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

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Dietary patterns among South African older adults indicate a moderate intake of total fat and salt, as well as a high sugar intake. Total fat, saturated fat, sugar and salt intakes are associated with non-communicable diseases (NCDs) and mortality. Processed and ultra-processed foods are common in elderly households and contain high levels of fat, sugar and salt and are associated with frailty. This paper aims to review the available scientific evidence on the effect on health status of dietary sugar, fat and salt consumption among the elderly. This information will be used to confirm the need for dietary sugar, fat and salt food-based dietary guidelines for the elderly South African population.

Keywords elderly, fat intake, food-based dietary guidelines, salt intake, South Africa, sugar consumption

Introduction

Regular consumption of processed foods can potentially contribute to excessive intakes of sugar, sodium and saturated fats that have a negative impact on health, especially in the elderly. Unfortunately, people can also add too much sugar, salt and fat to foods prepared at home. The consumption of too much added sugar, salt and fats, specifically saturated fats, can undermine healthy eating and should be used sparingly in the diet.[1]

Evidence shows an association between total dietary sugar intake and body weight.[2–7] Elevated dietary glycaemic load induced by high sugar consumption results in increased hepatic lipogenesis, dyslipidaemia,[3] insulin resistance, increased risk of metabolic syndrome (MetS),[3,8] type 2 diabetes (T2D),[3,8–10] and cardiovascular disease (CVD),[11–14] as well as dental caries.[15]

Although dietary fat is an essential part of the diet for older adults, there is evidence suggesting a relationship between fat intake and the development of chronic non-communicable diseases (NCDs), specifically dyslipidaemia, CVD and T2D. The emphasis of dietary guidelines has been historically on reducing the amount of total dietary fat rather than the type and quality of dietary fat that constitutes the overall percentage of total energy intake from different types of fatty acids. However, a growing body of evidence shows that there should be more emphasis on the type of fatty acids and the overall dietary pattern, rather than solid recommendations on following a low-fat diet.[16]

Research has shown a significant relationship between salt (sodium) intake and both systolic and diastolic blood pressure.[17–19] High salt intake also contributes to several other diseases that affect the elderly. Evidence from systematic reviews of studies conducted in different parts of the world and with different age groups reported an association between high sodium intake and hypertension,[17,18,20,21] CVD,[17,22–25] kidney stones,[26–28] certain eye conditions,[29,30] osteoporosis,[31,32] gastric cancer[33,34] and mortality.[19,22]

The body of evidence is thus strongly in favour of the assumption that lower consumption of added sugars, fat and sodium is associated with lower risk of NCDs in all adults including the elderly. Research also indicates that ultra-processed foods are high in fat, salt and sugar and is associated with frailty.[34] The revised food-based dietary guidelines (FBDGs) for the South African population aged seven years and older, namely 'Use sugar and foods and drinks high in sugar sparingly',[35] 'Use fats sparingly, choose vegetable oils rather than hard fats',[16] and 'Use salt and foods high in salt sparingly',[36] sufficiently provided the scientific basis to reduce risk of NCDs, but no specific information related to the elderly was included. The objective of this review is to provide supporting scientific evidence, specifically related to the South African elderly. The information in the revised 2013 FBDGs is relevant to the FBDGs for the elderly and will thus not be repeated, but additional information pertaining to the elderly specifically will be included to justify adoption or changes to the revised 2013 FBDG.[16,35,36] Each of these guidelines will be discussed separately.

Use foods and drinks high in sugar sparingly: a food-based dietary guideline for the elderly in South Africa

Definitions

The World Health Organization (WHO) defines sugars as (a) intrinsic sugars that are present in the structure of fruits and vegetables by nature (fructose); (b) sugars that are present in dairy (lactose and galactose); (c) free sugars including monosaccharides and disaccharides added to foods and beverages by the food industry or the consumer; and (d) sugars naturally

present in honey, syrups, fruit juices and fruit juice concentrates.[37] Based on the definition by the WHO, it seems that the terms 'free sugars' and 'added sugars' are used interchangeably. Added sugars could be listed under different names on food labels, including brown sugar, corn sweetener, corn syrup, dextrose, fructose, glucose, high-fructose corn syrup, honey, invert sugar, lactose, malt, syrup, maltose, molasses, raw sugar, sucrose, trehalose and turbinado sugar.[38] Foods with intrinsic sugars generally have more favourable nutrient profiles compared with those with added sugars that are added to foods during processing and preparation including mostly foods (e.g. jam, biscuits, cake, sweets, chocolates, sweetened breakfast cereals) and beverages (e.g. carbonated sugar-sweetened beverages, sweetened fruit and dairy drinks, fruit-flavoured squashes) higher in energy and lower in nutrient density.[39]

Importance of restricting sugar consumption among the elderly

Higher sugar intakes contribute to increased energy intakes that are associated with overweight, obesity and chronic diseases.[40] In addition, free sugars were responsible for 26.3% of the oral dental disease burden globally in 2010.[41] The harmful effects of sugar were also described and confirmed in the 2013 revised FBDG for South Africa (SA);[35] however, very little information pertained to the elderly. A study among the elderly in SA has shown that fibre intakes were inversely associated with sugar intakes. Added sugars resulted in a nutrient-diluting effect that contributes to a higher risk for inadequate micronutrient, protein and fibre intakes, which may negatively impact the performance and quality of life of the elderly.[2] There is also strong evidence that the intake of carbonated sugar-sweetened beverages (SSBs)/soft drinks has an inverse association with bone mineral density and a positive association with bone fractures due to the high levels of caffeine and phosphates that interfere with calcium absorption and cause loss of balance in calcium homeostasis, and thus an additional loss of calcium.[42] Although limited evidence exists that SSB consumption is associated with an increased risk of incident stroke and dementia,[43] conflicting findings for stroke have also been reported[44] and the evidence is thus not conclusive. However, stroke has a high mortality and disability burden in SA: 33% and 75% of all stroke cases die within 28 days or 4 years post-event. Also, 50–65% of stroke survivors remain with either a physical or cognitive disability. Approximately 10.0–13.0% of the national health budget is allocated to the cost of treating stroke and it is estimated that the 20% SSB tax implemented in 2017 may reduce the number of obese adults by more than 220 000, reduce the prevalence of diabetes by 4% and avert approximately 550 000 stroke-related disability-adjusted life years (DALYs) in SA.[45]

