

# Cardiovascular disease and nutrition: The use of food-based dietary guidelines for prevention in Africa

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## INTRODUCTION: CARDIOVASCULAR DISEASE (CVD) IN AFRICA

The global burden of CVD is enormous and is rapidly escalating in developing countries.<sup>(1)</sup> At present, this burden seems to be the second major public health concern after HIV/AIDS in many developing countries. The World Health Organisation (WHO) estimated in 2002 that 29% of deaths worldwide were due to CVD, and that 43% of global morbidity and mortality, measured in disability-adjusted life years (DALYs), was caused by CVD.<sup>(2)</sup> It is estimated that by 2020, CVD will be the leading cause of death, probably accounting for 73% of total global mortality and 56% of morbidity.<sup>(3,4)</sup> Africa, like many other developing regions, has traditionally focused on controlling infectious diseases. However, a health transition associated with development, urbanisation and modernisation of dietary patterns and lifestyles has contributed hugely to an increase in non-communicable diseases (NCDs), to the extent that in 2001, already 20% of deaths in sub-Saharan Africa were because of NCDs.<sup>(1)</sup> Clearly, a new approach to disease prevention in these countries is needed.

## ABSTRACT

**There is no doubt that morbidity and mortality from cardiovascular disease (CVD) are increasing in many African countries. Research and implementation of public health nutrition programmes in the developed world have shown that CVD can be prevented by dietary interventions. The objectives of this paper are to (i) review the relationships between diet and CVD; (ii) review the possible contribution of the nutrition transition, which is associated with economic development and “modernisation” to CVD in Africa; (iii) identify barriers and challenges plus assessing the opportunities available to steer the nutrition transition into a more positive direction; and (iv) show how ideal nutrient intakes can be translated into appropriate food based dietary guidelines (FBDGs) and how to apply these for prevention and management of CVDs. This should result in appropriate recommendations for diets that will be country-specific, affordable, culturally acceptable and based on available, traditional and indigenous foods. It is concluded that all health professionals should be sensitised, informed, trained and/or educated to apply FBDGs in a way that will motivate the public or patients to follow healthier diets for primary, secondary and tertiary prevention and treatment of CVD. SAHeart 2011; 8:38-47**

CVD the second major cause of death in Africa, accounting for almost 11% of total deaths.<sup>(5)</sup> The burden of CVD faced by African countries is most likely to double by 2020, due the accelerated pace of transition. In a prospective study among patients in Kenya, clinical evidence of CVD was present in 40% of the patients evaluated: over 52% were hypertensive and had arrhythmia, and 49% had congestive cardiac failure.<sup>(6)</sup> In a Cameroonian study from 1992-1997, coronary artery disease was ranked eighth among CVD with a prevalence of 1.53%.<sup>(7)</sup> The same study showed a high prevalence of CVD risk factors such as obesity (40%), hypertension (60%), dyslipidaemia (43%), smoking (36%), diabetes/hyperglycaemia (26%) and hyperuricaemia (20%). At least three of the CVD risk factors were present in 76% of the patients.<sup>(7)</sup> In a retrospective study conducted in the same country in 1995, comprising 312 adult patients with CVD, 38.5% were hypertensive,

25.6% had rheumatic valvular heart diseases and 22.5% had cardiomyopathies.<sup>(6)</sup> A prospective study in Ghana conducted between 1992 and 1995, revealed a high prevalence of CVD in the study population such as hypertension (18.7%), idiopathic cardiomyopathy (17.4%), congenital heart disease (14.5%) and coronary artery disease (12.7), respectively, all major causes of CVD morbidity.<sup>(9)</sup> In Mauritius between 1990 and 1994, age standardised stroke mortality between the ages of 35 and 74 years were 268 for men and 138 for women per 100 000,<sup>(10)</sup> Ghanem and Freji,<sup>(11)</sup> estimated that in a Tunisian population prevalence of risk factors for CVD were 19%, 10%, 28%, 36% and 21% for hypertension, diabetes, obesity, android obesity and smoking respectively. In South Africa, the Heart of Soweto study<sup>(12)</sup> indicated a very high prevalence of CVD risk factors and provided “strong evidence that the epidemiological transition in South Africa has broadened the complexity and spectrum of heart disease in the community”. Clearly, this summarised data does not augur well for Africa with projections that health will not improve and neither will the level of social and economic development, unless this CVD burden is controlled.

