1 An introduction to the revised food-based dietary guidelines for South Africa

Vorster HH, DSc, Research Professor; **Badham JB**, MSc, Research Scientist; **Venter CS**, DSc, Extraordinary Professor
Centre of Excellence for Nutrition, North-West University, Potchefstroom
Correspondence to: Este Vorster, e-mail: este.vorster@nwu.ac.za
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Abstract

Food-based dietary guidelines (FBDGs) are short, positive, science-based messages that aim to change the eating behaviour of the general population towards more optimal diets that meet energy and nutrient requirements, while simultaneously helping to protect against the development of noncommunicable diseases. Recently, a national working group revised the South African set of FBDGs (i.e. the draft paediatric FBDGs and the general FBDGs). Expert working groups have written technical support papers for each of the individual revised FBDGs published in this supplement of the journal. The recognition that child malnutrition remains a major public health problem in South Africa led to the formulation of a specific set of guidelines for the mothers and caregivers of infants and young children from birth to five years of age, based on existing paediatric nutrition-related health issues and local dietary habits. In this introductory paper, the process of the development and revision of the FBDGs for South Africa is briefly reviewed. The need for specific FBDGs is motivated by prevailing health risk factors and dietary intakes in South Africa. Potential barriers to the implementation of the guidelines are identified and recommendations are made for the development of educational material, as well as for the design of implementation, monitoring and evaluation programmes. It is concluded that the use of guidelines to educate and empower mothers and caregivers, as well as schoolchildren, adolescents and adults, on how to follow a healthier diet, could be a powerful tool in combating both under- and overnutrition-related public health problems throughout the life course.

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Introduction

The perception that "people eat foods and not nutrients" led nutrition scientists to replace nutrient-based recommendations for the public with food-based dietary guidelines (FBDGs), which are dietary recommendations based on local food and eating patterns.[1,2] Therefore, FBDGs are science-based policy recommendations in the form of guidelines for healthy eating.[3] They are a translation of the evidence-based nutrient recommendations into food or dietary patterns that should guide the general population to consume a healthy, optimal diet. The key concepts of FBDGs and the scientific evidence-based methodology for their preparation and use were conceptualised and designed by the joint Food and Agriculture Organization of the United Nations (FAO)/World Health Organization (WHO) consultation that was held in Nicosia, Cyprus in 1995.[1] This effort was a response to the World Declaration and Plan of Action on Nutrition adopted by the 1992 International Conference on Nutrition.[4] The action plan was to eliminate and reduce famine and famine-related deaths, starvation and specific nutritional deficiencies, and also to reduce nutrition-related noncommunicable diseases (NCDs). Thus, FBDGs became part of the FAO/WHO strategy to promote appropriate diets through recommendations of optimal dietary patterns and healthy lifestyles. Governments were called upon to provide evidence-based advice to the public in the form of guidelines that they could understand, to which they could relate, and which they could apply. Therefore, it is important to note that the purpose of FBDGs is to simultaneously ensure the adoption of adequate diets that meet all nutrient needs, and diets that help to prevent the development of deficiencies and NCDs.

In the nutrition literature, FBDGs are often suggested as a tool that can be used to improve optimal nutrition and health.[5,6] Unfortunately, less is known about the successes and failures and the impact of implementation on dietary behaviour and health in the short or long term. This may be because, although the science of and supporting methodology for the development of FBDGs has been documented to a certain extent,[1-3] many countries still lack the capacity with which to translate scientific evidence into FBDGs and to develop appropriate educational and promotional material, implementation programmes and monitoring and evaluation strategies.

The objectives of this introduction are to review the South African process by which FBDGs for the general population, as well as those for infants and young children, were developed and revised; to summarise nutrition-related health outcomes and dietary intakes in South Africa, in order to motivate for specific, local guidelines; and to explore the barriers to communicating nutritional messages to the public. A holistic approach towards the development of educational materials for the FBDGs messages and the design of an appropriate implementation plan, as well as monitoring and evaluation strategies, will be discussed.