Sugar consumption among the elderly in South Africa

One aspect of the existing nutrition transition in SA is the food consumption shifts towards a diet higher in total energy, total dietary fat, processed snack foods and sugar-sweetened beverages (SSBs)/soft drinks. Despite SA having a significant production capacity, an increase of 83% in nutrient-dense and nutrient-poor processed snack foods imported into SA and the South African Development Community (SADC) was observed between 1995 and 2010.[46] The annual per capita total soft drink consumption has increased from 55.0 litres in 1999 to 92.9 litres in 2012. This is significantly higher than the global average of 22.3 litres per capita per year. This increased consumption was true for all soft drinks, including SSBs, low and no-calorie beverages, other sparkling beverages, ready-to-drink (RTD) juices and juice drinks, sports and energy drinks, RTD coffees and teas, liquid concentrates (e.g. squashes), sweetened dairy beverages and flavour and vitamin-enhanced waters.[47] Over the past 50 years, added sugar consumption in the form of SBBs showed a rising trend among South Africans[3] and SA is one of the top 10 countries with the highest consumption of SSBs in the world.[48] In 2012 SSBs alone constituted about one-third of the sugar content in the SA diet.[49] A report by Ronquest-Ross and co-authors showed that there was a 7.5% decrease in the consumption of raw sugar and natural sweeteners from 1994 to 2015. When sugar content of processed foods was taken into consideration, however, the total intake of sugar and non-nutritive sweeteners (NNS) had increased by 7.1% since 1994–2015. A large increase of 33.1% in consumption of processed snacks and confectionary using sugars and sweeteners as ingredients and SSBs was observed[50] due to these products becoming more affordable and accessible. This is reflected in the market for soft drinks, which doubled from 2294 million litres in 1998 to 4746 million litres in 2012. During the same time the market for processed packaged foods increased from ZAR 55 815 to ZAR 61 286.[46] Plain sweetened biscuits sales increased by 60.0% from 1999 to 2012 and this is attributed mainly to lower price point offerings for strong brands that appeal to the lower income population groups.[47] The South African Health and Demographic Survey (SADHS) (2016) showed that, although the per capita SSB consumption ranged from 391 to 700 ml per person per day throughout the country, the elderly (≥ 65 years) had the lowest proportional intake (19.0%) when compared with other age groups.[51]

The South African National Health and Nutrition Examination Survey (SANHANES-1) found a low sugar intake (mean sugar score of 2.2) among the elderly (≥ 65 years). The largest proportion of the population with a low sugar score and the lowest rate of a high sugar score (sugar score of 6.0–8.0) was found among the elderly (59.4% and 10.7%, respectively).[52] Two smaller studies among the elderly showed that the mean daily per capita intake of white sugar was 15[53] and 12[54] grams (g) respectively, with SSBs and fruit juice appearing in the top 20 most frequently consumed foods. These results point to the fact that some elderly individuals may consume more than the recommended sugar intake (10% of total energy),[37] which may be harmful, particularly for those who are already overweight/obese.[35] This is consistent with a study undertaken in 13 European countries which showed that total sugars contributed more than15% of total energy intakes (15.0–22.5%) in the elderly.[55] A study among Brazilian elderly has found that table sugar was the major source of added sugar, but that table sugar and SSBs represented more than 50% of the added sugars consumed.[56] Similar findings were observed in Spain where table sugar, pastries, jams, sweetened yoghurt and fermented milks were the major contributors to the average daily added sugar intake of 20.7 g (14.9% of total energy).[57]

Added sugar recommendations in different countries' guidelines

Recommendations for the intake of added sugars vary and the different guidelines have various definitions for 'sugar'. Table 1 provides a summary of different recommendations on (added/free) sugars.

Table 1: Recommendations regarding sugar intake in different countries

Resource	Recommendation	Quantitative measure (if any)	Definition of added sugar (if provided)	Additional consideration	Additional consideration
Dietary Guidelines for Americans 2015–2020 (USDA)[38]	'Limit calories from added sugars and saturated fats and reduce sodium intake. Consume an eating pattern low in added sugars, saturated fats, and sodium. Cut back on foods and beverages higher in these components to small amounts that fit within healthy eating patterns.'	'Consume less than 10.0 percent of calories per day from added sugars'	'Added sugars include syrups and other caloric sweeteners that are added to foods during processing or preparation.'	'The fruits food group includes whole fruits and 100.0% fruit juice. At least half of the recommended amount of fruits should come from whole fruits. When juices are consumed, they should be 100.0% juice, without added sugars.'	'Grain products that are high in added sugars and saturated fats, such as cookies, cakes, and some snack foods, should be limited.'
Dietary Reference Intake (Institute of Medicine)[58]	'No more than 25 percent of energy from added sugars should be consumed.'	'No more than 25.0 percent of energy from added sugars should be consumed.'	'Added sugars are defined as sugars and syrups that are added to foods during processing or preparation.'	'Although there were insufficient data to set a UL for added sugars, this maximal intake level is based on ensuring sufficient intakes of essential micronutrients.'	N/A
World Health Organization (WHO)[37]	'A reduced intake of free sugars throughout the life course' (strong recommendation)	'Reducing the intake of free sugars to less than 10.0% of total energy intake in both adults and children' (strong recommendation)	'Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.'	'A further reduction of the intake of free sugars to below 5.0% of total energy intake (conditional recommendation).'	'Free sugars', include both added sugars and all sugars present in 100% fruit juice, honey, syrups, and fruit juice concentrates.
American Heart Association (AHA)[59]	'A prudent upper limit of intake for added sugars as half of the discretionary calorie allowance that can be accommodated within the appropriate energy intake level needed for a person to achieve or maintain a healthy weight based on the USDA food intake patterns.'	'For most American women is no more than 100.0 calories per day and for most American men is no more than 150.0 calories per day from added sugars.'	'Sugars added to foods and beverages when they are processed, prepared, or at the table'	N/A	N/A
Dutch Dietary Guidelines 2015[60]	'Minimize the consumption of sugar-containing beverages.'	'Minimize the consumption of sugar-containing beverages to less than 150.0 mL/d.'	'Sugar-containing beverages are all drinks with added sugar and other sugar-containing beverages such as fruit juice and they have similar sugar content.'	The language conveys the recommendations do not defer between naturally occurring sugar in beverages (e.g. 100.0% fruit juice) and beverages with added sugar.	N/A
Canada's Food Guide[1]	'Choose vegetables and fruit prepared with little or no added fat, sugar or salt'; 'Choose grain products that are lower in fat, sugar or salt.'	N/A	N/A	N/A	N/A
Australian Dietary Guidelines[61]	'Limit intake of foods containing saturated fat, added salt, added sugars and alcohol.'	N/A	'It's the foods and drinks with sugars added as a sweetener, flavor enhancer or preservative, not the naturally occurring sugars in fruit, vegetables or milk products.'	Has a statement about artificially sweetened foods and beverages mentioning that they can provide a useful alternative to foods with high added sugars. But artificially sweetened soft drinks should only be used sometimes and in small amounts since they are acidic and may erode tooth enamel.	N/A

