

## Nutrition, health, and aging in sub-Saharan Africa

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*The proportion of the population that is  $\geq 60$  years of age in sub-Saharan Africa (SSA) is increasing rapidly and is likely to constrain healthcare systems in the future. Nevertheless, the elderly are not a health policy priority for African countries. This paper reviews the nutritional and health status of older adults in SSA and their determinants. Literature was abstracted through the Medline, Google Scholar, and Dogpile databases using the following search terms: sub-Saharan Africa, older adults, nutrition, health. Findings showed that up to half (6–48%) of elderly Africans in SSA are underweight and almost a quarter (2.5–21%) are overweight, while 56% of older South Africans are obese. Low-quality diets contribute to poor nutritional status. Poverty, HIV/AIDS, and complex humanitarian emergencies are major determinants of undernutrition. Effective interventions need to consider socioeconomic, health, and demographic factors; social pensions may be the most cost-effective option for improving the health and nutritional status of the elderly in SSA.*

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### INTRODUCTION

Despite the human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) epidemic, which has reduced life expectancy by more than 30 years in some parts of Africa, population aging is rising on the continent. Between 2000 and 2025, the percentage rise of the elderly population (60 years and older) will be the greatest of any region globally, with an expected increase of 149% (41–102 million). In sub-Saharan Africa (SSA), the older population is projected to increase fourfold from 36.6 million to 141 million (5–10%) between 2005 and 2050. Similar to other developing countries, the majority (over 60%) of these individuals will be living in rural areas and elderly women will outnumber men by virtue of their longer lifespan.<sup>1–8</sup>

Older adults tend to have a higher disease burden; hence, they are likely to constrain healthcare systems in the future.<sup>9,10</sup> Moreover, their significant contribution to

family welfare and income, compounded in SSA by their unique role as caregivers of their AIDS-stricken children and orphaned grandchildren, warrants greater focus on the welfare of the elderly.<sup>3,5–7,11–13</sup>

The changes in aging are attributable to a demographic transition, defined as the shift from high to low fertility and mortality levels.<sup>9,14</sup> In the case of SSA, however, high mortality due to HIV/AIDS is contributing to a change in population structure, so there are more elderly individuals and fewer young adults.<sup>3,8</sup> The demographic transition has been accompanied by an epidemiologic transition (a shift from infectious diseases and undernutrition to chronic and degenerative diseases as major causes of mortality), which is being aggravated by a nutrition transition (a shift to diets high in fat, sugar, and refined grains, as well as greater tobacco use and sedentary behavior).<sup>9,14–17</sup> As a result, most countries are experiencing a double burden of infectious and non-communicable diseases.<sup>1,18</sup> Dietary changes are

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*Key words:* elderly, HIV/AIDS, nutrition, pension, sub-Saharan Africa

doi:10.1111/j.1753-4887.2008.00113.x

*Nutrition Reviews*® Vol. 66(11):611–623

promoting overweight and obesity; however, undernutrition still predominates.<sup>4,15,16,18–20</sup> In the older population, key determinants of undernutrition include poverty, declining family support systems, food insecurity, drought and famine, war, poor health services, and the indirect impact of HIV/AIDS.<sup>6,7,12,13,21</sup> HIV/AIDS, in particular, has had a very negative impact on the elderly. Although a small proportion (6%) of older adults have HIV infection,<sup>9</sup> most have become caregivers of their sick children, as well as their orphaned grandchildren, some of whom may be HIV-positive. Almost two-thirds (63%) of all persons infected with HIV live in SSA, and 72% of global AIDS deaths occur in this region.<sup>22</sup>

The elderly are not a priority in the health and nutrition programs of countries in SSA, which primarily target children (<5 y), women (pregnant and lactating), and people living with HIV/AIDS (PLWHA).<sup>6,7,13,23</sup> Likewise, many countries lack support mechanisms such as formal social protection for this population.<sup>2,5,11,24,25</sup> The nutritional and health status of older adults in SSA and their determinants will be described in this paper. Interventions appropriate for improving the health and nutritional status of the elderly will also be discussed.

### NUTRITIONAL STATUS OF OLDER ADULTS IN SSA

Data on the nutritional status of elderly Africans are scarce owing to competing interests and the low priority of this population on governmental agendas. Older adults are viewed as contributing little to society and hence considered a drain on a country's resources.<sup>3,7,26</sup> HelpAge

International (HAI) in collaboration with the London School of Hygiene and Tropical Medicine (LSHTM) has done some preliminary studies in Benin, Botswana, Cameroon, Ethiopia, Ghana, Kenya, Malawi, Mozambique, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, and Uganda, which have provided most (~95%) of the available data on the elderly in Africa.<sup>13</sup> Karen Charlton, of the University of Cape Town, has done more extensive work, but this has been largely limited to South Africa.<sup>17,21,23,27–31</sup> All of these studies have been cross-sectional and not nationally representative nor standardized; thus, their generalizability is limited. The age criterion for defining older adults has also been inconsistent, varying from 45 years to 60 years (Tables 1–3), which likewise affects interpretation of results. The challenge of defining an older person in Africa, where social standing as a whole and functional age in rural regions may be better markers than chronological age, may explain the inconsistency.<sup>7,8,32</sup> Additionally, many people do not know their birthdates, since official records are lacking. Most studies used the age eligibility for receiving a pension and the formal retirement age (55–65 years in Africa) as the standard.<sup>7,29,32</sup> Difficulty in locating the elderly and inability to correctly evaluate nutritional status constitute major barriers to nutrition research; relatively few elderly are institutionalized and appropriate assessment tools are lacking.<sup>17,33</sup> There is no consensus yet by researchers on the best method of screening for nutritional risk or assessing the nutritional status of older Africans.<sup>13,17</sup> Conventional indices in use and those proposed by investigators are discussed below.