Evidence exists from Western industrialised communities that with ideal programmes and strategies, CVD and its risk factors can be reduced and are preventable.<sup>(13-16)</sup> The decline in coronary mortality in Finland<sup>(17)</sup> is often used as an example of how it is possible to control CVD. A holistic, community-based cardiovascular control programme, which included a variety of measures to change dietary intakes, was initiated in 1972 in North Karelia, a county in the Eastern part of Finland. The decline in coronary mortality in this region between 1969 and 1979 was 24% in men and 51% in women. The drop in the rest of Finland over the same period was 12% in men and 24% in women. The decline in North Karelia was greater than that of other counties of Finland for both men and women, suggesting that the preventive programme was effective.<sup>(17)</sup> Nutrition/diet has been shown to be a significant modifiable independent risk factor for CVD.<sup>(18,19,20,21)</sup>

Despite this knowledge of prevention of CVD, one should pose the question: why does Africa, together with other developing regions, continue to experience an uncontrollable increase in mortality and morbidity due to CVD? We propose that changes in lifestyle,

especially changes from traditional prudent dietary patterns and nutrient intakes to modern, imprudent diets, play a major role. Therefore, in the rest of this paper, we will focus on the relationships between nutrition and CVD risk; the present nutrition transition in Africa; the barriers, challenges and opportunities available to reduce the dietary risk of CVD in Africa, and especially how appropriate food based dietary guidelines (FBDGs) for specific groups of people can be applied for prevention and management of CVD.

## THE RELATIONSHIPS BETWEEN NUTRIENT INTAKES AND CVD

The evidence that optimal, prudent and adequate nutrient intakes can reduce CVD risk is convincing.<sup>(19,20,22,23-25,26)</sup> An imprudent diet; high in saturated fats,<sup>(27,28-32)</sup> salt,<sup>(33)</sup> alcohol,<sup>(34,35)</sup> and refined carbohydrates,<sup>(36)</sup> low in fruits and vegetables<sup>(37)</sup> and with more energy than needed, is strongly associated with increased risk for developing CVD.<sup>(19)</sup> The link of this diet with CVD risk factors is illustrated in Figure 1.

The ideal prudent but adequate (balanced) nutrient profile agreed by national, regional and international bodies<sup>(38-40)</sup> that establish dietary requirements for the prevention of diet-related NCDs, including CVD, are summarised in Table I. It is important to realise that the optimal nutrient profile to prevent and treat CVD given in Table I, can be accomplished by many different food combinations, which may for example result in the Mediterranean diet, a typical traditional African diet, or others.

The Table emphasises that for prevention of CVD, diets must have sufficient amounts of fruits, vegetables and whole-grain cereals but limited amounts of energy, saturated and trans fatty acids, added sugars, refined carbohydrate sources, salt and alcohol.

## FATS AND OILS

A diet with excess saturated and trans fats leads to dyslipidaemia, and especially hypercholesterolaemia a risk factor for CVD.<sup>(18,23-25,41)</sup> Saturated fats are mostly found in animal products. Trans fats are found in semi-hard oils that have undergone hydrogenation in