The South African FBDG for people aged seven years and older[35] is consistent with the WHO recommendation[37] to limit the daily intake of sugar to 10% of total energy intake, an estimated 25–50 g per person per day. Although a further restriction to ≤ 5% was recommended by the WHO,[37] this will be difficult to achieve. Taking into consideration the high prevalence of overweight/obesity and its comorbidities among the elderly, sugar intakes should be restricted to 10% of the total energy intake per day, thus 25–30 g or a maximum of six teaspoons per day. Sufficient evidence exists to justify this FBDG for the elderly. Also, due to the high consumption of processed sweetened snacks and SSB, the 2013 sugar-related FBDGs for South Africans were revised to 'Use foods and drinks high in sugar sparingly'[62] for the elderly.

Practical considerations to limit sugar intakes among the elderly

In order to practically address limiting sugar intakes among the elderly, the preference for SSBs and snack foods should be taken into consideration. Moreover, in resource-limited communities, competing needs may increase demand for the consumption of easily accessible foods and beverages with high sugar content. In this regard, the following practical recommendations are suggested to limit sugar intakes among the elderly:

- Avoid chewy and sticky foods such as sweets and dried fruit in between meals as these adhere to teeth longer and result in acid-creating bacteria and dental caries. Rather consume these foods with meals.[15]
- Consume food products with low calories and no added sugars regularly, e.g. fruit and vegetables, fibre-rich grains, low fat/fat free dairy products.[63]
- Replace SSBs, energy drinks and sport drinks with water or fruit-infused water.
- Replace fruit juice with fruit-infused water.
- Gradually reduce the sugar in coffee and tea to zero sugar added.
- Replace sweetened breakfast cereals with unsweetened cereals/porridge such as oats, maltabella, and maize porridge.
- Choose plain milk instead of flavoured milk.
- Choose natural plain yoghurt instead of sweetened flavoured yoghurt and add a little honey, vanilla or fresh chopped fruit to it if too sour.
- Prevent adding sugar to naturally sweet-flavoured vegetables (e.g. carrots, pumpkin).
- Restrict intakes of confectionery, biscuits, sweets, ice cream, chocolates and dessert.
- Read food labels when purchasing foods and beverages and avoid food items with added sugars (sugar, honey, brown sugar, molasses, glucose, fructose, syrup, maltose, sucrose, dextrose).
- Replace jam with fish paste or peanut butter on bread.
- Advise the elderly with diabetes and metabolic syndrome to avoid or consume NNS in minimal amounts.

Note on non-nutritive sweeteners

Artificial sweeteners (AS), also called non-nutritive sweeteners (NNS), are much sweeter than sugar and the majority contribute no or very little energy to the diet.[63,64] NNS were originally developed as alternatives to sugar in the diet and the

purpose was to decrease energy intake, as well as to prevent/decrease the incidence and prevalence of overweight, obesity and diabetes mellitus respectively.[64] Saccharin, aspartame, sucralose, neotame, stevia and acesulfame-K are the six NNS approved as safe for human consumption by the United States Food and Drug Organization (FDA).[63] There has thus been a surge in the use of NNS that resulted in many products, including confectionary, sweets, chewing gum, salad dressings, soft drinks and non-edible products such as mouthwash, toothpaste, cosmetic products and certain medications being available on the market.[63,64] Global health organisations, including the British Dietetic Association and the American Diabetes Association, recognised and stated that NNS do not raise blood glucose or insulin levels, and when used as a sugar replacement can lower carbohydrate intakes. This can lead to better long-term glycaemic and weight control as well as improved cardio metabolic health.[65] This was confirmed in the Dietary Guidelines 2020–2025 Scientific Report.[66] All these benefits led to NNS becoming more popular and widely used as a sugar replacement for obesity-related comorbidities such as MetS and insulin resistance.[64,67] A similar trend was also observed in SA.[47] Contversely, epidemiological, observational and biomedical research has shown that obesity, glucose intolerance and diabetes may be promoted by regular NNS consumption over a long period of time.[68] A review of the scientific evidence also showed a significant impact of long-term consumption of NNS on the microbiome, glucose homeostasis, overall weight gain and adiposity.[64] This may be explained by the findings of Nettleton and co-authors[68] that NNS consumption disturbs the gut microbiota and thus disrupts metabolic health in susceptible people. Not all people are equally affected and the response to NNS consumption may depend on (a) the individual variability (a person's 'starting gut microbiota profile'), (b) the dose of NNS or (c) the unique chemical composition and metabolism of the individual NNS.[68] However, a recent review assessing the effects of NNS in nine randomised controlled trials ($n = 979$ people with type 1 or 2 diabetes) did not show significant differences among NNS or sugar or a placebo on bodyweight. Neither were other side effects observed.[67] The effects of NNS on glucose metabolism are not yet clearly understood,[69] specifically not in the elderly for whom very little evidence was available in the published literature.

Although the use of NNS is generally considered safe for human consumption, Nettleton and co-authors warn that safe may not necessarily be healthy.[68] Due to the conflicting information and paucity thereof specifically related to the elderly, elderly people with any condition (e.g. diabetes, dementia, epilepsy) should use NNS with caution. The FDA established the recommended level of NNS as the maximum consumption level with no adverse effects at one milligram of NNS per 100 kg (kg) bodyweight. The elderly should further be warned that the amount of NNS in for example toothpaste and mouthwash is not available, but also contributes to the total NNS intake.[63]

Use fats sparingly: choose vegetable oils rather than hard fats – a food-based dietary guideline for the elderly in South Africa

Importance of addressing dietary fat consumption among the elderly

The different types of fat and harmful effects of fat were also described and confirmed in the 2013 revised FBDG for SA, but

very little information pertained to the elderly.[35] Studies pertaining specifically to the elderly will be described here.

