

# Malnutrition in the elderly residing in long-term care facilities: a cross sectional survey using the Mini Nutritional Assessment (MNA<sup>®</sup>) screening tool

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**Objectives:** The objective of this study was to determine and compare the nutritional status of the elderly in two long-term care facilities - one situated in a higher socio-economic area and one in a lower socio-economic area.

**Design:** A cross-sectional study was undertaken.

**Setting:** The study setting comprised two urban areas of Bloemfontein, Free State province, South Africa.

**Subjects:** Sixty-two elderly residing in a long-term care facility from both the higher and lower socio-economic areas agreed to participate and met inclusion criteria ( $N = 124$ ).

**Outcome measures:** The nutritional status of participants was assessed using the Mini Nutritional Assessment (MNA<sup>®</sup>) questionnaire. Indicators of nutritional status that were assessed as part of the validated MNA<sup>®</sup> included anthropometry, a global assessment, dietary assessment and subjective assessment. A total score of 24 or more points was interpreted as being well-nourished.

**Results:** Malnutrition was identified in 3.2% of participants from the long-term care facility situated in the higher socio-economic area and 11.3% from the lower socio-economic area. A significantly higher percentage of participants from the lower socio-economic area were found to be at risk of malnutrition than those from the higher socio-economic area (74.2% vs. 37.1%) [95% CI 19.8%; 51.4%]. Participants from the higher socio-economic area consumed significantly more fluid and protein rich foods than their counterparts.

**Conclusion:** Elderly participants from the lower socio-economic area were more likely to have a poor nutritional status and be at risk of malnutrition. The findings highlight the need to focus on screening for malnutrition in order to promote health and prevent the possible development of nutrition-related co-morbidities in the elderly.

**Keywords:** care facility, elderly, malnutrition, mini nutritional Assessment, nutrition screening, South Africa

## Introduction

The elderly (> 60 years<sup>1</sup>) are a group of people that are usually more dependent on healthcare services than the general public. When malnutrition is prevalent in this group, morbidity and mortality rates are likely to increase.<sup>2</sup> Energy and protein deficiencies lead to changes in body composition and functions, such as impaired muscle function, decreased bone mass, delayed wound healing, reduced cognitive and immune function, and anaemia.<sup>3</sup> Combined data from twelve countries, including South Africa, indicated that 13.7% of elderly residing in a nursing home were malnourished, while 5.8% of community dwelling elderly were malnourished.<sup>4</sup>

Chronic illness, medications, economic hardship, low levels of education, low functional status, low self-perceived health, and symptoms of depression are recognised risk factors for developing malnutrition.<sup>3-6</sup> Frailty is often associated with loss of muscle mass and cachexia, both of which are closely related to malnutrition in the elderly.<sup>7</sup>

In view of the impact of malnutrition on health and quality of life, it has been recommended that the elderly be screened at regular intervals to identify and treat nutrition-related problems as early as possible.<sup>7,8</sup> The Mini-Nutritional Assessment (MNA<sup>®</sup>) is an 18-question screening and assessment tool that was developed by the study group of Vellas and Guigoz in 1989. It has become the most widely applied nutritional assessment tool for the elderly, with proven validity,<sup>9</sup> and is well accepted and

recommended worldwide.<sup>4,10,11</sup> A cross-sectional study of 283 free-living and institutionalised South Africans above the age of 60 years compared the validity of existing nutrition screening tools for use in older South Africans living in rural areas. The authors demonstrated that the MNA<sup>®</sup> was an appropriate screening tool for use in elderly South Africans who may have high levels of malnutrition.<sup>2</sup> Based on an in-depth literature review, no studies related to the nutritional status or risk of the elderly have been undertaken in the Free State province of South Africa.

The aim of this study was to determine and compare the nutritional status of the elderly in a long-term care facility situated in a higher socio-economic area, to one situated in a lower socio-economic area in Bloemfontein, South Africa.