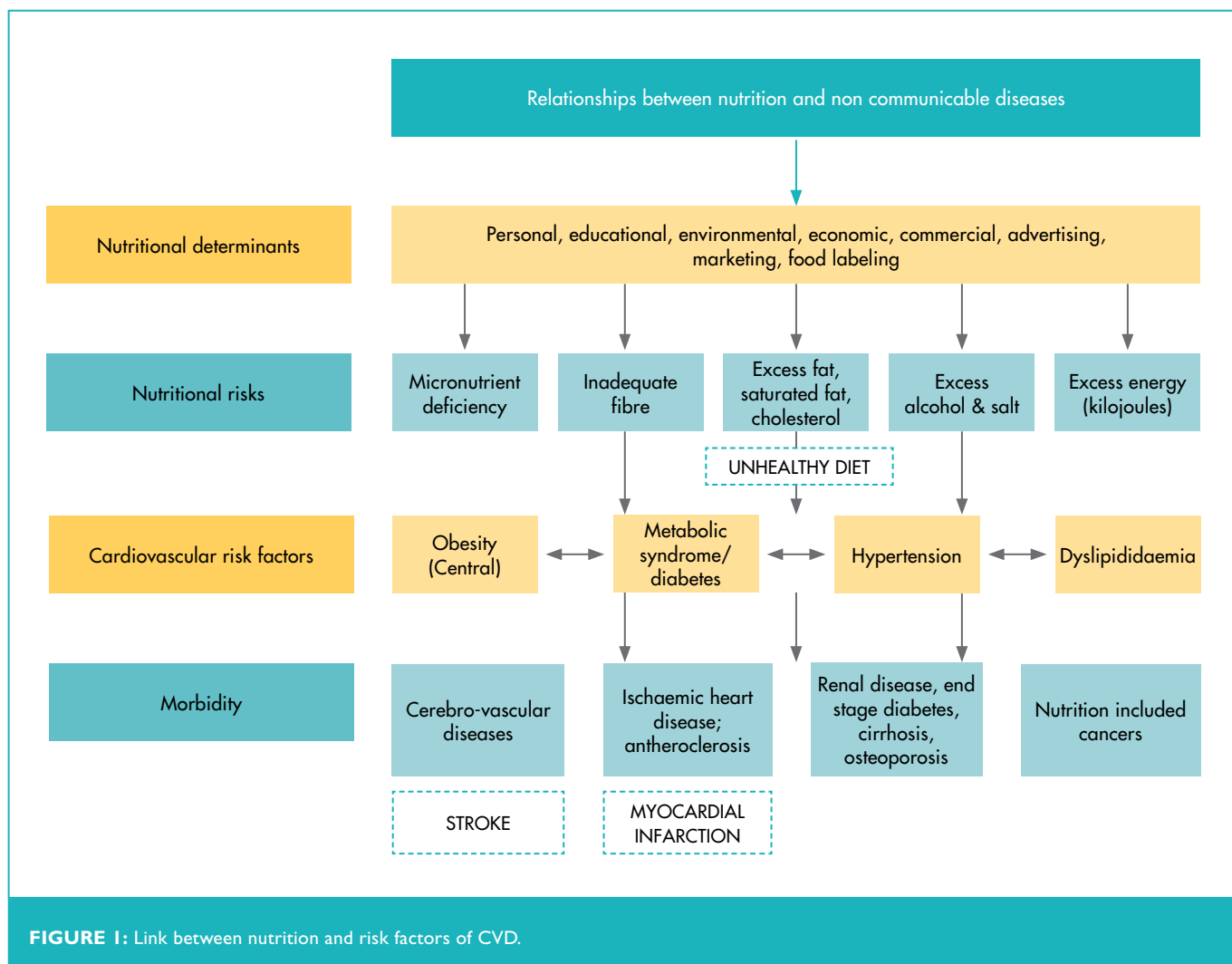


FIGURE 1: Link between nutrition and risk factors of CVD.

the manufacturing of margarines. The new inter-esterification process that replaced hydrogenation gives margarine less trans fats. Saturated fats should be replaced by poly- and monounsaturated oils, shown to be beneficial for overall cardiovascular function and health.<sup>(20,21,23-25)</sup> The major sources of these oils are plant food sources such as soybean, sunflower, rapeseed, palm and groundnut oil. The essential omega 3 and omega 6 fatty acids are mainly found in fish oils,<sup>(42-45)</sup> nuts,<sup>(46-49,50)</sup> soy bean oil,<sup>(51)</sup> and are additionally preventative of CVD.<sup>(18,19,20,21)</sup> Additionally plant sterols have been shown to reduce CVD in different populations.<sup>(52,53,54)</sup>

