Agric Nutr Dev*. 2022;22:19727-19777.
50. Cappuccio FP, Kerry SM, Micah FB, Plange-Rhule J, Eastwood JB. A community programme to reduce salt intake and blood pressure in Ghana. *BMC Public Health*. 2006;6:13.
51. Charlton KE, Steyn K, Levitt NS, et al. A food-based dietary strategy lowers blood pressure in a low socio-economic setting: a randomised study in South Africa. *Public Health Nutr*. 2008;11:1397-1406.
52. Oldewage-Theron WH, Kruger R. Impact of food aid on food variety and dietary diversity of an elderly community in Sharpeville, South Africa. *J Nutr Health Aging*. 2009;13:300-308.
53. Bhurosy T, Jeewon R. Effectiveness of a theory-driven nutritional education program in improving calcium intake among older Mauritian adults. *Sci World J*. 2013;2013:750128.
54. van Velden DP, Reuter H, Kidd M, Muller FO. Non-allopathic adjuvant management of osteoarthritis by alkalisation of the diet. *Afr J Prim Health Care Fam Med*. 2015;7:21.
55. Muchiri JW, Gericke GG, Rheeder P. Subjects' experiences of a nutrition education programme: a qualitative study of adults with type 2 diabetes mellitus living in a rural resource-limited setting in South Africa. *S Afr J Clin Nutr*. 2016;29:83-89.
56. Muchiri JW, Gericke GG, Rheeder P. Impact of nutrition education on diabetes knowledge and attitudes of adults with type 2 diabetes living in a resource-limited setting in South Africa: a randomised controlled trial. *J Endocrinol Metab Diabetes S Afr*. 2016;21:26-34.
57. Muchiri JW, Gericke GG, Rheeder P. Effect of a nutrition education programme on clinical status and dietary behaviours of adults with type 2 diabetes in a resource-limited setting in South Africa: a randomised controlled trial. *Public Health Nutr*. 2016;19:142-155.
58. Shalaby SI, Awad MM, El Dean HN, Mohamed RA, Gupta N, Kumar R. Impact of nutritional health educational program 'on elderly persons' nutritional knowledge, attitude and practice. *Res J Pharm Biol Chem Sci*. 2016;7:460-476.
59. Lloyd-Sherlock P, Gomez-Olive FX, Ngobeni S, Wagner RG, Tollman S. Pensions and low sodium salt: a qualitative evaluation of a new strategy for managing hypertension in rural South Africa. *Curr Aging Sci*. 2019;11:140-146.
60. Napier C, Grobbelaar H, Oldewage-Theron W. An introduction to the food-based dietary guidelines for the elderly in South Africa. *S Afr J Clin Nutr*. 2021;34:S1-S8.
61. Napier CE, Oldewage-Theron WH, Grobbelaar HH. Testing of developed food based dietary guidelines for the elderly in South Africa. *S Afr J Clin Nutr*. 2018;31:55-61.
62. Charlton KE, Corso B, Ware L, et al. Effect of South Africa's interim mandatory salt reduction programme on urinary sodium excretion and blood pressure. *Prev Med Rep*. 2021;23:101469. <https://doi.org/10.1016/j.pmedr.2021.101469>
63. Muchiri JW, Gericke GG, Rheeder P. Effectiveness of an adapted diabetes nutrition education program on clinical status, dietary behaviors and behavior mediators in adults with type 2 diabetes: a randomized controlled trial. *J Diabetes Metab Disord*. 2021;20:293-306.
64. Elsaid AF, Agrawal S, Agrawal A, Ghoneum M. Dietary supplementation with biobran/MGN-3 increases innate resistance and reduces the incidence of influenza-like illnesses in elderly subjects: a randomized, double-blind, placebo-controlled pilot clinical trial. *Nutrients*. 2021;13:4133.
65. Kandhari N, Prabhakar M, Shannon O, et al. Feasibility and acceptability of a nutritional intervention testing the effects of nitrate-rich beetroot juice and folic acid on blood pressure in Tanzanian adults with elevated blood pressure. *Int J Food Sci Nutr*. 2021;72:195-207.
66. Kuhn L, Wenhold F, MacIntyre U, Kotze C, Becker P. Fish supplementation and cognition in resource limited elderly: a randomised controlled trial. *S Afr J Clin Nutr*. 2021;34:40.
67. Grobler CJ, Oldewage-Theron WH, Chalwe JM. The effect of vitamins B12, B6 and folate supplementation on homocysteine metabolism in a low-income, urbanised, Black elderly community in South Africa. *S Afr J Clin Nutr*. 2022;35:162-167.
68. Fouad AA, Abd Allah ES, Hussien AG, Mohamed RA. Effect of a nutritional education program on dietary habits and nutritional status among elderly. *NeuroQuantology*. 2022;20:4461-4475.
69. Muchiri JW, Gericke GG, Rheeder P. Adults living with type 2 diabetes experiences of a randomised adapted diabetes nutrition education programme: a qualitative process evaluation. *S Afr J Clin Nutr*. 2023;37:77-83.
70. Nkurunziza M, McHiza ZJ, Zembe Y. Meals on wheels: promoting food and nutrition security among older persons in Cape Town, South Africa. *Int J Environ Res Public Health*. 2023;20:31.
71. Seid AM, Babbel NF. Behavioral model-guided nutritional counseling could improve the dietary practice and nutritional status of elders in Ethiopia: a quasi-experimental study. *BMC Geriatr*. 2023;23:757.
72. Almohaisen N, Gittins M, Todd C, et al. Prevalence of undernutrition, frailty and sarcopenia in community-dwelling people aged 50 years and above: systematic review and meta-analysis. *Nutrients*. 2022;14:1537.