## Methods

A cross-sectional study was undertaken in the elderly residing in long-term care facilities from urban Bloemfontein, Free State, South Africa.

## Population and sample selection

A long-term care facility from both a higher and lower socio-economic area comprised the research population. When the study was undertaken in March 2014, the long-term care facility situated in a lower socio-economic area accommodated 80 elderly residents, and the long-term care facility situated in a higher socio-economic area housed 88 elderly residents.

All permanent residents who gave written informed consent were eligible to participate. Participants who were excluded were those with dementia and cognitive impairment to such a degree that they were unable to communicate with ease.

### Data collection

Approval to undertake the study was obtained from the Ethics Committee of the Faculty of Health Sciences at the University of the Free-State (STUD NO 02/2014). Written permission to undertake the study was also obtained from the management of both care facilities. Before data collection, the researchers arranged information sessions with the caretakers and nursing staff involved in the care of the elderly to inform them about the data collection process. Information documents were provided in both English and Afrikaans. Participation was voluntary and participants provided written informed consent. Nursing staff served as translators when necessary.

Three trained final year dietetic students collected the data. Each participant was individually interviewed in a private room to ensure confidentiality, after which anthropometric measurements were taken by the researchers using calibrated equipment.

### Measurements

Data were gathered using the MNA<sup>®</sup> tool. The 18 questions which constitute the tool can be aggregated in the following subsections: anthropometric measurements, a global evaluation, dietary assessment, and a subjective assessment.<sup>12</sup> The anthropometric assessment, relevant to the elderly population, included weight and height to determine body mass index (BMI), mid-upper arm circumference (MUAC) and calf circumference (CC). Weight and height were measured using a calibrated Seca<sup>®</sup> electronic scale with a telescopic measuring rod. Calculated weight and height using knee height and mid-upper arm were used when a participant was too weak to stand for measurements. Anthropometric measurements were taken using standard techniques to ensure reliability of results.<sup>13</sup>

The global evaluation included questions related to where the participants live; prescription drug use; presence of psychological stress/acute disease; mobility; neuropsychological problems; as well as, presence of pressure sores/skin ulcers.

The dietary assessment included questions related to how many full meals were eaten daily; daily servings of dairy; weekly servings of beans/eggs; daily number of servings of meat, fish or poultry; daily servings of fruits or vegetables; food intake decline over the past three months due to a loss of appetite, digestive problems, chewing or swallowing difficulties; number of cups of fluid consumed daily; and, the need for feeding assistance.

The subjective assessment included questions related to the participant's self-view of nutritional status and how participants would consider their health status in comparison to other people of the same age.

MNA<sup>®</sup> scores were interpreted as follows: A total score of 24 to 30 points was classified as well-nourished. A score of 17 to 23.5 points was classified as being at risk of malnutrition, while a score of less than 17 points was classified as malnourished.<sup>14</sup>

To calculate the total score, the BMI values were categorised on the MNA<sup>®</sup> questionnaire as follows.<sup>12</sup>

0 = BMI less than 19 kg/m<sup>2</sup>

1 = BMI 19 kg/m<sup>2</sup> to less than 21 kg/m<sup>2</sup>

2 = BMI 21 kg/m<sup>2</sup> to less than 23 kg/m<sup>2</sup>

3 = BMI 23 kg/m<sup>2</sup> or greater

Additionally, to independently interpret BMI in relation to all-cause mortality risk, BMI values were also compared to the optimal BMI range for the elderly as identified by Winter *et al.*<sup>15</sup> The meta-analysis of the authors demonstrated that a BMI range of 24.0 – 30.9 kg/m<sup>2</sup> was associated with the lowest all-cause mortality in the elderly.<sup>15</sup>

### Pilot study

A pilot study was undertaken on five participants from both long-term care facilities to determine whether participants understood the questions and to note the time it would take to complete the questionnaire and anthropometric measurements. Since no changes were made to the questionnaires after the pilot study, the data of these ten participants were included in the main study.