**Table 1 Nutritional status of older men and women in sub-Saharan Africa.**

Country	Sample size	Age (years)	Mean BMI (kg/m <sup>2</sup> )	BMI Categories (% of subjects)				Mean MUAC (cm)	MUAC Categories (% of subjects)
				<16	<18.5	25–29.9	≥30		
Benin	465	≥60	22.7					29.5	
Botswana	372	>60	24.2	3.0	17.5	18.8	17.5		
Cameroon	531	55–120			5.5		19.0		11.9
Ethiopia	250	≥50	20.1	4.2	30.5	5.0	1.3		
Ghana	519	≥65	19.4	21.6	48.3	2.5			16.8
Kenya	289	≥45	21.1	9.0	29.8	14.0		25.1	
Malawi	296	55–94		13	30.1				
Senegal	400	≥60	28.2	3.5	12.2	12.4	12.0	23.6	16.7
South Africa <sup>23,29†</sup>	283	≥60	31.4	2.1	5.3	21.4	55.5	32.7	7.8
Tanzania	819	≥60	18.2						
Uganda	362	≥50	22.5	4.3	22.7	14.9	13.4	27.6	7.0*
Emergency situations									<22 cm
Kenya (Turkana)	457	>50		20.5					
Kenya (Wajir)			19.9					24.4	
Rwanda <sup>37,42</sup>	828	50–92							
Sierra Leone (Kenema)	167			45.0	76.0	4.0	0		78.0

\* Men < 23 cm, women < 22 cm.

† Sample constitutes black South Africans only.

Modified from HelpAge International.<sup>13</sup>

**Table 2 Nutritional status of older men in sub-Saharan Africa.**

Country	Sample size	Age (years)	Mean BMI (kg/m <sup>2</sup> )	BMI Categories (% of subjects)				Mean MUAC (cm)	MUAC Categories (% of subjects)
				<16	<18.5	25–29.9	≥30		
Benin		≥60	21.8		8.0		3.0	28.3	
Botswana		>60	22.2	4.2	20.1	16.4	7.9		
Cameroon	196	55–120	22.8		7.7		23.3	27.0	6.7
Ethiopia		≥50	19.9		30.1			23.0	50.0*
Ghana	182	≥65	18.0	30.0	62.2	0		27.5	25.3
Kenya		≥45	20.5		15.3	25.9		24.8	
Malawi	97	55–94	19.8	4.0	36.1	4.0	0	25.0	23.0
Senegal	214	≥60	27.2	4.0	14.5	16.5	5.0	21.8	18.5
South Africa <sup>29†</sup>		≥60	24.0	5.8	19.2	25.5	14.7	27.5	21.2
Tanzania	53	≥60		0.8	7.6	4.8	0.3		
Uganda		≥50	20.7	2.9	13.3	4.0	2.3	26.6	
Emergency Situations									<22 cm
Kenya (Turkana)		>50	19.1	15.2				23.6	19.6
Kenya (Wajir)			19.6					24.1	
Rwanda <sup>37,42</sup>	413	50–92	20.2		19.5			25.1	
Sierra Leone (Kenema)			16.7	42.0				17.7	86.0

\* MUAC &lt;23 cm.

† Sample constitutes black South Africans only. Modified from HelpAge International.<sup>13</sup>

### Screening indices for nutritional risk

There are several tools that have been developed for the identification of older adults with malnutrition. Following is a description of these tools applied to the African context. The Mini Nutritional Assessment (MNA), an 18-item questionnaire, is a validated tool developed for use in Europe.<sup>29,34</sup> It comprises four aspects of assessment:

general, health and nutritional status, dietary, and anthropometric. Among elderly black South Africans, the questionnaire results were directly associated ( $P < 0.05$ ) with anthropometric measures, cognitive function, and activities of daily living; in women, there was also an association with handgrip strength.<sup>29</sup>

“DETERMINE” is a validated ten-item checklist that is used in the United States.<sup>29,35</sup> It was found to be inef-

**Table 3 Nutritional status of older women in sub-Saharan Africa.**

Country	Sample size	Age (years)	Mean BMI (kg/m <sup>2</sup> )	BMI Categories (% of subjects)				Mean MUAC (cm)	MUAC Categories (% of subjects)
				<16	<18.5	25–29.9	≥30		
Benin		≥60	23.3		11.8		11.0	30.5	
Botswana		>60	26.3	1.6	14.8	21.3	27.9		
Cameroon	335	55–120	25.0		4.2		16.5	29.1	1.5
Ethiopia		≥50	20.3					23.8	23.3*
Ghana	337	≥65	19.5	17.1	44.6		3.9	30.5	12.2
Kenya		≥45	21.7		10.0	48.0			
Malawi	199	55–94	20.3	9	27.0	5.0	1.0	25.9	
Senegal	186	≥60	29.2	3.0	9.0	32.5	19.0	25.3	14.0
South Africa <sup>29†</sup>	230	≥60	33.1	1.3	2.2	20.5	65.1	33.9	4.8
Tanzania		≥60		2.0	10.6	2.1	0.2		
Uganda		≥50	24.2	1.4	9.4	10.9	11.1	28.5	28.5
Emergency situations									<22 cm
Kenya (Turkana)		>50	19.2	12.5		7.0		23.8	17.7
Kenya (Wajir)			20.1					24.6	
Rwanda <sup>37,42</sup>	415	50–92	21.3		13.1			26.1	
Sierra Leone (Kenema)			17.4	46.0				18.4	77

\* MUAC &lt;22 cm.