According to the Vulnerable Groups Indicator report of 2017, 60.1% of South Africans aged 60 years and older suffer from chronic diseases.[70] Dietary fats have long been studied for their association with developing chronic conditions such as CVD, cancer and diabetes. Among all types of fatty acids, saturated fatty acids (SFAs) have been recognised as the number one culprit for increasing serum cholesterol levels.[16,52,71] In addition, a growing body of evidence from animal and cellular studies suggests that SFAs reduce insulin sensitivity and promote chronic inflammation. Clinical studies have not yielded consistent evidence with respect to SFAs on adverse effects on blood pressure, thrombosis and vascular function.[72] For decades, the emphasis of dietary recommendations has been on reducing the proportion of energy intake from total dietary fat and SFAs. However, current evidence suggests the need for more multidimensional recommendations to address the complex interplay between different types of dietary fats, the food sources of dietary fats and the proportion of energy from the three macronutrients (fats, carbohydrates and proteins).[73] In this section, we will review some aspects of this interplay.

High-fat diets result in an increase in postprandial triglyceride level, which is linked to a higher risk of developing cardiovascular disease (CVD), including coronary heart disease (CHD) and stroke.[74] However, in the Women's Health Initiative study, over 8 years of follow-up, postmenopausal women (50–79 years) who were randomised to receive a low-fat diet (total fat intake 20.0% of energy) did not show any significant lower risk of CHD, stroke or CVD compared with the comparison group.[75] The results of a meta-analysis of cohort studies and randomised controlled trials[76] confirmed these findings. On the other hand, findings from the Seven Countries Study, conducted among 16 cohorts of middle-aged men, indicated a strong association between average SFA consumption, average serum cholesterol level and 10-year CHD mortality rates.[77] At 25 years, this strong relationship was still observed between CHD mortality rates and average SFA consumption.[78] In this study, CHD-related mortality over 10- and 15-years' follow-up were inversely associated with monounsaturated fatty acid (MUFA) intake at baseline. Moreover, the results showed that variations in SFA and MUFA consumption could greatly explain the variability of CHD-related mortality rates in different geographical regions.[76] Likewise, a systematic review aiming to assess the relationship between dietary factors and CHD found a significant inverse association for MUFA, but the evidence for a causal association between SFA and CHD was weak. However, in this study, a western dietary pattern was associated with CHD (RR [95.0% CI] 1.55 [1.27–1.83]).[79] Two meta-analyses did not find any significant association between MUFA intake or its biological measures and risk of developing CHD or its mortality.[76,80]

To understand the inconsistencies in the MUFA–CHD association, it might help to note that MUFA and SFA coexist in many foods, particularly in animal sources, which makes it difficult to estimate the independent effects of MUFA.[81] For example, in the Nurses' Health Study, dietary intakes of MUFA and SFA were highly positively correlated with one another ($r = 0.81$), suggesting that fat was primarily from animal sources.[82] In western dietary patterns (dietary habits of the United States and northern Europe), MUFA mostly comes from animal sources such as meat and meat products, added

fats and dairy products, whereas in southern Europe (e.g. Greece, Spain, and Italy), 64% of dietary MUFA is supplied from plant sources, most importantly from extra virgin olive oil.[83] Therefore, when the MUFA–CHD association is assessed in a western cohort, investigators probably assessed oleic acid (major MUFA in pork, beef and olive oil) from beef and pork; but among a Mediterranean cohort, intake of oleic acid from olive oil would be analysed.[84] Evidence has shown that benefits of MUFA differ in respect of the sources these fatty acids originate from (plant vs. animal sources).[85] In the meta-analysis by Schwingshackl and co-authors, the higher tertile of MUFA intake from various sources showed 11%, 12%, 9%, and 17% lower risk for all-cause mortality, CVD mortality, combined CVD events and stroke respectively compared with the lowest tertile. Interestingly, in a subgroup analysis, such a relationship was only seen between olive oil and lower risk for all-cause mortality, CVD events and stroke.[83]

Although population studies have produced heterogeneous results in respect of the association between individual fatty acid types and CHD risk, findings for polyunsaturated fatty acids (PUFAs), particularly omega-3 PUFA ($n-3$), have been consistent. There is strong evidence that $n-3$, particularly eicosapentaenoic acid (EPA) (20:5, $n-3$) and docosahexaenoic acid (DHA) (22:6, $n-3$), have protective effects against CHD.[86] Contrary to this, a meta-analysis investigating the replacement of SFA with omega-6 PUFA showed that it is unlikely to reduce CHD events or mortality.[87]

A meta-analysis by Mozaffarian and Rimm (2006) showed that risk of coronary disease mortality and total mortality reduces by 36% and 17% respectively with daily consumption of 250 mg EPA/DHA.[86] Moreover, another meta-analysis demonstrated that alpha-linolenic acid (ALA) (18:3, $n-3$) consumption may also have cardiovascular benefits, so that each 1 g per day increment of ALA intake was associated with a 10% lower risk of CHD-related mortality.[88] ALA is mostly taken from plant foods such as flaxseed, walnuts, canola oil and soybeans; therefore, it is less expensive and more accessible compared with EPA and DHA, which are mostly consumed from seafoods.[89] ALA is an essential fatty acid and cannot be synthesised by the human body. It is converted to EPA within the body; however, the conversion rate is limited to less than 10%.[88] Therefore, it is not clear whether or not the beneficial effects of ALA go beyond EPA-mediated mechanisms. Common mechanisms through which ALA and EPA/DHA work may include anti-arrhythmic properties, anti-thrombosis properties, improvement in endothelial function and inflammatory factors.[88]

The other type of fatty acid with convincing evidence of association with CHD events is trans fatty acid (TFA) consumption, which is associated with higher risk of CHD events. TFAs are unsaturated fatty acids, which originate from two sources: naturally occurring ingredients in beef, lamb and dairy products and industrially produced TFA, produced when vegetable oils are partially hydrogenated in the food industry. TFA from both sources contains the same isomers, but in different proportions. Elaidic acid isomers (trans-C18:1 D9) are found in larger quantities in industrially produced fat, while vaccenic acid (trans-C18:1 D11) is usually the main component of the TFA pool coming from ruminants.[90] It has been suggested that the detrimental effects of TFA go beyond their impact on serum lipid profile, such as the evidence of TFA effects on endothelial function and inflammatory processes. These effects are suggested to be through TFA incorporation into cell membranes, which

consequently affects inflammation-related membrane signalling pathways and endothelial dysfunction. Moreover, consumption of TFA has been linked to increased tumour necrosis factor (TNF) system activity, plasma interleukin (IL)-6 level and CRP level independent of serum lipid profile.[91,92] Moreover, certain studies suggest that in the assessment of the role of TFA in the development of CHD, their source of origin is an important factor to be taken into consideration. For example, a systematic review and meta-analysis of observational studies performed by de Souza and co-authors demonstrated that total TFA intake was associated with all-cause mortality, CHD mortality and total CHD risk. However, when stratified, based on TFA source, only industrial, but not ruminant, TFA was associated with CHD mortality and CHD risk.[93]