### Statistical analysis

Descriptive statistics, namely frequencies and percentages for categorical data, and medians and ranges for continuous data were calculated per group. The groups were compared by means of 95% confidence intervals (CI). Prevalence of malnutrition or risk of malnutrition was calculated and described by means of 95% CI for the prevalence.

### Results

A total of 124 participants met inclusion criteria and agreed to participate, i.e. 62 participants from the long-term care facility situated in the higher socio-economic area and 62 participants from the facility from the lower socio-economic area.

### Study sample characteristics

Female participants were in the majority in both long-term care facilities, i.e. 83.9% in the facility situated in the higher socio-economic area, and 59.7% in the facility situated in the lower socio-economic area. All participants from the care facility situated in the higher socio-economic area were white residents, whereas all participants from the care facility situated in a lower socio-economic area were black residents, except for one coloured resident.

A statistically significant difference [95% CI 3.0; 9.0 years] was found between the median ages of the participants at the two facilities. Participants from the lower socio-economic area were significantly younger with a median age of 78 (58–99) years compared with participants from the higher socio-economic area who had a median age of 85 (62–95) years.

### Anthropometric assessment

The median BMI of participants from the higher socio-economic area [24.9 kg/m<sup>2</sup> (18.8–36.6)] and lower socio-economic area [24.6 kg/m<sup>2</sup> (17.2–43.5)] was similar and in the ideal range for BMI for the elderly (24 - 30.9 kg/m<sup>2</sup>).<sup>15</sup>

Categories of MUAC, CC, weight-loss during the previous three months, and BMI are shown in Table 1. A statistically significant difference was found between the percentage of participants

**Table 1:** Mid-upper arm circumference, calf circumference, recent weight loss, and body mass index in elderly participants (N = 124)

	Higher socio-economic area		Lower socio-economic area		95% CI for the percentage difference
	n	%	n	%	
<i>Mid-upper arm circumference</i>					
MUAC < 21 cm	0	0.0	1	1.6	[-8.6%; 4.4%]
21 ≤ MUAC ≤ 22 cm	4	6.5	3	4.8	
MUAC > 22 cm	58	93.6	58	93.6	
<i>Calf circumference</i>					
CC < 31 cm	13	20.9	27	43.6	[-37.5%; -6.1%]*
CC ≥ 31 cm	49	79.0	35	56.5	
<i>Weight loss during the last 3 months</i>					
Weight loss > 3 kg	10	16.1	12	19.3	[-16.8%; 10.4%]
Does not know	1	1.6	11	17.7	
Weight loss between 1 and 3 kg	3	4.8	8	12.9	
No weight loss	48	77.4	31	50.0	[10.5%; 42.3%]*
<i>Body mass index (kg/m<sup>2</sup>)</i>					
BMI < 19	2	3.2	6	9.7	
19 ≤ BMI < 21	9	14.5	9	14.5	
21 ≤ BMI < 23	9	14.5	11	17.7	
BMI ≥ 23	42	67.7	36	58.1	[-7.2%; 25.8%]

\*Statistically significant difference.

with a calf measurement below and above 31 cm at the two facilities, with participants from the lower socio-economic area having a lower CC [95% CI -37.5%; -6.1%].

### Global evaluation

More than half (57.3%) of all participants reported using more than three medications per day, while less than a third (29.8%) of all participants reported experiencing psychological stress or acute disease. Pressure ulcers were reported in 7.3% of all participants.

A statistically significant difference was found between the percentage of participants who were bed-bound or chair-bound at the two facilities, with participants from the lower socio-

**Table 2:** Mobility and neuropsychological problems in elderly participants (N = 124)

	Higher socio-economic area		Lower socio-economic area		95% CI for the percentage difference
	n	%	n	%	
<i>Mobility</i>					
Bed-bound or chair-bound	4	6.5	14	22.6	[-28.6%; -3.7%]*
Able to get out of bed/chair, but does not get out	11	17.7	23	37.1	
Goes out	47	75.8	25	40.3	
<i>Neuropsychological problems</i>					
Severe depression	4	6.5	8	12.9	[-17.7%; 4.5%]
Mild dementia	12	19.4	26	41.9	
No psychological problems	46	74.2	28	45.2	

\*Statistically significant difference.

economic area (22.6%) being more likely to be bed-bound or chair-bound than participants from the higher socio-economic area (6.5%) (Table 2).