† Sample constitutes black South Africans only. Modified from HelpAge International.<sup>13</sup>

fective in older black South Africans as it had a low positive predictive value (55.6%) and specificity (11.2%) compared to the MNA.<sup>29</sup>

The Mini Nutritional Assessment-Short Form (MNA-SF), a new six-item tool, has been developed for use in elderly black South Africans.<sup>23</sup> It has nine domains: motor disability, cognitive function, health status, use of health aids, repeat memory phase, meals per day, dietary intake, food security, psychological stress, and mid-upper-arm circumference (MUAC). The tool has a high sensitivity (87.5%), specificity (95%), and negative predictive value (99.5%) compared to the MNA. However, it will require validation in a different population since it was developed and validated only in black South Africans.

In the recently developed Nutritional Risk Index (NRI) score, a lower score was associated with lower food variety, undernutrition, and anemia, as well as poor physical and cognitive function and health status in elderly Tswana.<sup>36</sup> The NRI is based on age, area of residence, education level, cattle ownership, and number of meals eaten per day. This tool requires validation in different populations before it can be used broadly. The International Checklist of Vulnerability Indicators for Emergency Situations developed by HAI has five features: household, social, health, mobility, and basic needs.<sup>37</sup> There is no published information as to whether it has been validated or not.

The MNA-SF and the NRI score have potential for use in other SSA countries besides South Africa and Botswana, since these countries have in common concepts such as food security and cattle ownership.

### Nutritional status of elderly Africans

The nutritional status of older Africans is next discussed by type of nutritional indicator.

*Anthropometry.* Presented in Tables 1–3 is the nutritional status of older adults in SSA in the HelpAge studies,<sup>13</sup> as evaluated by body mass index (BMI) and MUAC. The mean BMI for elderly adults was within the normal range, except for Tanzania where it was below normal (<18.5 kg/m<sup>2</sup>) and in Senegal and South Africa where it was above normal (>25 kg/m<sup>2</sup>). The overall prevalence of undernutrition, based on BMI, ranged from 6% in Cameroon to 48% in Ghana. The rates of underweight (BMI < 18.5 kg/m<sup>2</sup>) were 7–62% in men and 2–45% in women. However, a recent study in Uganda observed the opposite, with more women being undernourished (68% vs. 32% of men).<sup>38</sup> Rural elderly were also more undernourished than urban adults in the HelpAge studies.<sup>13,14</sup> The prevalence of overweight (BMI 25.0–<30 kg/m<sup>2</sup>) among the elderly ranged from 2.5% in Ghana to 21% in South Africa. The trend was opposite to

that of underweight; up to half (48%) of women and a quarter (26%) of men were overweight. In general, overweight and obesity (BMI ≥ 30 kg/m<sup>2</sup>) levels were high in Botswana, Cameroon, Kenya, Senegal, South Africa, and Uganda. Kenya had the highest rates of overweight for both men and women but no obese adults, whereas Cameroon had substantial rates of obesity but no overweight individuals. South Africa had the highest rate of overall overweight as well as obesity; it also had the highest prevalence of obesity for women. In Botswana, over half (52%) of obese females and over one-third (36%) of obese males considered their body weight to be “too low”. This might be due to the public’s association of obesity with affluence.<sup>13,19,39</sup>

The only study that has compared institutionalized and community-dwelling elderly, which was done in Tanzania, found 30% and 26% of institutionalized men and women and none of the non-institutionalized to be overweight and/or obese (BMI ≥ 25 kg/m<sup>2</sup>).<sup>40</sup> By contrast, 39% and 23% of community-dwelling men and women were undernourished. This is most likely due to lower levels of physical activity in the institutionalized elderly.

HAI and LSHTM investigators have shown that a MUAC value below 24 cm is indicative of undernutrition in older Africans and have proposed use of this measure rather than BMI. BMI may be inappropriate for older adults due to kyphosis and changes in body composition.<sup>13,14</sup> Based on studies in Malawi and among Rwandese refugees residing in Tanzania, which showed that an arm circumference of 21.7 cm had 86% sensitivity in relation to a BMI cut-off of 16 kg/m<sup>2</sup> (severe undernutrition), the researchers recommended MUAC for use in the acute phase of emergencies. In contrast to the HAI and LSHTM proposed MUAC threshold value, most investigators use World Health Organization (WHO) cut-points of 23 cm in men and 22 cm in women.<sup>13,14,23,41,42</sup>

A trend similar to that of BMI was observed with MUAC in the HelpAge studies; the prevalence of underweight for the elderly overall and for elderly men and women was 7–16%, 7–50%, and 2–29%, respectively (Tables 1–3). Generally, the proportion of undernourished adults was greater when assessed by MUAC than by BMI.