### “FREE” OR ADDED SUGARS

High intakes of mono- and disaccharides added to foods and drinks may reduce or dilute nutrient quality of diets by providing

only energy, therefore contributing to overall energy density, a low micronutrient density, a positive energy balance, and increased weight gain. A randomised trial showed that when soft drinks rich in free sugars are consumed there is a higher energy intake and a progressive increase in body weight when compared to situations in which energy-free drinks that are artificially sweetened are consumed.<sup>(55)</sup> The recommendation is that to prevent these effects, not more than 10% of total energy intake should be in the form of added sugars.<sup>(56)</sup>

### MICRONUTRIENTS AND DIETARY FIBRE

Essential vitamins, minerals, dietary fibre (non-starch polysaccharides, or NSP), phytosterols and various anti-oxidant phytochemicals, all play, through a variety of mechanisms, a pivotal role in the

prevention and management of CVD and other NCDs.<sup>(57-60)</sup> The benefit of fruit, vegetables, legumes and whole-grain cereals, all dietary sources of these nutrients, is undisputable.<sup>(20)</sup> Low intakes of fruit and vegetables account for 20% of CVD worldwide.<sup>(61)</sup> The present recommendation is that at least five servings (400 – 500 grams) of fresh fruit and vegetables, and cereals and grains in unrefined form where possible should be eaten daily.

## TABLE SALT AND ALCOHOL

A diet high in salt or sodium chloride increases the risk of developing hypertension in susceptible persons, a major risk factor for CVD.<sup>(33)</sup> A universal reduction of about 3g of salt a day, could lead to a

50% reduction in the number of people needing treatment for hypertension, a 22% drop in the number of deaths resulting from strokes and a 16% fall in the number of deaths from coronary heart disease.<sup>(61)</sup> There is a hypothesis that African populations have a genetic predisposition for salt retention, which may be compounded in urban African cultures where salt intakes are generally high, causing an increased prevalence of hypertension.<sup>(62)</sup>

Epidemiological evidence suggests a J or U shaped relationship between alcohol consumption and CVD,<sup>(34,35,63)</sup> which resulted in an acceptance that moderate consumption of alcoholic beverages such as red wine, may be cardio-protective. However, in a population-based study amongst 2010 black South Africans, increased alcohol consumption was associated with favourable lipid profiles (increases in HDL-cholesterol) but also with increased blood pressure, indicating that the cardio-protective effect of alcohol possibly disappears because the increase in blood pressure offsets the benefits.<sup>(64)</sup>

## CHANGING DIETARY PATTERNS IN AFRICA: THE NUTRITION TRANSITION (NT)

The NT in Africa, which accompanies economic development, industrialisation, urbanisation and more sedentary lifestyles, is characterised by an increased intake of animal-derived foods, “fast or convenience” fried and/or packaged foods, salty and sweet snack foods, sugary and/or alcoholic beverages, while intakes of plant-derived foods such as staple whole-grain cereals, legumes, fruit and vegetables decline.<sup>(65,66)</sup> Although some of these dietary changes may actually improve intakes of some micronutrients such as more iron from meat or calcium from milk, they mostly result in diets with too much energy, saturated and trans fats, salt, alcohol and sugars, and not sufficient dietary fibre (NSP), as well as deficiencies of many micronutrients and anti-oxidant phytochemicals. The result is an increased risk of NCDs, including CVD, which explains the observed increased morbidity and mortality from these diseases in developing countries such as South Africa.<sup>(67)</sup> Tragically, in many developing countries, the transition to these “modern” diets is taking place before the battle against under-nutrition has been won, resulting in a double burden of infectious and NCDs, further exacerbated by the HIV/AIDS pandemic.<sup>(65)</sup>

**TABLE 1:** Ranges of population nutrient intake goals for prevention of NCDs.<sup>(38-40)</sup>

Nutrient	Goal (% of total energy, unless otherwise stated)
Total fat	15 - 30%
Saturated fatty acid (SATFAs)	<10%
Polyunsaturated fatty acids (PUFAs)	6 - 10%
n-6 PUFAs	5 - 8%
n-3 PUFAs	1 - 2%
Trans fatty acids	<1%
Monounsaturated fatty acids (MUFAs)	By difference*
Total carbohydrate	55 - 75%†
Free sugars‡	<10%
Protein	10 - 15%**
Cholesterol	<300mg per day
Sodium chloride (sodium)‡	<5g per day (<2g per day)
Fruits and vegetables	≥400g per day
Total dietary fibre	From foods*§
Non-starch polysaccharides (NSP)	From foods*§

\*Calculated as: total fat - (saturated + polyunsaturated + trans fatty acids).