However, the aforementioned summary of the health effects of different types of fatty acids, especially on CVD events and mortality, provided an overview on the complexity of the impacts of each individual type of dietary fat. The literature makes a clear distinction between CVD and CHD and the main findings are summarised as follows:

- Cardiovascular disease

The mechanisms underlying the dietary fat effects on CVD remain unclear. A recent dose–response meta-analysis of cohort showed that reducing total fat or SFA intake does not necessarily bring about an improved lipid profile or lower risk of CVD. The same meta-analysis did not find any association of total dietary fat, PUFA, MUFA and SFA intake with risk of CVD, but TFA intake showed a linear dose–response association with risk of CVD and also an inverse association between PUFA intake and risk of CVD among studies followed for 10 or more years. Although this meta-analysis did not support the hypothesis that dietary fat intake could increase risk of CVD, the role of dietary fat could have been confounded by other food sources such as fruits and vegetables that have a protective role against CVD development.[94] In addition, conflicting evidence exists for the efficacy of omega-3 fatty acids on lowering risk of CVD, particularly among the elderly.[95]

- Coronary heart disease

Research has found that reducing total fat or SFA intake does not necessarily bring about an improved lipid profile or lower risk for CHD events and mortality but, rather, the types of nutrients that replace them are of particular importance. Substitution of total fat or SFA with carbohydrates is not associated with reduced risk of CHD. Conversely, there is convincing evidence that substituting PUFA for SFA is associated with reduced risk of CHD events and deaths.[74,91,92] It has been shown that for every 1% energy supplied by PUFA instead of SFA, incidence of CHD is reduced by 2–3%.[91,92] The health effects of substitution of MUFA for SFA depend on the type (e.g. cis vs. trans configurations) and source (e.g. plant vs. animal foods) of MUFA.[85] Replacement of TFA with carbohydrate and other types of fatty acids including SFA results in improved lipid profile; however, the most favourable effects are seen by replacing SFA with PUFA.[91,92] Additionally, a theoretical dietary substitution analysis concluded that when tub margarine is replaced with butter or harder stick margarine, a lower risk of myocardial infarction is observed.[96]

In sum, the elderly have different nutrient requirements from adults because of changes in physiological and body composition, physical activity, disease incidence, loss of sensory appreciation, reduced appetite and dentition that may result in chewing and swallowing problems that may lead to inadequate dietary intakes,[97] resulting in nutrition-related diseases. Therefore, the cornerstone of dietary recommendations in respect of fats should be optimising the type and quality of dietary fats. For this reason, the existing revised 2013 FBDG, namely 'Use fats sparingly. Choose vegetable oils, rather than hard fats',[16] is adopted for the elderly FBDGs. Moreover, recommendations for dietary fat intake should be complimented by recommendations on total energy composition and adopting a healthy diet as recommended by the FBDGs for the elderly. The focus should thus not only be on dietary fat intakes, but also on eating a variety of foods, with an emphasis on low- or fat-free fat dairy products, lean protein sources, wholegrains, fruit and vegetables, nuts, seeds and liquid vegetables.[98,99]

The South African situation

There is a scarce body of evidence regarding the contribution of the different types of fatty acids to total energy intake, particularly among the elderly. The cardiovascular risk in black South Africans (CRIBSA) study showed an increase in total fat intakes from 1990 to 2009 among men and women aged 19–64 years old.[100,101] Similar trends were observed in the Prospective Urban and Rural Epidemiology (PURE) study.[3] However, the fat intakes were still in the recommended 25–35% of total energy intake range for both studies.[51,100,101] A review of 12 studies and two raw databases demonstrated that percentage energy intake from fat ranged between 17% and 37% (mean 25.3%), however.[102] The 2012 SANHANES showed the national mean fat score was 7.3 (moderate fat intake) with the elderly (≥ 65 years) showing the lowest mean fat score (5.5) among the different age groups, indicating low fat intakes. However, 35.7% and 9.3% of the elderly had moderate and high fat scores respectively.[52]

Food items that contribute to total dietary fat intakes include non-dairy creamers, margarine (brick), chicken, full-cream milk, chicken eggs, beef, fish, chicken heads and feet, oily bread spreads, and peanut butter.[16] Fat and oils consumption increased by more than 28.5% from 1999 to 2012 in SA, but the increase was largely attributed to increased vegetable oil (> 29.6%) and oil crops (108.3%) consumption. During this time animal fat consumption decreased by 53.8%. However, the consumption of butter increased by 33% between 1999 and 2012, reaching a per capita intake of 0.4 kg per year in 2012. A 13.6% increase in the consumption of margarine was observed over the same period, reaching a per capita intake of 2.5 kg per year.[50] This change was probably associated with a reduced maize and increased wheat (bread) consumption. No specific recommendation is made in the revised FBDG for SA regarding butter versus margarine intakes. The general recommendation is to 'consume food that is high in PUFAS or MUFAS, and limit the intake of food that is high in SFAs'.[16] In general, tub/soft margarine is made from vegetable oils and contains mainly PUFAS and MUFAS, but hard and stick margarine may also contain partially hydrogenated vegetable oils or fats, thus TFAs, and should be avoided. Butter is produced from animal fat and contains more SFAs. There is, however, an ongoing debate as to whether SFA consumption should be reduced to reduce the risk of chronic diseases of lifestyle, more specifically CVD.[103] However, the evidence strongly and consistently points to reducing dietary SFA and replacing it with PUFAs.[94,99] Thus, the evidence still favours margarine made from vegetable oils above butter consumption in FBDGs.[96]

Dairy (cheese, drinking milk products, yoghurt and sour milk) consumption increased from 37.2–42.6 kg per capita per year in 1999 and 2012 respectively and is also a source of SFAs in the diet. Cow's milk was the most consumed dairy product and increased from 27.4 to 29.4 litres per capita per year in 1999 and 2012 respectively. Olive oil consumption, an important source of MUFAs, seems to be consumed in small amounts with only 0.1 kg per capita per year in 2012.[50] It was estimated that street foods and fast foods were consumed by 2.5 billion people globally in 2011. Although no national data were available at the time, it was further estimated that street foods contribute to 40% of the daily diet of people living in urban areas in developing countries. This study also indicated that the population group ≥ 50 years old in SA consumed the least street foods (9.8%). Fast foods were most frequently consumed by the high-income group and least often in the low-income group.[104] During the last two decades there has been an increase in fast-food demand for both national and international fast-food brands in SA, but there are still no specific data are available for fast-food consumption by the elderly.[105] However, it is well known that fast foods are often fried and may also contribute to total fat, SFA and TFA intakes.[46] The 2016 SADHS indicated that 26.8% and 4.4% of the elderly (≥ 65.0 years) consumed fried foods at least once a week or daily, respectively. A similar trend was observed among the 55–64-year-old population, who consumed fried foods at least once a day (4.9%) or once weekly (29.7%).[51] Contribution of SFAs to the total energy intake ranged from 4–9% among South Africans,[16,52,71] which is within the recommended intakes. However, although it seems as if South African elderly are within the recommended guidelines for total dietary fat intakes, PUFAs provide only 5.5–9.0% of total energy intakes,[16,71] which is consistent with reviews that reported adults from 50% of the countries globally did not meet PUFA intakes at the recommended level of 6–10% of total energy.[106–108] In SA, this can be attributed to low consumption of oily fish, nuts and vegetable oils in the South African diet.