*Dietary intake.* Overall, food intake among elderly Africans failed to meet the recommended level of more than three meals a day.<sup>13,43,44</sup> Over three-quarters of adults reported eating only two-to-three meals per day. Moreover, both dietary variety and mean energy intake were low.<sup>13,36</sup> In South Africa, 29% of older adults, mostly blacks, had energy intakes of less than 67% of the Recommended Dietary Allowances (RDA), a cut-off that denotes low intake.<sup>17,29,31</sup> Protein was derived mainly from plants; animal protein and dairy intake were very

low.<sup>10,13,38</sup> Among elderly women living in underserved areas of Nairobi, Kenya, a mean of only 6 g/d was reported for animal protein.<sup>17,45</sup> About a quarter (27%) of the elderly in Zimbabwe ate a protein-containing meal less than once a week, and 17.6% of black South Africans had intakes that were less than 66% of Dietary Reference Intakes (DRI), the lower reference value for adequate intake.<sup>17,29,46</sup>

Fruit and vegetable consumption were equally low, except in Kenya;<sup>13,17,28,36</sup> this may have contributed to the low fiber intake in black and colored South Africans (11–16 and 17 g/day, respectively).<sup>28,31</sup> Fat intake as a proportion of total calories varied by race in South Africa, being higher (>35%) among white elderly, moderate (32%) in colored elderly, and low (24–26%) in black elderly.<sup>17</sup> Micronutrient intake was recently assessed in black South Africans and found to be low. More than half of older adults had intakes of vitamins A, B<sub>6</sub>, C, D, E, K, and folate, minerals (calcium, selenium magnesium, copper), and biotin that were less than the 67% of DRI.<sup>29</sup>

Two studies compared the dietary intake of institutionalized and community-dwelling older adults. In South Africa, institutionalized adults had a more varied nutrient-dense diet than non-institutionalized elderly;<sup>29</sup> the converse was true in Tanzania.<sup>40</sup> Differences in economic development between the two countries may account for the finding, since South Africa has more resources to provide for the institutionalized elderly.<sup>47</sup>

**Clinical indicators.** Physical examination showed that anemia was present in over a third of African seniors (38–42%) and was related to low folate intake in South Africa.<sup>17</sup> Edema, an indication of severe malnutrition, affected up to 28% of adults, with more women affected than men (30% versus 25%, respectively).<sup>13,38,41</sup> In Uganda, dehydration was present in a third of the elderly; the prevalence was 41% in rural areas, 27% in urban areas, 37% in women, and 29% in men.<sup>38</sup>

**Biochemical indicators.** Based on WHO criteria (hemoglobin <13 g/dL in men and <12 g/dL in women), 25% of the elderly in Zimbabwe were anemic.<sup>17,29</sup> Equivalent rates for colored and black South Africans were 13.9% and 24.5%.<sup>29,30</sup> Low RBC folate (<111.6 ng/mL) was present in 30% of the elders in Zimbabwe and in 12% of elderly black South Africans.<sup>17,29</sup> Suboptimal serum vitamin B<sub>12</sub> (<200 pg/mL) levels were similar in Zimbabweans (13%) and South African blacks (12% of men and 11% of women).<sup>17,29</sup> Hyperferritinemia (>300 ng/mL) affected 6.5% of South Africans, mainly blacks (50% of men and 11% of women).<sup>29,30</sup> This may be related to high alcohol consumption, hemochromatosis, or possibly iron-gene interactions.<sup>48–51</sup> In addition, 66% of black South African elderly, mainly men (84%), had suboptimal

plasma vitamin C concentrations (<0.6 mg/dL) and 9% had low serum albumin (<35 g/dL).<sup>29</sup> About one-quarter (27%) of the elderly in Zimbabwe had low calcium levels (<8.5 mg/dL).<sup>46,52</sup>

### Determinants of nutritional status of older adults in SSA

Factors that influence food intake of elderly Africans, including health status, disabilities, socioeconomic factors, health behaviors, and environmental health, are discussed in this section.<sup>3,11,13,24</sup>

**Food access.** Food insecurity was found to be prevalent, affecting  $\geq 50\%$  of elderly households.<sup>13</sup>

A study in South Africa found 50% of elderly households, relative to 40% of younger households, to be in food poverty ( $P < 0.05$ ). Rates were highest (65.4%) in elderly households headed by black Africans; they were also higher in rural areas and in larger households.<sup>13,17,23</sup> Older adults exhibited large interseasonal variations in body weight in rural Kenya; women had a mean weight loss of 1.7 kg and men a mean loss of 4 kg (3% and 7% of body weight) during the lean season, which was attributable to low energy intakes.<sup>17,53</sup> Poverty, natural disasters, wars, and famine are the main factors influencing food security.<sup>7,13,17</sup> When food shortages occur, the elderly are usually discriminated against in favor of children in intra-household food distribution.<sup>13</sup> About one-third (36%) of the adults buy their food supplies, but agriculture (60–90%) is the main source of food.<sup>13</sup>

**Socioeconomic status.** Many older Africans are economically active; over half are formally employed and/or involved in informal employment. Sale of agricultural produce and animals is the chief source of income (40%), but a substantial proportion of adults (12–45%) also run small-scale businesses. Nevertheless, poverty rates are high (43–95%), reflected in high rates of dependency on children (32% in urban areas and 24% in rural areas) and a low food budget (~70%). Only about 20% of the elderly receive pensions.<sup>13,54</sup>