### Dietary assessment

Most participants consumed three full meals per day (91.9% from the higher socio-economic area and 96.8% from the lower socio-economic area). A full score for protein rich food intake was achieved in 59.7% of participants from the higher socio-economic area, versus 40.3% of participants from the lower socio-economic area who had a full score. [95% CI 1.8%; 35.3%]. A full score is obtained if a person consumes one serving of dairy per day, at least two servings of legumes or eggs per week, and consumes meat, fish or poultry daily. A significantly higher percentage of participants from the higher socio-economic area (96.8%) consumed two or more servings of fruit or vegetables per day, compared to participants from the lower socio-economic area (69.4%) [95% CI 14.7%; 40.0%].

Table 3 indicates results related to a decline in food intake over the past three months due to a loss of appetite, digestive problems, chewing or swallowing difficulties, as well as the daily number of cups of fluids (water, juice, coffee, tea, milk) that were consumed. Significantly more participants from the lower socio-economic area had a fluid consumption of less than three glasses per day (27.4%), compared to participants from the higher socio-economic area (1.6%). Results related to the need for feeding assistance are also indicated in Table 3.

### Subjective assessment

Significantly more participants from the lower socio-economic area (8.1%) indicated that their health status was not as good as other people of the same age, than participants from the higher socio-economic area (0.0%) [95% CI 0.7%; 17.5%]. Results relating to all participants' self-view of nutritional status showed that most participants viewed themselves as having no nutritional problems (83.9%).

### Final score

Table 4 shows the scores obtained for each of the four sections included in the MNA<sup>®</sup>. Statistically significant differences were found between both the global assessment score and the dietary assessment score, with significantly more participants from the higher socio-economic area obtaining a higher score than participants from the lower socio-economic area for global assessment [95% CI 1.0; 2.0] and for dietary assessment [95% CI 0.5; 1.0].

Table 5 shows the final MNA<sup>®</sup> score classification which indicates the prevalence of participants with malnutrition, those at risk of malnutrition and those who were well-nourished. Significantly more participants from the lower socio-economic area were at risk of malnutrition (74.2%) than those in the higher socio-economic area (37.1%) (95% CI -51.4%; -19.8%).

### Discussion

From 2005 to 2014, the combined average life expectancy for males and females in South Africa gradually increased from 53.5 to 62.5 years. In 2015, a stall in life expectancy occurred (62.5 years) possibly in part due to the Acquired Immune Deficiency Syndrome (AIDS) epidemic.<sup>16</sup> Nevertheless, the total elderly population is on the rise.<sup>17</sup> According to the most recent census data, the elderly population (≥ 60 years) in South Africa increased from 7.1% in 1996 to 8% in 2011.<sup>18</sup> A large percentage of the health budget is allocated to managing the problem of AIDS which leaves fewer

**Table 3:** Recent decline in food intake, consumption of fluids, and the need for feeding assistance in elderly participants (N = 124)

	Higher socio-economic area		Lower socio-economic area		95% CI for the percentage difference
	n	%	n	%	
<i>Decline of food intake over the past three months due to loss of appetite, digestive system problems, chewing or swallowing difficulties</i>					
Severe loss of appetite	3	4.8	1	1.6	[-4.4%; 11.8%]
Moderate loss of appetite	9	14.5	18	29.0	
No loss of appetite	50	80.7	43	69.4	
<i>Daily fluid consumption</i>					
Less than 3 cups	1	1.6	17	27.4	[-38.1%; -14.0%]*
3 to 5 cups	24	38.7	35	56.5	
More than 5 cups	37	59.7	10	16.1	
<i>Need for feeding assistance</i>					
Unable to eat without assistance	1	1.6	2	3.2	[-9.5%; 5.7%]
Self-fed with some difficulty	3	4.8	4	6.5	
Self-fed without any problem	58	93.6	56	90.3	

\*Statistically significant difference.