Recommendations for fat intake

The global recommendations for dietary fat intake are:

- Total dietary fat intake 25–35% of total energy intake.
- TFA < 1% of total energy intake.
- SFA < 10% of total energy intake.
- PUFA 6–11% of total energy intake.
- MUFA balance (total dietary fat – [SFA + TFA + PUFA]).
- Linoleic acid (C18:2; omega 6) 2.5–9.0% of total energy intake.
- Linolenic acid (C18:3; omega 3) 0.5–2.0% of total energy intake.[109]

Practical recommendations on how to reduce unhealthful fat and improve healthy fat intakes among the elderly

Reducing total fat or SFA intake does not necessarily bring about an improved lipid profile or lower risk of CHD events and mortality but, rather, the types of nutrients that replace them are of particular importance. Substitution of total fat or SFA with carbohydrates is not associated with reduced risk of CHD. Conversely, there is convincing evidence that substituting PUFA for SFA is associated with reduced risk of CHD events and deaths. It has been shown that for every 1% energy supplied by

PUFA instead of SFA, incidence of CHD is reduced by 2–3%. The evidence for the health effects of substitution of MUFA for SFA is inconsistent and depends on the type (e.g. cis vs. trans configurations) and source (e.g. plant vs. animal foods) of MUFA.[85] Replacement of TFA with carbohydrate and other types of fatty acids including SFA results in improved lipid profile; however, the most favourable effects are seen by PUFA.[91,92]

The amount of total fat intake needs to be controlled in such a way that the total energy intake would be kept within the required limits for each individual. The importance of keeping total energy intake within the limits is of particular importance knowing that 56% of older South Africans are estimated to be obese,[110] and that the majority of South African elderly with dyslipidaemia have also been shown to be obese in the Vaal region.[111] On the other hand, it is obvious that emphasis of dietary recommendations for fat intake need to be beyond simply reducing SFA or total fat in the diet because inappropriate substitutions result in lack of any positive health effects or even negative health impacts. Encouraging a low-fat diet often promotes an increasing contribution of refined carbohydrates to the total energy intake which results in dyslipidaemia and increased CHD risk. Moreover, replacing certain sources of fat with other types is not necessarily accompanied by improvement in lipid profile and lower CHD risk. Therefore, the cornerstone of dietary recommendations in respect of fats should be optimising types of dietary fat. Moreover, recommendations for dietary fat intake should be complimented by recommendations on total energy composition and improving sources for carbohydrate intake. In other words, dietary advice needs to be based on healthy dietary patterns including non-hydrogenated vegetable oils, seafood, nuts (e.g. walnuts), whole grains, fruits and vegetables; and lowering partially hydrogenated vegetable oils, animal fats, and sugar-sweetened foods and beverages.[88,89,101] Consumption of processed foods and beverages, as well as fried fast foods, should be avoided.

Current evidence shows that the total dietary fat intake that contributes to total energy intake is within the recommended intake of < 30%. Therefore, the practical emphasis should be on shifting from unhealthy sources of dietary fat to more healthy sources. The practical measures proposed by Smuts and Wolmarans[16] for the general South African population seem to be largely applicable for older adults as well. In this regard, some important steps to be taken include replacing full-fat dairy products with low-fat substitutes, consuming lean meat and chicken without the skin, trimming beef, pork and chicken of all visible fat, reducing the frequency of eating fast foods and ultra-processed foods, replacing red meat and chicken with fish high in long-chain PUFA such as mackerel, salmon and herring for a number of meals per week. The elderly should be advised to replace fats that are solid at room temperature (hard fats), which are high in SFA and TFA and mostly come from animal fats and hydrogenated vegetable oils, with vegetable oils, which are sources of PUFA and MUFA. Examples of hard fats include butter, beef fat, chicken fat, cream, lard, shortening and partially hydrogenated oils. Examples of vegetable oils that need to be favoured over hard fats include grapeseed oil, soybean oil, avocado oil and canola oil. Moreover, vegetable oils including canola oil, soybean oil and sunflower oil can be replacements for butter and partially hydrogenated vegetable oils for cooking purposes. These vegetable oils, as well as olive oil and avocado oil, are

good sources of PUFA and MUFA. Older adults should be trained to be able to use the food labels as a source of information on the type of dietary fat in food supplies.

Use salt, salty seasonings and food high in salt sparingly: a food-based dietary guideline for the elderly in South Africa

The role of high sodium (salt) intake in disease, effects of salt reduction and public health strategies were described in detail in the 2013 revised FBDG for SA,[36] but very little information pertained to the elderly.

Salt (sodium) in the diet

The normal daily physiological requirement for sodium is estimated to be between 0.1 and 1.0 g.[112] Sodium is mainly consumed as salt (sodium chloride), mostly from discretionary salt, which is salt added during cooking, at mealtimes and also from salt used for processed foods.[113] About 41% of the population has a high discretionary salt intake[114] and about half of daily salt intake in SA comes from processed foods, with bread being the largest contributor,[113] providing 5–35% of sodium intake, depending on ethnic group under study.[102] Other sources of sodium in the diet may be from fast foods such as pizza, pasta dishes and crumbed fried chicken. Another contributor to sodium intake is sodium glutamate, used as a condiment,[115] salt in soup and gravy powders (17%), margarine (13.0%) and atchar, a spicy condiment providing up to 5% of the total sodium intake.[116] Other foods consumed in SA that one might not expect to have salt are biscuits/cookies, cakes and breakfast cereals.[117] Recently, many flavouring and spice mixes (e.g. bobotie spice mix, braai mix) have become available on the market and these usually contain salt. Although no national data or data for the elderly specifically exist for stock cubes, stock powder, or spice and flavouring mix consumption patterns, a study undertaken has found that 97% of the more than 800 participants used stock cubes and/or powder on a daily basis in cooking.[118] High stock cube consumption has also been observed in the community nutrition studies undertaken by the authors.