The majority (~60%) of elderly Africans live in a family setting and a similar proportion ( $\geq 66\%$ ) support children and grandchildren. Almost half (46%) live with grandchildren who may be orphaned or whose parents live elsewhere. About 8% live with single orphans and 2% with double orphans; HIV/AIDS is the suggested likely cause for the latter.<sup>13,55</sup> Between 50% and 60% of orphans live with grandparents in Botswana, Malawi, Namibia, South Africa, Tanzania, and Zimbabwe, countries which have been especially afflicted by HIV/AIDS.<sup>3,56</sup> Additionally, an estimated 40–50% of PLWHA are cared for by their elderly parents.<sup>56</sup> The HIV/AIDS epidemic, coupled

with urbanization, has led to a decline in family support systems, contributing significantly to poverty. Care-giving responsibilities negatively affect productivity, thereby further aggravating poverty. They also exacerbate the already compromised nutritional status of the elderly.<sup>13</sup> Likewise, the psychosocial stress associated with HIV/AIDS, as well as poor housing of the majority of the elderly affects appetite.<sup>13,38</sup> Women and adults aged over 70 years are particularly vulnerable. Women shoulder the responsibility of care-giving and are more likely to be widows because of early marriage to older men. Owing to their low social position, they are highly dependent on family members financially. Land tenure is an issue for women, especially widows and very old seniors; women, in general, lack land rights and the latter group may lose land to male relatives.<sup>7,11</sup> Losses of loved ones coupled with lack of expected support in old age are major sources of loneliness for most of the elderly, which adversely impacts their nutritional status.<sup>13</sup>

*Health behaviors.* Tobacco and alcohol use are common in African elderly. Between 34% and 66% of adults, mainly men (74%) consume alcohol, especially in rural areas and in Botswana, Benin, and Uganda. In Botswana, alcohol is associated with severe health problems and obesity.<sup>13,38,57</sup> Smoking is also prevalent (30–44%)<sup>13,38,57</sup> and was associated with underweight in Malawi, as was the combination of smoking and alcohol use in Botswana.<sup>13,57</sup>

*Health status.* Medical problems are widespread in African elders. About 19–67% of adults had eye problems, with cataract being the most prevalent condition, affecting over one-half (51%) of the adults.<sup>12,13,54,58</sup> Almost two-thirds (62–65%) had partial or total vision loss and up to 22% had hearing disabilities.<sup>13,38,58,59</sup> Dental problems affected 36–77% of the elderly.<sup>13,37,38,54</sup> Cardiovascular disease was present in 44% of Kenyan and 37% of Tanzanian elderly.<sup>60,61</sup> Hypertension was also commonly reported; it affected 22–42% of Tswana, 51% of Ugandans, and 39–74% of South African older adults.<sup>17,27,31,38,59</sup> Type 2 diabetes mellitus rates varied from 25% in South Africa to 41–94% in Sudan.<sup>13,27</sup> Respiratory infections were present in up to two-thirds (14–63%) and reduced appetite in up to one-third (15–33%) of the elderly.<sup>13,37,38,54,58,61</sup> Eight percent of the adults in Benin and 28% in Uganda had gastric ulcers.<sup>13,38</sup> Arthritis/joint pains (8–89%) and backache (38–78%) were prevalent, especially in women (40% versus 30% in men).<sup>13,38,54,59</sup> Malaria/fever was equally common, affecting up to 65% of the seniors.<sup>13,37,38,61</sup> The statistics for rural elderly were generally worse than for urban older Africans.

*Mental and physical functioning.* Both physical and mental disabilities were evident in elderly Africans.

Kyphosis was the most common disability, affecting 15–58% of adults.<sup>13,14,38,41</sup> Poor mobility was reported by 23% of all elderly, and paralysis by 4% of seniors in Botswana.<sup>13,59</sup> A good proportion (18%) had sustained injuries due to falls.<sup>13</sup> Undernutrition was associated with impaired functional ability in Malawian elderly.<sup>23,62,63</sup> About 3–9% of all older adults had cognitive impairment, while depression was present in 7% of Tswana elderly.<sup>13,59</sup>

Despite these disabilities, most adults (over 80%) were able to perform activities of daily living.<sup>13,38,58</sup> Physical disabilities affected food procurement, joint pains and visual problems interfered with food preparation, and dental problems complicated food intake. Medications affecting appetite lead to reduced sense of taste.<sup>13</sup>

Health conditions are worsened by the poor public health infrastructure (including the perceived negative attitudes of health workers) and lack of finances. These factors, as well as delays in seeking treatment, contribute to the higher prevalence of health problems in rural areas.<sup>6,7,12,13,58</sup> Most seniors (~70%), particularly in rural areas (~65%), rely on traditional medicine in which they also strongly believe.

### **Nutritional status of older people in emergency situations**

The nutritional status of internally displaced individuals and refugees is worse than that of the community-dwelling elderly due to their unique circumstances. Rates of underweight were very high; up to 76% when evaluated by BMI and up to 86% using MUAC (Tables 1–3). Similar to their community-dwelling counterparts, more men than women were undernourished. The relatively better nutritional status of Rwandan refugees compared to that of adults in other countries is most likely because they were evaluated in the post-emergency phase when they had received support from HAI.<sup>14,42</sup> Of note is the observation that overweight was present even in emergency situations (4% of all adults in Sierra Leone and 7% of women in Turkana, Kenya).