†The percentage of total energy available after taking into account that consumed as protein and fat, hence the wide range.

‡The term “free sugars” refers to all monosaccharide and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrups and fruit juices.

\*\*The suggested range should be seen in the light of the Joint WHO/FAO/UNU Expert Consultation on Protein and Amino Acid Requirements in Human Nutrition, held in Geneva in April 2002.<sup>(38)</sup>

§Salt should be iodised appropriately. The need to adjust salt iodisation, depending on observed sodium intake and surveillance of iodine status of the population, should be recognised.

§The recommended intake of fruits and vegetables and consumption of wholegrain foods is likely to provide >20g per day of NSP (>25g per day of total dietary fibre).

### **BARRIERS AGAINST STEERING THE NT IN A MORE POSITIVE DIRECTION**

A critical question at this stage of development in Africa is why has it proven so difficult to steer the NT into a more positive direction, moving populations from undernutrition to optimal nutrition and not to overnutrition? The answer is probably because the many, integrated forces driving the NT are also barriers to optimal nutrition. These include inter alia negative changes in the food environment, inherent food preferences, lack of knowledge, and the poverty-malnutrition cycle.

The changed food environment is a consequence of globalisation and economic development leading to availability and affordability (even for many poor people) of food products such as salty and sweet snacks, fast foods, cheap fats and oils and sweetened beverages not previously easily assessable. It is especially the food industry that could play a role in this area to improve and promote the availability of healthier products at affordable prices, and governments through policies, legislation and intervention programmes to facilitate a healthier food environment.

Another barrier is that humans inherently prefer and have appetites for creamy, fatty, sweet and salty foods with a high energy density and lack of fibre.<sup>(68)</sup> In addition to many direct effects on CVD risk factors, high intakes of these foods, coupled to more sedentary lifestyles could lead to obesity, a risk factor of CVD (and other NCDs). A lack of knowledge and support to change behaviours regarding healthy food choices are also barriers. This is often exploited by the food industry, marketing and promoting food products in ways that are not conducive to good nutrition. In children and adolescents inappropriate advertisements and peer pressure can also contribute to the wrong food choices. Governments and institutional bodies can play important roles by legislating against practices such as advertising certain products during children's television programmes in an attempt to combat childhood obesity,<sup>(69)</sup> or for example regulating what is sold at school venues. Labelling of food products and informing consumers how to interpret labels may help to remove some of these barriers.

A major obstacle in steering the present rapid NT into a more positive direction is the difficulty of breaking the vicious inter-

generational poverty-malnutrition cycle. This cycle starts when malnourished women become pregnant. It is now known that nutritional insults during foetal life may programme the foetus to be vulnerable for several NCDs in later life when exposed to an imprudent diet. This is in addition to possibly being a low-birth weight or disproportionate baby, as well as a mental and physical stunted child, developing into an adult with low human capital, unable to escape poverty and malnutrition.<sup>(70)</sup> This phenomenon contributes to the co-existence of undernutrition in children and high prevalence of obesity and NCDs in adults that many African countries are experiencing at the moment.

### **HOW DO WE TRANSLATE THE OPTIMAL CVD-PREVENTATIVE NUTRIENT PROFILE INTO PRACTICAL FOOD-BASED DIETARY GUIDELINES (FBDGs)?**

From the above it is logical that to sensitise, guide and help individuals to make the right dietary choices for prevention of CVD, an appropriate food environment should be available. But equally important, it is essential to equip and empower people with the knowledge of what to eat and motivate them to make the right food choices based on this knowledge.