**Table 4:** Summary of the scores of the MNA<sup>®</sup> sections

	Possible score	Higher socio-economic area			Lower socio-economic area			95% CI for the median difference
		Minimum	Median	Maximum	Minimum	Median	Maximum	
Anthropometric	8	1.5	8.0	8.0	2.0	5.0	8.0	[0.0; 2.0]
Global	9	3.0	6.0	8.0	1.0	4.0	8.0	[1.0; 2.0]*
Dietary	9	4.5	8.5	9.0	3.5	7.5	9.0	[0.5; 1.0]*
Subjective	4	1.0	3.0	4.0	1.0	3.0	4.0	[0.0; 1.0]

\*Statistically significant difference.

**Table 5:** Final MNA<sup>®</sup> score for elderly residents (N = 124)

	Higher socio-economic area		Lower socio-economic area		95% CI for the percentage difference
	n	%	n	%	
<i>Malnutrition</i>					
(score of < 17)	2	3.2	7	11.3	[-18.6%; 1.6%]
		[0.8%; 11.0%]		[5.6%; 21.5%]	
<i>At risk of malnutrition</i>					
(score of 17–23.5)	23	37.1	46	74.2	[-51.4%; -19.8%]*
		[26.2%; 49.5%]		[62.1%; 83.4%]	
<i>Well-nourished</i>					
(score of ≥ 24)	37	59.7	9	14.5	[28.7%; 58.3%]*
		[47.3%; 71.0%]		[7.8%; 25.3%]	

\*Statistically significant difference.

resources available to develop effective programmes designed to promote the well-being of elderly South Africans.<sup>17</sup>

South Africa is a country with long-standing racial inequities. Discussions related to the health and nutritional status of the elderly cannot exclude the influence of historical discrimination prior to the first democratic elections in 1994. These inequities led to limited access to education and unemployment, with resultant poverty, especially for black South Africans.<sup>19</sup> The possible effects of previous racial inequities were made clear in the current study. The results established that elderly residents

from a long-term care facility situated in the lower socio-economic area (mostly black residents) were more likely to be at risk of developing malnutrition than those from a higher socio-economic area (all white residents). Similar findings have been reported in The English Longitudinal Study of Aging Elderly which reported that elderly participants from a lower socio-economic neighbourhood were found most vulnerable for malnutrition and consequently, for frailty.<sup>20</sup> Balia and Jones<sup>21</sup> have reported that inequalities in health between different social groups are partly explained by differences in lifestyle and living conditions depending on socio-economic status.

In the current study, participants from a higher socio-economic area were found to be significantly older than participants from a lower socio-economic area. Possible reasons for this finding may be related to the increased likelihood of presenting with poor health at an earlier age in the elderly from a lower socio-economic area, due to a lifetime of deprivation of healthier foods and health care. According to Lin *et al.*<sup>22</sup> a shorter life expectancy was observed in disadvantaged individuals living in the United States of America, emphasising the influence of socioeconomic status on survival.

The World Health Organisation (WHO) defines a normal BMI for adults as 18.5 – 24.9 kg/m<sup>2</sup>.<sup>23</sup> However, previous studies have concluded that the elderly with a BMI in the overweight range (25 – 29.9 kg/m<sup>2</sup>) had a lower or similar risk of mortality than their normal weight counterparts.<sup>15</sup> Thus, an adjusted BMI range can be used to interpret mortality risk in the elderly. Despite the fact that the median BMI of both groups of participants fell in the optimal range (lowest all-cause mortality) for the elderly, 37.1% of participants in both facilities had a BMI below 23.0 kg/m<sup>2</sup>. According to Winter *et al.*<sup>15</sup>, a BMI value below 23.0 kg/m<sup>2</sup> indicated an increased risk of mortality. This value coincides with that which is used in the MNA®, since an individual will be awarded a lower score as BMI decreases below 23.0 kg/m<sup>2</sup>.