Dietary intake was low in populations in emergency situations due to limited food availability and the culturally unacceptable and/or unfamiliar relief food, which takes a long time to prepare, cook, and chew, in addition to being monotonous (corn was unacceptable to Rwandese and pulses to Kenyans). The elderly were also excluded from food programs.<sup>13,14,37</sup> In general, most donor agencies lack the necessary skills to screen older adults for targeted feeding programs.<sup>13,37</sup>

Risk factors for poor nutrition were somewhat similar to those of community-dwelling adults in non-emergency circumstances. Dehydration, edema, immobility, extreme weakness, and vomiting predicted poor nutritional status among the elderly in Turkana, Kenya. In

Senegal, predictors of undernutrition were living alone, child-care responsibilities, immobility, loss of a source of income and psychosocial problems.<sup>13,37</sup> Similar to in Malawian seniors, undernutrition was associated with impaired functional ability in Rwandese adults.<sup>23,62,63</sup> Kyphosis was present in 5% of these Rwandan refugees and was associated with higher levels of undernutrition.<sup>42</sup> Depression was common (22%) in Rwandan refugees as well, and in this population, women over 70 years were the most affected.<sup>13,37</sup>

## PROGRAMS FOR THE ELDERLY IN SSA

### Nutrition programs

There are no specific nutrition programs for older adults due to the low priority of these individuals in the nutrition policies of countries of SSA. The HAI Regional Nutrition Programme, however, has launched several initiatives aimed at improving the nutritional status of the elderly. These include the following: 1) training programs for nutritionists, HAI members, partners, and relief agencies; 2) awareness creation, education, and advocacy for older people with key nutrition policy makers in Africa (nutritionists and NGOs); 3) income-generating projects (animal rearing, vegetable gardening, and sale of commodities) in Kenya, Mozambique, and South Africa; 4) an Africa-wide rights initiative to address property rights of older adults in Ghana, Kenya, South Africa, and Swaziland; and 5) programs to assist elderly individuals affected by HIV/AIDS (Ethiopia, Kenya, Mozambique, Sudan, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe). The following projects have been instituted for refugees in Mozambique and Sudan: relief and supplementary feeding in camps; programs addressing repatriation and resettlement; and post-resettlement development pro-

grams. Universities in Benin, Ethiopia, Kenya, Senegal, South Africa, and Sudan have introduced curricula, and are conducting research, on the nutrition of older people.<sup>13,17,26,64</sup>

Income-generating, relief, and HIV/AIDS projects have been effective in addressing the nutritional and health concerns of the elderly.<sup>26</sup>

### Social security programs

Most social security programs available for the elderly in SSA include pensions that are earnings-related. Universal and means-tested pensions are offered by very few countries. A non-contributory means-tested pension scheme for adults operates in South Africa (women:  $\geq 60$  years; men:  $\geq 65$  years) and Namibia ( $\geq 60$  years), Botswana has a universal scheme ( $\geq 65$  years), while Lesotho has a limited universal pension ( $\geq 70$  years). Supplementing the earnings-related benefits is a means-tested pension in Liberia, a flat-rate universal pension in Mauritius ( $\geq 60$  years) and a flat-rate pension in the Seychelles ( $\geq 60$  years).<sup>17,25,36,44,56,65-70</sup>

The schemes are helpful; program coverage in Mauritius is 100% and in Namibia 87%. However, bureaucracy and financially inadequate pensions (US\$109 per month), partly due to sharing in households, has minimized benefits of the South African program, as only 60% of the elderly are covered.<sup>67,68,70</sup> The presently available universal and means-tested pension schemes in SSA are presented in Table 4.

*Other programs.* Other programs that supplement the nutrition-related projects and pensions provide examples of interventions for further assessment and replication. South Africa has free primary and secondary healthcare, housing subsidies, care dependency grants, disability grants, and child support. Ghana offers limited health cost

**Table 4 Social pensions in sub-Saharan Africa.**

Country	Age eligibility (years)	Universal (U) or means-tested (M)	Amount paid per month	Adults over 60 years (%)	Adults over 60 years receiving pension (%)	Costs as % of GDP
Botswana	$\geq 65$	U	US\$27 (166 pula)	5.0	85.0	0.4
Lesotho	$\geq 70$	U*	US\$21 (150 loti)	8.0	53.0	1.4
Mauritius	$\geq 60$	U	US\$60 (1978 rupees)	10.0	100.0	2.0
Namibia	$\geq 60$	M	US\$28 (200 dollars)	5.0	87.0	0.8
South Africa	Men $\geq 65$ Women $\geq 60$	M	US\$109 (780 rand)	7.0	60.0	1.4

\* Universal with a few exceptions, primarily people who are already receiving a substantial government pension (about 4% of those who would otherwise be eligible).  
Modified from HelpAge International.<sup>70</sup>