Importance of addressing salt (sodium) consumption among the elderly

According to the WHO, reducing salt intakes to the recommended level of less than 5.0 g per day could prevent an estimated 2.5 million deaths per year globally and will 'generate an extra year of healthy life for a cost that falls below the average annual income or gross domestic product per person'.[115] The significant positive relationship between salt intake and blood pressure has been well established.[36] Randomised control trials further provided evidence of dose–response effects in salt intake and blood pressure.[17] A study by He and co-authors found that a reduction in salt consumption of 4.4 g per day resulted in a reduction in blood pressure of approximately 4.2/2.1 millimeter of mercury (mm Hg).[18] Another study observed a linear relationship between average sodium intake and mortality (95% CI = 1.00–1.26, $p = 0.05$), with risk increasing as dietary sodium intake increased.[20]

Certain populations such as the elderly are more sensitive to the effects of salt reduction and may benefit the most from cutting down on salt intake.[119,120] One meta-analysis showed that less sodium in the diet could lead to blood pressure reductions of 1% and 3.5% in normotensive and hypertensive individuals respectively.[20] Reducing dietary salt intake has further been

associated with the prevention or delay in the need for antihypertensive therapy.[120]

Overall, the evidence strongly suggests that lowering SA's salt intake would likely result in a reduction of population blood pressure, and this effect is observed in all age groups of both genders, including the elderly.

Salt intake among the elderly in SA

In SA, the nutrition transition from traditional diets to more processed foods high in salt is one of the reasons the elderly have a relatively high salt intake.[50,121] The latest available studies have shown that the majority of people in SA consume too much salt – a daily mean per capita intake of 6–11 g, which is higher than the recommended maximum level of 5 g per day,[122] which is consistent with results from many adult populations in sub-Saharan Africa.[112] No national dietary intake studies have been conducted since the implementation of the final stage of the salt regulation in June 2019. The mean salt intake may have changed since then. Salt is often used to preserve foods,[123] and the salt content is thus high in processed meats such as ham and sausages.[117] Salt and other ingredients such as sugar and fat have a psycho-sensory dimension that the food industry has capitalised on by creating formulations to produce satiety, pleasure and a 'feel good' feeling known as hedonia.[123] Howard Moskowitz, an American market researcher and psychophysicist, referred to the amount of salt that people perceived as just right as the 'bliss point' and described how this can be manipulated in the development of 'craveable' foods such as chips and fried foods that customers would crave and ultimately purchase more of.[124] However, the SADHS showed that only 4% of those aged 65 and older consume salty snacks on a daily basis, but 16.9% consume it at least once a week. In addition, 19.1% and 8.3% of elderly consume processed meats and fast foods at least once a week.[51] Although the majority of the elderly (57.7%) indicated that they had already lowered their salt consumption for longer than a six-month period, 20.7% were not interested in lowering salt consumption.[51] This needs to be addressed in the elderly population because they have a higher burden of high blood pressure in SA.[121]

Although most of the information on the role of high sodium (salt) intake in disease, effects of salt reduction and public health strategies described in the 2013 revised FBDG for SA[36] are also relevant to the elderly, the aforementioned information provided the evidence for the FBDG 'Use salt, salty seasonings and food high in salt sparingly',[62] specifically for the elderly.

Implementing the EFBDG and strategies for salt reduction

There is growing evidence suggesting those public health approaches that have been successful at reducing salt intake in various countries. Population-based approaches, such as mandatory reformulation by the food industry, were found to be more successful than interventions that target individuals. Multicomponent strategies have been found the most effective at reducing salt intake.[24] This is partly because salt restriction in food processing allows for more equitable distribution of the benefits of salt reduction within the population, compared with individualised strategies that focus on access to health services such as counselling.[125]

WHO Member States have committed to a 30% reduction in salt intake by 2025 as part of a strategy to reduce NCDs.[115] A recent

Table 2: SHAKE package for salt reduction- priority areas[129]

WHO's SHAKE Package	
Surveillance	Measure and monitor salt use
Harness industry	Promote the reformulation of foods and meals to contain less salt
Adopt standards for labelling and marketing	Implement standards for effective and accurate labelling and marketing of food
Knowledge	Educate and communicate to empower individuals to eat less salt
Environment	Support settings to promote healthy eating

Table 3: Various recommendations pertaining to total salt intake for adults[130]

Nutritional authoritative body	Sodium (mg/day)
American Heart Association	< 1 500
Australia and New Zealand	1 600–2 300
Canada	< 2 300 by 2016
Dietary Guidelines for Americans	< 1 500
Scientific Advisory Committee on Nutrition (UK)	2 400
RSADoH	Adults: < 2 000(< 5 g/day of salt)
World Health Organization	Adults: < 2 000(< 5 g/day of salt)
World Health Organization	Children: The recommended maximum level should be adjusted downwards, based on the energy requirements of the children

Cochrane systematic review showed several countries have been successful at reducing the salt intake of the population.[126] SA has been one of the leading nations in using policies and legislative instruments to address the high salt intake and was the first African country to implement legislation that stipulates the maximum amount of salt that can be used during food processing by industry.[114]

Mandatory regulations set by the South African National Department of Health (SADoH) have been implemented to reduce sodium content in processing of foods.[127] Researchers suggested that by reducing daily salt intake by 0.85 g per person, mostly through salt reduction in bread consumption, the country could prevent 7400 cardiovascular deaths and save 4300 lives from non-fatal stroke annually. The reduction in hospital admissions could result in savings of as much as ZAR 300 million per year.[125] Another paper estimated that the salt reduction policy of SA will result in savings at household level that may prevent as many as 2000 households from becoming poor, while at the same time reducing cardiovascular-related deaths by 11% and saving the government ZAR 713 million per year in healthcare costs.[128]

WHO published the SHAKE Package for Salt Reduction, to provide member states with policy and strategy guidance on how to achieve this salt reduction.[129] The SHAKE acronym stands for key issues that need to be addressed for salt reduction and is referred to in Table 2.

A public health strategy used to reduce sodium intake is the use of country-specific recommendations. Different countries have different targets for salt reduction and country-specific recommendations for salt intake for adults (Table 3). No specific recommendations are available for older adults/the elderly, however.