Because people eat foods and not nutrients, the WHO/FAO<sup>(71)</sup> started a process in 1996 to guide member countries and regions on how to prepare and use food-based dietary guidelines (FBDGs) to address nutrition-related chronic diseases. The WHO<sup>(72)</sup> has now published a comprehensive procedural manual for the development and implementation of regional and country-specific FBDGs to promote healthy eating for the prevention of both under- and overnutrition-related disease. In this manual, the process is discussed step-by-step on how to formulate appropriate guidelines, how to develop a suitable food guide and education material for different target groups, how to field-test developed materials, as well as how to design, monitor, and evaluate a holistic implementation plan of FBDGs, which is aligned with all other nutrition programmes within countries.

The major characteristics of FBDGs to be successful in changing eating behaviour of individuals and groups are that the FBDG-

messages should be simple, understandable, positive, affordable take existing eating patterns into account, promote indigenous and traditional foods of all cultures in society and that they are based on the scientific evidence within countries of the prevalence of nutrition-related disease. Moreover, following the FBDGs to choose a diet must always result in adequate (balanced) diets that meet all nutrient requirements.

In South Africa, a working group, representing different organisations involved in food and nutrition, developed a set of FBDGs<sup>(73)</sup> that were adopted by the Department of Health (Directorate Nutrition) as the messages to communicate healthy nutrition to different target groups. These guidelines can be used for the primary prevention as well as the treatment of NCDs, including CVD. The working group developed the messages to promote traditional diets and published the scientific evidence and rationale for each.<sup>(73)</sup> A few other African countries like Nigeria have also developed FBDGs. It is suggested that in the absence of appropriate guidelines in some countries, the South African FBDGs are suitable for use in the whole African region to prevent both undernutrition and the risk of CVD.

The way the FBDG messages are focussed, communicated, promoted and explained to individuals and groups, will depend on the level of education and characteristics of the potential users, as well as the targets to be reached. FBDGs, appropriately illustrated by a food guide such as the plate model or the food pyramid, can be a very useful tool for all health professionals to reduce diet-related risk factors for CVD in individuals as well as on population level by using different interview and social marketing techniques. Some practical advice on the way the South African FBDGs can be communicated and explained for prevention of CVD is given in Table 2.

## SOME CONCLUDING REMARKS

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Besides increased mortality rates, African countries face great economic challenges with the expected CVD epidemic. The costs are largely to health systems, and to the continent as a whole. For

example in South Africa, 2 to 3% of the country's gross national income, or roughly 25% of South African healthcare expenditures, was devoted to the direct treatment of CVD in 1991.<sup>(74)</sup> This situation is made worse by the fact that such a high proportion of CVD burden occurs earlier among adults of working age in developing countries.<sup>(75)</sup>

It is difficult for policy makers and health professionals in Africa to plan for prevention, as decisions are often made by politicians. The socioeconomic consequences and costs of secondary and tertiary healthcare of CVD are high. There should be more emphasis on prevention. But unfortunately, the resources devoted towards prevention of CVD are scarce. As mentioned earlier, there are many examples of holistic, multidisciplinary intervention programmes with strong evidence for significant reductions in morbidity and mortality associated with CVD, but few of these interventions have been implemented in Africa.

Therefore, in this developing region with limited resources, the challenge would be to create and implement cost-effective, multidisciplinary prevention programmes as well as sustainable infrastructure and trained personnel for care and treatment of CVD. Because of the relationships between nutrition and CVD, these programmes should aim to equip all health professionals with adequate and relevant nutrition knowledge to contribute to improved diets and nutrition quality, ensure food and nutrition security and increase physical activity. These primary practices could curb obesity, hypertension CVD, diabetes and other NCDs.

Primary and secondary prevention of CVD are possible, but it will need capacity in the form of financial and suitably trained human resources to implement timely and appropriate dietary interventions to steer the nutrition and epidemiological transition in Africa into a more positive direction.