**Table 5 Recommendations for improving the health and nutritional status of older adults in sub-Saharan Africa.**

Recommendation	Reference
<i>Research</i>	
Proper data collection systems, surveillance, and evaluation	Aboderin (2005) <sup>3</sup> HelpAge International (2002) <sup>6</sup> Kalasa (2001) <sup>11</sup> HelpAge International (2004) <sup>13</sup> Unwin et al. (2001) <sup>20</sup> Nhongo (2005) <sup>64</sup>
The full spectrum of malnutrition (excess, deficiency, and imbalance of nutrients)	HelpAge International (2001) <sup>7</sup> Meydani et al. (2005) <sup>10</sup>
Demographic and health surveys as well as local nutrition surveys to include nutrition assessment of older adults	HelpAge International (2004) <sup>13</sup> Ismail (1999) <sup>14</sup> Charlton et al. (2001) <sup>17</sup> Charlton (1999) <sup>21</sup>
Appropriate local reference standards for assessment of nutritional status, including a MUAC value for overweight and obesity	HelpAge International (2001) <sup>7</sup> Meydani et al. (2005) <sup>10</sup> HelpAge International (2004) <sup>13</sup> Ismail (1999) <sup>14</sup> Charlton et al. (2001) <sup>17</sup> Charlton (1999) <sup>21</sup> Charlton et al. (2005) <sup>23</sup>
Traditional medicine	HelpAge International (2002) <sup>6</sup> Charlton (1999) <sup>21</sup>
<i>National Level Interventions</i>	
<i>Nutrition</i>	
Develop a geriatric nutrition policy	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Kalasa (2001) <sup>11</sup> Kowal et al. (2003) <sup>12</sup> HelpAge International (2004) <sup>13</sup> Charlton (1999) <sup>21</sup>
Integrate gerontology in the curricula of agriculturalists and nutritionists	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Ismail (1999) <sup>14</sup>
Micronutrient supplementation, food fortification, and dietary diversity of nutrient-rich local foods to meet RDIs	Meydani et al. (2005) <sup>10</sup> Kuczmariski et al. (2005) <sup>43</sup> Stephen et al. (2006) <sup>73</sup> Meydani et al. (2007) <sup>74</sup>
Include the elderly in HIV/AIDS programs that support PLWHA and orphans	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> World Health Organization (2002) <sup>75</sup>
NGOs to include older people in emergency situations in relief programs, provide appropriate alternative foods, as well as institute therapeutic and supplementary feeding programs	HelpAge International (2001) <sup>7</sup> HelpAge International (2004) <sup>13</sup>
<i>Health</i>	
Develop geriatric services and incorporate geriatrics in the training curricula of health professionals (physicians, dentists, nurses)	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Kowal et al. (2003) <sup>12</sup> HelpAge International (2004) <sup>13</sup> Darkwa et al. (2002) <sup>24</sup> Petersen et al. (2005) <sup>76</sup>
Provide free preventive health care, including mosquito nets	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> HelpAge International (2004) <sup>13</sup>
Set up mobile clinics for the very old, those with disabilities, and elders in emergency situations	HelpAge International (2001) <sup>7</sup> HelpAge International (2004) <sup>13</sup> World Health Organization (2002) <sup>75</sup>



Table 5 Continued

Recommendation	Reference
Subsidize medication and related services (dental, ophthalmic, hearing aids, prostheses, walking aids, and other assistive devices)	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> HelpAge International (2004) <sup>13</sup>
Ensure adequate drug supplies for both the elderly and HIV/AIDS patients	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> HelpAge International (2004) <sup>13</sup>
Develop health insurance schemes that include the elderly	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Darkwa et al. (2002) <sup>24</sup>
Strengthen health systems (with regard to availability, accessibility, affordability, and health personnel)	HelpAge International (2001) <sup>7</sup> Kalasa (2001) <sup>11</sup> HelpAge International (2004) <sup>13</sup> World Health Organization (2002) <sup>75</sup>
Implement the <i>Africa Health Strategy</i>	HelpAge International (2007) <sup>77</sup>
Implement the WHO strategy for chronic disease prevention, the <i>World Oral Health Report</i> , the <i>Global Strategy on Diet, Physical Activity and Health</i> , and the <i>Framework Convention for Tobacco Control</i> through an integrated approach	World Health Organization (2005) <sup>19</sup> World Health Organization (2004) <sup>65</sup> Petersen (2003) <sup>78</sup> Petersen et al. (2005) <sup>76</sup> World Health Organization (2003) <sup>79</sup>
<b>Social</b>	
Broaden social security policies to cover the employed, unemployed, and the informal sector	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Darkwa et al. (2002) <sup>24</sup>
Increase coverage of pensions where they are available; in countries where they are non-existent, provide universal pensions. Eligibility age should preferably be lowered in countries most affected by HIV/AIDS	HelpAge International (2006) <sup>56</sup> HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Kalasa (2001) <sup>11</sup> Kowal et al. (2003) <sup>12</sup> HelpAge International (2006) <sup>56</sup> Nhongo (2005) <sup>64</sup>
Provide allowances, subsidies, and tax relief for families to support the aged	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Darkwa et al. (2002) <sup>24</sup>
Provide child support grants for grandparents to ease the burden of caring for orphans	HelpAge International (2001) <sup>7</sup> HelpAge International (2004) <sup>13</sup>
Address land tenure problems and property rights of women and those very advanced in age	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Nhongo (2005) <sup>64</sup>
Provide adequate housing and subsidize transport costs	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Kalasa (2001) <sup>11</sup> Darkwa et al. (2002) <sup>24</sup>
Address the needs of elderly adults with disabilities	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup>
Provision of free primary-school education to free household finances for other needs	HelpAge International (2006) <sup>26</sup>
Integrate gerontology in the curricula of schools and tertiary institutions	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup>
<b>Economic</b>	
Economic development, in particular rural, to stem rural-urban migration	HelpAge International (2002) <sup>6</sup> Kalasa (2001) <sup>11</sup>
Include the elderly in poverty-alleviation programs such as the Millennium Development Goals as well as in food production and marketing programs	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Kalasa (2001) <sup>11</sup> Kowal et al. (2003) <sup>12</sup> World Health Organization (2002) <sup>75</sup> HelpAge International (2004) <sup>13</sup>