73. Liu C, Wong PY, Chung YL, et al. Deciphering the “obesity paradox” in the elderly: a systematic review and meta-analysis of sarcopenic obesity. *Obes Rev*. 2023;24:E13534. <https://doi.org/10.1111/obr.13534>
74. Petermann-Rocha F, Balntzi V, Gray SR, et al. Global prevalence of sarcopenia and severe sarcopenia: a systematic review and meta-analysis. *J Cachexia Sarcopenia Muscle*. 2022;13:86-99. <https://doi.org/10.1002/jcsm.12783>
75. Chan AKY, Tamrakar M, Jiang CM, Lo ECM, Leung KCM, Chu CH. A systematic review on caries status of older adults. *Int J Environ Res Public Health*. 2021;18:10662. <https://doi.org/10.3390/ijerph182010662>
76. Borg-Bartolo R, Rocuzzo A, Molinero-Mourelle P, et al. Global prevalence of edentulism and dental caries in middle-aged and elderly persons: a systematic review and meta-analysis. *J Dent*. 2022;127:104335. <https://doi.org/10.1016/j.jdent.2022.104335>
77. Cui A, Zhang T, Xiao P, Fan Z, Wang H, Zhuang Y. Global and regional prevalence of vitamin D deficiency in population-based studies from 2000 to 2022: a pooled analysis of 7.9 million participants. *Front Nutr*. 2023;10:1070808. <https://doi.org/10.3389/fnut.2023.1070808>
78. Smith L, Il Shin J, McDermott D, et al. Association between food insecurity and depression among older adults from low- and middle-income countries. *Depress Anxiety*. 2021;38:439-446. <https://doi.org/10.1002/da.23147>
79. Manyara AM, Mwaniki E, Gill JMR, Gray CM. Knowledge, perceptions and practices towards diabetes risk in sub-Saharan Africa: a mixed-methods scoping review. *Public Health Nutr*. 2024;27:E104. <https://doi.org/10.1017/S1368980024000752>
80. Poscia A, Milovanovic S, La Milia DI, et al. Effectiveness of nutritional interventions addressed to elderly persons: umbrella systematic review with meta-analysis. *Eur J Public Health*. 2018;28:275-283. <https://doi.org/10.1093/eurpub/ckx199>
81. Khor PY, Vearing RM, Charlton KE. The effectiveness of nutrition interventions in improving frailty and its associated constructs related to malnutrition and functional decline among community-dwelling older adults: a systematic review. *J Hum Nutr Diet*. 2022;35:566-582. <https://doi.org/10.1111/jhn.12943>
82. Reinders I, Volkert D, de Groot L, et al. Effectiveness of nutritional interventions in older adults at risk of malnutrition across different health care settings: pooled analyses of individual participant data from nine randomized controlled trials. *Clin Nutr*. 2019;38:1797-1806. <https://doi.org/10.1016/j.clnu.2018.07.023>
83. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implement Sci*. 2012;7:37. <https://doi.org/10.1186/1748-5908-7-37>
84. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci*. 2011;6:42. <https://doi.org/10.1186/1748-5908-6-42>
85. Teggart K, Ganann R, Sihota D, et al. Group-based nutrition interventions to promote healthy eating and mobility in community-dwelling older adults: a systematic review. *Public Health Nutr*. 2022;25:1-32. <https://doi.org/10.1017/S136898002200115X>
86. Hoffmann TC, Glasziou PP, Boutron I, et al. Better reporting of interventions: Template for Intervention Description and Replication (TIDieR) checklist and guide. *BMJ*. 2014;348:G1687.
87. Schulz KF, Altman DG, Moher D. CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. *J Pharmacol Pharmacother*. 2010;1:100-107.
88. Glasziou P, Altman DG, Bossuyt P, et al. Reducing waste from incomplete or unusable reports of biomedical research. *Lancet*. 2014;383:267-276.
89. South A, Hanley B, Gafos M, et al. Models and impact of patient and public involvement in studies carried out by the Medical Research Council Clinical Trials Unit at University College London: findings from ten case studies. *Trials*. 2016;17:376. <https://doi.org/10.1186/s13063-016-1488-9>
90. Price A, Albarqouni L, Kirkpatrick J, et al. Patient and public involvement in the design of clinical trials: an overview of systematic reviews. *J Eval Clin Pract*. 2018;24:240-253. <https://doi.org/10.1111/jep.12805>
91. Crocker JC, Ricci-Caballo I, Parker A, et al. Impact of patient and public involvement on enrolment and retention in clinical trials: systematic review and meta-analysis. *BMJ*. 2018;363:K4738. <https://doi.org/10.1136/bmj.k4738>

© The Author(s) 2025. Published by Oxford University Press on behalf of the International Life Sciences Institute.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited.

Nutrition Reviews, 2025, 00, 1–19

<https://doi.org/10.1093/nutrit/nuaf109>

Scoping Review