A significantly higher percentage of the elderly from the lower socio-economic area had a CC of less than 31 cm which indicates a higher risk of muscle wasting. Bronnefoy *et al.*<sup>24</sup> have emphasised that the easily accessible CC is an important parameter to use in the assessment of the nutritional status of the elderly. According to Tsai and Chang<sup>25</sup>, a smaller CC is associated with mortality, muscle-related disability and functional decline in older adults. More participants from the higher socio-economic area could go out compared to participants from the lower socio-economic area, with significantly more participants from the lower socio-economic area being bed-bound or chair-bound. Malnutrition increases the risk for frailty which is associated with poor mobility.<sup>26</sup> Loss of muscle mass and frailty are closely related to loss of strength, reduction in physical function and diminished capacity to exercise, all of which significantly impact on the well-being of the elderly.<sup>7</sup> More than a third of participants from the lower socio-economic area could go out, but do not go out. It should be noted that the opportunities for going out were more available to the elderly from the higher socio-economic area, for example in the form of organised bus trips to a shopping centre. Based on their research, Choi *et al.*<sup>27</sup> reported that the elderly in care facilities view going out as a temporary escape from social isolation and an important connection to the outside world.

As age increases, the need for medication also increases. More than half of the elderly in both facilities included in the current study used more than three prescription medications per day. The term 'polypharmacy' has been used with different meanings and definitions in the literature, including the use of more than three medications.<sup>28</sup> Regardless of the definition, the elderly is a population group vulnerable to the negative consequences of polypharmacy, since aging influences how the body metabolises medications. Polypharmacy in the elderly is associated with falls, hip fractures, confusion and preventable hospitalisation.<sup>29</sup>

In the facility from the lower socio-economic area, significantly more of the participants had a fluid consumption of less than three glasses per day compared to their counterparts. This may be due to the higher mobility of the participants living in the facility in the higher socio-economic area who are thus able to

fetch their own drinks and visit the restroom frequently. Physiological changes in the elderly increase the likelihood for developing dehydration. Dehydration is one of the most common causes for hospitalising an elderly person residing in a long-term care facility, and special attention is required during periods of warm weather.<sup>30</sup> According to Wotton *et al.*<sup>31</sup>, there is a strong association between malnutrition and dehydration in the elderly. Dehydration is also associated with constipation, medication toxicity, decreased muscle strength, headaches and an increased risk for pressure sores.<sup>31</sup> In this study population, no statistically significant differences were found between fluid intake and the presence of pressure sores.

Significantly more participants from the higher socio-economic area obtained a full score for the intake of protein rich foods. Baum and Wolfe<sup>32</sup> reiterate the importance of a higher protein intake for improving physical function in the elderly. A low fruit and vegetable consumption is associated with a higher risk of micronutrient deficiencies, a low fibre intake and chronic disease.<sup>33</sup> In the current study, participants from the higher socio-economic area consumed more fruit and vegetable portions than their counterparts, most probably due to possible financial constraints in the facility from the lower socio-economic area. In urban Sao Paolo, Viebig *et al.*<sup>33</sup> have confirmed that fruit and vegetable intake is most often determined by socio-economic situation. More participants from the lower socio-economic area reported a moderate decrease in appetite and recent weight loss. Physiological anorexia is caused by, amongst others, a diminished sense of taste and smell, delayed gastric emptying, and hormonal influences. A decreased food intake can contribute to malnutrition, and it has been reported that improving food palatability can improve dietary intake and body weight in the elderly in long-term care facilities.<sup>34</sup> However, the fact that anorexia and weight loss occurred more frequently in the facility situated in the lower-socioeconomic area demonstrates the possible effects of socio-economic factors on nutritional status.