**Table 5 Continued**

Recommendation	Reference
Regularize the operation of informal credit systems	HelpAge International (2002) <sup>6</sup> Darkwa et al. (2002) <sup>24</sup>
Environmental health	
Ensure access to clean, safe water and sanitation	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> Kowal et al. (2003) <sup>12</sup> HelpAge International (2004) <sup>13</sup> Darkwa et al. (2002) <sup>24</sup>
<i>Community Level Interventions</i>	
Health and nutrition education for all individuals, including the elderly	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> World Health Organization (2004) <sup>65</sup>
Educate the society on aging and related issues	HelpAge International (2001) <sup>7</sup> HelpAge International (2004) <sup>13</sup>
Involve elders in community activities to help relieve loneliness and depression	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup>
Develop and implement income-generating activities, plus training in business skills for the younger elderly	HelpAge International (2002) <sup>6</sup> HelpAge International (2001) <sup>7</sup> HelpAge International (2004) <sup>13</sup> World Health Organization (2002) <sup>75</sup>
Daycare centers for socialization and interaction	Darkwa et al. (2002) <sup>24</sup>
<i>Partnerships</i>	
African Research on Ageing Network	Aboderin (2005) <sup>3</sup> African Research on Ageing Network (2005) <sup>80</sup>
Institute of Traditional Medicine at the University of Cape Town	Charlton (1999) <sup>21</sup>
Center for Traditional Medicine and Drug Research at the Kenya Medical Research Institute	Kenya Medical Research Institute (2007) <sup>81</sup>
International Federation of Medical Students' Associations. Africa Region	International Federation of Medical Students' Associations (2005) <sup>82</sup>
Tobacco Free Initiative	World Health Organization (2003) <sup>79</sup>
International Forum for Hypertension Control in Africa	Lemogoum et al. (2005) <sup>83</sup>
World Heart Federation	Wilson (2003) <sup>84</sup>
African Heart Network and the Pan-African Society of Cardiology	Wilson (2003) <sup>84</sup>
International Diabetes Federation	Kengne et al. (2005) <sup>85</sup>
World Diabetes Foundation	Kengne et al. (2005) <sup>85</sup>
WHO INTERHEART study	World Health Organization (2008) <sup>86</sup>
Cardiovascular Health Research Initiative	World Health Organization (2008) <sup>86</sup>
National Center for Chronic Disease Prevention and Health Promotion	Smith et al. (2003) <sup>4</sup> Centers for Disease Control and Prevention (2008) <sup>87</sup>
National Institute on Aging	National Institutes of Health (2007) <sup>88</sup>

exemption schemes, while HAI, governments, and religious societies run daycare programs on a small scale.<sup>3,13,24,67</sup>

### SUCCESSFUL PROGRAMS IN OTHER COUNTRIES

Various programs in other countries provide models for SSA. The Title IIIIC Nutrition Program (formerly, the Elderly Nutrition Program) in the United States is a non-means-tested program that targets those most in need. It provides congregate and home-based meals and related services.<sup>43,71,72</sup> While highly effective, this type of program

is unaffordable in most SSA countries. Brazil has a pension system for the elderly and Mexico a cash transfer program that includes older adults.<sup>44,65,66</sup> The Chilean government provides a pension, in addition to monthly food rations, to seniors aged over 70 years who are registered at primary health clinics.<sup>44,65</sup>

Social pensions have been shown to be an effective way of reducing poverty, hence improving household food security, nutritional status, and health outcomes. The South African and Chilean schemes have reduced the number of people living in poverty by 5% and 45%, respectively. In Brazil, the program increased the income

of the poorest 5% of the population by 100%. The schemes greatly empower women and help mitigate the impact of HIV/AIDS. Furthermore, they are affordable (costs range from 0.03–2% of gross domestic product) and sustainable. Universal pensions are cheaper and easier to manage than means-tested pensions.<sup>56,64,66–68,70</sup>

## RECOMMENDATIONS

A first step is to conduct research that will aid in formulating nutrition-related policies. Programs need to be implemented at the national and community levels and they should address all determinants of nutritional status in the elderly. Collaborative research between academia and NGOs is essential for success. A multisectorial and intersectorial approach for interventions is likewise vital. These should be country-specific, depending on available resources, as well as region- and gender-specific, with a focus on the needs of the rural elderly and women. Partnerships need to incorporate other organizations already involved in research and program development in SSA. Recommendations for long-term interventions that would be appropriate and feasible for countries in SSA to implement are outlined in Table 5. Priority interventions include the following: providing pensions to older adults; developing income-generating projects; including the elderly in HIV/AIDS programs that support PLWHA and orphans; ensuring adequate drug supplies for both elderly and HIV/AIDS patients; and development of geriatric services.

## CONCLUSION

Despite limitations related to study design and discrepant age criteria for older adults, as well as inappropriate evaluation tools, research shows older adults in SSA, especially women, to be a greatly vulnerable group at high risk of undernutrition. Most elderly are underweight, largely due to an inadequate, low-quality diet; men, rural elderly, and older adults in emergency situations are disproportionately affected. Overweight and obesity levels are moderately elevated in some countries, especially among women, contributing to a double burden of disease. High alcohol consumption and tobacco use, particularly by men, are also problematic and adversely affect elders' nutritional status. Poverty, HIV/AIDS, and complex humanitarian emergencies are major determinants of undernutrition.

Effective nutrition intervention programs need to consider economic, health, social, and demographic factors; social pensions, shown to be effective in other countries, appear to be the most viable cost-effective option. Future research is needed to develop assessment tools appropriate for SSA and country-specific strategies

to promote health and nutrition in the elderly at both the population and the individual levels.

## Acknowledgments

*Declaration of interest.* The authors have no relevant interests to declare.

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