## RECOMMENDATIONS

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The first recommendation is that all health professionals should be sensitised about the important role of nutrition in the prevention

**TABLE 2:** The use of the South African FBDGs<sup>(73)</sup> for prevention of CVD.

FBDG-message	Some additional information and advice <sup>(37)</sup>
Enjoy a variety of foods	Enjoy eating; do not feel guilty when eating; eat as large a variety of foods that is possible (affordable), and preferably not highly processed foods; eat from each food group per day if possible (explain food groups).
Be active!	Thirty minutes of moderate to vigorous activity on most days can reduce CVD mortality 1.5 to 2.0 fold. Advise on ways to increase activity (walking, climbing stairs) during daily life.
Make starchy foods the basis of most meals	When planning meals, plan around the starchy staple food such as maize porridge, rice, bread, pasta, potatoes, sump, and other staple grains and cereals, preferably in whole, unrefined, unprocessed form where possible.
Eat plenty of fruit and vegetables	At least 400-500g of fresh (or frozen) fruit (2 servings) and vegetables (3 servings) should be eaten daily. Explain cheaper options in season, how to grow own, the use of indigenous leafy green vegetables, and that diabetics should focus more on vegetables and less on fruit. Limit additions of salt, sugar and fat and explain cooking methods that will preserve micronutrients.
Eat dry beans, split peas, lentils and soya often	Legumes are rich sources of many nutrients and dietary fibre that helps to control blood lipids and glucose. For prevention of CVD, advise on 3 servings per week and for treatment one serving per day. A serving is 100g cooked legume. Tinned products are good but may contain too much salt. Best to cook own and serve as such, in salads, soups or mixed with starchy foods such as sump or bread.
Meat, chicken, fish, milk and eggs can be eaten every day	One serving of an animal-derived food per day is recommended (100g cooked meat, chicken or fish, or 2 eggs), preferably low fat options and cooked with little added fat and salt. Adults should also have 500ml milk or equivalent products daily, preferably the low-fat options. At least 3 fish dishes (servings) per week are advised to lower CVD risk factors.
Eat fats sparingly	At present it is recommended to have 15-30% of total energy as fat, of which not more than a third should come from saturated (hard, animal) fats. To keep fat and oil intakes at this level, low-fat options of meat, and chicken without skin should be chosen as well as preparation methods with limited use of oils.
Use salt sparingly	Too much salt intake is linked with hypertension. It is difficult to keep salt intake low in diets with many processed foods. Advise people to use fresh herbs and spices to flavour food and not to put salt on the table. Make sure that all salt used is iodised.
Drink lots of clean safe water	Approximately 2 litres of fluids are needed daily, preferably as clean water and not too much sugary or other drink. Relevant advice on how to sterilise water, especially in rural areas, could be given.
If you drink alcohol, drink sensibly	This guideline takes the reality that there will always be people who drink alcoholic beverages into account. It does not promote drinking, but emphasise moderate drinking which means not more than 14 tots for men and 7 for women per week. The negative health and social consequences of binge drinking and over-consumption should be explained to target groups.
Use food and drinks containing sugar sparingly and not between meals	This guideline is mainly aimed at dental health but individuals and groups should be made aware that over-consumption of especially sugary drinks may contribute to obesity and risk of other NCDs.



as well as treatment of CVD. Many of these professionals have more access to individual patients and groups within communities than the relatively few trained nutritionists and dieticians.

The second recommendation is that either country-specific or regional FBDGs for Africa should be developed with different options of traditional and indigenous foods. These guidelines should be accompanied by the development and funding of appropriate marketing/training materials (at all levels: for the general population and high risk groups such as pregnant women, pre-school, and primary school children, adolescents, and the elderly), as well as plans on how to implement a holistic FBDG programme aligned with other public health interventions in a country.

The third recommendation is that all health professionals should be trained on how to implement these FBDGs to prevent and treat CVD, as well as other nutrient-deficiency and non-communicable diseases. Nutrition should form a prominent part of health professional training at tertiary institutions. In many instances re-training via short courses or workshops would be the preferred option.

The last recommendation is that nutritionists and dieticians in African countries should be enabled take leading roles in co-ordinating all efforts to implement appropriate interventions to improve the nutritional status of populations and to prevent future CVD epidemics.

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