More participants from the lower socio-economic area reported a low self-perceived health status. Johansson *et al.*<sup>6</sup> have reported that a lower self-perceived health status was one of the highest predictive risks for malnutrition. Indeed, these participants had an increased risk for malnutrition.

After all sections were scored together, the final score indicated that more elderly residents from the lower socio-economic area were considered malnourished and at risk of malnutrition than residents from the higher socio-economic area. A combined prevalence of malnutrition was identified in 9 of 124 participants (7.3%), while the combined prevalence for a risk of malnutrition was 55.6%. This figure corresponds with similar studies done in Europe.<sup>35,36</sup> Even though relatively few participants in the current study were classified as malnourished, the high number of participants with a risk of malnutrition is concerning. Such individuals should also receive interventions to improve nutritional status, and be carefully monitored to ensure the avoidance of deterioration of nutritional status.

There is a paucity of data regarding the nutritional status of elderly Africans,<sup>37</sup> including South Africans.<sup>17</sup> Charlton *et al.*<sup>2</sup> used the MNA® and determined that malnutrition was present in 5.0% of elderly residents (both community dwelling and in care facilities) in peri-urban Cape Town, and that half of the participants were at risk of malnutrition. These findings correspond with the combined malnutrition prevalence in the current study. More recent published data from South Africa investigating nutritional

risk in the elderly, were obtained in a sample of community-dwelling elderly from KwaZulu-Natal, South Africa.<sup>38</sup> The authors used the MNA®-Short Form and identified malnutrition in this group in 5.5% of participants, which is similar to the current study. However, the methodology of that study differs from the current study in that the elderly were not in long-term care facilities, and the short form of the MNA® was used. Regardless of these differences, the prevalence of malnutrition in the elderly, irrespective of where they reside, requires prompt intervention.

### Limitations

The main limitation of the study included the self-reported nature of the components of the MNA®, which can lead to over-representation or underrepresentation of risk factors for malnutrition. Due to the relatively small study sample, the results cannot be extrapolated to all elderly residents in long-term care facilities in South Africa. Forty-four residents either refused to participate or did not meet inclusion criteria due to cognitive impairment, which could introduce a certain degree of bias.

### Conclusion

The findings of this study confirmed that elderly residents from a long-term care facility situated in a lower socio-economic area were more likely to have a poor nutritional status and be malnourished. The fact that participants from the lower socio-economic area were younger confirms that ageing itself is not the only factor that is involved in a compromised nutritional status. Significant differences in indicators of well-being and nutritional status in the elderly from a higher and lower socio-economic area confirm the complex interplay between nutritional status and health in the elderly.

### Recommendations

The findings of the current study support the importance of routine screening for malnutrition in elderly populations.<sup>38</sup> Relevant and culturally acceptable interventions need to be designed and implemented to improve nutritional status in the elderly in order to meaningfully improve health and quality of life. In a Cochrane review by Milne *et al.*<sup>39</sup> it was concluded that the use of protein and energy supplements might be beneficial in improving the intakes and nutritional status of the elderly in long-term care who are at risk of developing malnutrition.<sup>39</sup> However, in resource poor settings, the provision of expensive supplements might prove to be an obstacle. The involvement of nutrition experts, such as dietitians, during the planning of meals for these elderly residents, might be an effective way of improving nutrient adequacy, whilst remaining within the food budget of the facility. Smoliner *et al.*<sup>40</sup> reiterate that physical therapy should also be a focus in the treatment of the frail elderly in care facilities since it might preserve functional status. The increased involvement of physiotherapists and occupational therapists can assist in this regard. Stange *et al.*<sup>41</sup> propose that nursing personnel in elderly care facilities should receive adequate training related to nutritional problems specifically for residents who are functionally impaired. It is thus recommended that the elderly be screened at regular intervals to identify and treat nutritional problems timeously to improve outcome and quality of life.

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