In addition, only a few countries have FBDGs to address salt intakes by the elderly and these are summarised in Table 4.[116]

SA has strict food labelling and advertising standards according to the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972).[135] Food labels provide nutritional information concerning a product such as its composition, ingredients and amounts.[136] Whenever salt and sodium are in the first few ingredients listed, there is a high salt content in the product.[116] The elderly population in SA faces additional challenges in addition to difficulty interpreting label information and the interchangeable use between sodium and salt during labelling.[137] For instance labels are often written in English and in many cases the elderly in SA cannot read or understand English.[63,136] Eyesight challenges such as cataracts are also common within the

Table 4: Sodium/salt FBDG for the elderly globally[116]

Country	EFBDG
South Africa	Use salt, salty seasonings and food high in salt sparingly[36]
Australia	Limit intake of foods and drinks containing fat, added salt, added sugars and alcohol[62]
New Zealand	Choose and prepare foods low in fat, salt and sugar (adequate intakes for sodium for older people aged 65 years and over 460–920 mg of sodium/day)[131]
Singapore	Use less salt and sauces, and cut down on salted and preserved foods[132]
UK	Aim to keep your salt intake to less than 6 g per day[133]
USA	Limit calories from added sugars and saturated fats and reduce sodium intake Consume an eating pattern low in added sugars, saturated fats and sodium[134]

elderly population[138] and may hinder their ability to read the labels.

All the salt in SA is legislated to be iodised. Previous studies suggested that salt reduction does not have a negative effect on iodine status.[139] However, a more recent paper from the same author has shown that low salt intakes may affect iodine intakes and that some participants consuming less than 5 g of salt per day did not meet their iodine requirements(95 μg/day).[114] The iodine status of the South African population and other populations that rely on iodised salt for their iodine intake need to be monitored to prevent recurrence of iodine deficiency.[114]

Practical considerations on how to reduce salt intake in the lifestyle of the elderly

Some practical steps to reduce salt intake include minimising intake of the foods identified within the SA diet as the main sources of salt, such as bread, pies, sausages and cold meats, breakfast cereals, salted snacks, soups and margarine.[140] The elderly should be recommended to use alternative seasonings, herbs and spices for flavouring food and to avoid the addition of salt at the table.[140] They should also be made aware that while the food might seem bland initially, eventually their taste buds will adjust. It is further recommended to remove salt from the table and systematically lessen the amount of salt added during cooking.[140] No known studies have been

conducted to assess the effect of reduced salt intake on the iodine status of the elderly. However, research has shown that asymptomatic disturbances in thyroid function occur more often in the elderly.[141] Alternative iodine sources should be promoted[142], such as cheese, cow's milk, eggs, saltwater fish, soy milk, milk or yoghurt as appropriate.[143]

Barriers to implementing the three guidelines

Loss of taste and smell
The decreased ability to taste and smell food results in foods often tasting bland for the elderly. This is further exacerbated by certain medications that can affect taste.[144] Taste changes with age, and research suggests that the elderly have increased acuity for bitter and sour tastes, and diminished ability to detect sweetness, umami and saltiness.[145] This often leads to the elderly adding additional sugar and salt to improve the taste of foods.[144] Taste for salty products was significantly lower in the elderly compared with the young in a Dutch study comparing different tastes.[146] A different study revealed that elderly participants required a salt concentration as much as three times higher than a younger participant for them to be able to taste it. As such the elderly population presents a unique challenge as loss of ability to taste salt[147] may thus contribute to higher intakes of salt.[145]

Knowledge, memory and psychological capabilities
Not being awareness of what healthy and unhealthy foods are and the inability to read food labels results in an inability to calculate the consumption of sugar,[148] fat and salt. Memory loss and lack of attention may also contribute to the elderly forgetting dietary advice and not choosing foods or meals with lower sugar, salt and fat content.[148]

Food environment
The food environment has changed significantly in recent years as highly processed foods and SSBs have become more affordable and accessible, not only through local processing in SA, but also increased imports of these foods.[46] The annual consumer price inflation also increases annually and reached 3.2% in July 2020 compared with 2.2% in June 2020. The main contributors to the increased annual inflation rate were food and non-alcoholic beverages, as well as housing and utilities. Food and non-alcoholic beverages increased by 4.3% year-on-year.[149] Food inflation in SA has been substantial for the healthier food options, specifically for fresh products such as meat, chicken, milk, eggs, cheese and vegetables.[150] The fact that highly processed foods containing sugar, salt and fat are becoming more affordable and healthy food items such as vegetables are becoming more expensive may result in the elderly consuming more of these items,[148] especially when in resource-poor households. Not only are these products more affordable, but they are also convenient for the less mobile elderly to consume as they do not require much preparation.

Legislative bodies can play a crucial role when it comes to changing a behaviour at the population level, especially when some controlling measures need to be applied on the food industry. A prominent example is the salt reduction legislation implemented in 2019. Another example is the regulations passed in 2011 indicating that 'the sale, manufacturing and importation of any oils and fats, including emulsions with fat as the continuous phase, either alone or as part of processed foods, which are intended for human consumption or assumed to be intended for human consumption, in the retail trade, catering businesses, restaurants, institutions, bakeries etcetera, of which the content of Trans-Fat exceeds 2 grams per 100 grams of oil or fat, is prohibited'. In this legislative Act, 'Trans-Fat' refers to industrially produced TFA. The regulations also require any product labelled as 'trans fat-free' to contain less than one gram of TFA per 100 g.[151]

Conclusions and recommendations on the three guidelines
The elderly population has a high burden of hypertension, CVD and other NCDs and should be assisted in making healthier food choices. The body of evidence is strongly in favour of the assumption that reducing the consumption of foods and drinks high in sugar, salt and fat, as recommended by these three South African FBDGs for the elderly, will lower the risk of nutrition-related NCDs, which are of a public health concern in the elderly population. Moreover, in line with the 2013 SA FBDGs and the other countries' FBDGs for the elderly, the recommendations regarding sugar, sodium and dietary fat need to be supplemented by dietary recommendations on maintaining variety in the diet, including more fruit, vegetables, legumes, low fat dairy and wholegrain foods in the daily diet. Attention should be given in the development of nutrition education material to guide the elderly consumer in how to limit the intake of sugar and salt, and on how to choose healthier fats. Sugar, salt and fats are often combined and hidden in foods, specifically processed foods, and the elderly should also be educated on reading food labels. Legislation on sugar, salt and fat content of processed foods and/or beverages should be revised regularly. More research is needed to determine the sugar, NNS, fast food and salt consumption by the elderly in SA. Furthermore, research is needed to determine the specific fatty acid intakes as well as NNS and dose–response of NNS and the effects of various fatty acids on cardio metabolic risk factors, specifically in the elderly.

Author contributions
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