The South African process for developing and revising FBDG messages

The Nutrition Society of South Africa (NSSA) initiated the process of designing FBDGs for the general South African population in 1997[7] in partnership with the Department of Health, Directorate Nutrition, the Medical Research Council (MRC) and several other stakeholders from different United Nations' agencies and food producer organisations in South Africa. The testing of the developed messages in women of different population groups[8] was funded by the United Nations Children's Fund (UNICEF). The technical support papers, promoting the guidelines from scientific literature and providing more information about the types and amounts of the different food groups to be eaten, were published in the *South African Journal of Clinical Nutrition* in 2001.[9] The Department of Health formally adopted the set of FBDGs in 2003 to form the basis of nutrition communication to the public, with the addition of a guideline on sugar intake, based on the relationship between sugar consumption and dental caries. The final set of 11 guidelines is listed in Table I. These FBDGs were aimed at individuals aged seven years and older.

Therefore, a similar process was initiated by the NSSA, who established a paediatric working group to develop FBDGs for infants and children younger than seven years of age, which was published in *Maternal and Child Nutrition* in 2007.[10] The paediatric guidelines were specific to the following age groups: birth to 6 months; > 6 months to < 12 months; and > 1 year to < 7 years. They paralleled the FBDGs for children aged seven years and older,[11] with the introduction of the same messages to target the younger ages. However, these paediatric FBDGs were not officially adopted by the Department of Health as, because of funding constraints, the messages had not been fully tested.

Table I: First set of South African food-based dietary guidelines, 2003

- Enjoy a variety of foods.
- Be active.
- Make starchy foods the basis of most meals.
- Eat dry beans, peas, lentils and soy regularly.
- Chicken, fish, meat or eggs can be eaten daily.
- Drink lots of clean, safe water.
- Eat plenty of vegetables and fruit every day.
- Eat fats sparingly.
- Use salt sparingly.
- If you drink alcohol, drink sensibly.
- Use foods and drinks containing sugar sparingly, and not between meals.

The majority of South Africans are experiencing a rapid process of economic development, urbanisation, acculturation and modernisation of their dietary habits. This phenomenon, together with new knowledge about the relationships between dietary intakes and health, led to the recommendation that the 2003 FBDGs should be reviewed and adapted accordingly on a regular basis.[7] In 2011, the Department of Health, Directorate of Nutrition, embarked on a process, funded and supported by the FAO, to develop a food guide for South Africa. As part of this process, it was decided to review the existing FBDGs.

A national working group was convened and, during a workshop that took place in March 2011, several expert working groups, including a paediatric working group, were formed to review the new literature and make suggestions regarding revision of the specific guidelines. The expert and paediatric working groups reported their findings and made suggestions to the national working group during a meeting in July 2011. During this meeting, consensus was reached on the formulation of a set of FBDGs for the general population of individuals older than five years of age, a separate set of paediatric guidelines for infants and children younger than five years of age, the inclusion of a milk guideline in the general FBDGs, a focus on the quality of fats in the fat guideline, and minor changes to the wording of some of the other guideline messages. It was also agreed that the alcohol guideline created much confusion, especially the words "drink sensibly". As there are other initiatives in South Africa that address alcohol abuse, it was decided to delete this guideline message. However, a technical support paper on alcohol is included in this supplement, to assist nutritionists and dietitians in dealing with alcohol recommendations.

Special attention was given to the words "eat", "consume" and "use". "Use" was restricted to the salt, sugar and fat guidelines, because salt and sugar, and at times fats and oils, are seen as ingredients that are added in the preparation of food. Debate on the use of "regularly", "sparingly" and "moderately" led to slight reformulation of some guidelines. It was also decided that each expert working group would take responsibility for writing the technical support paper according to a specific terms-of-reference document, and that information in the technical support paper should also focus on the needs of infants and children under five years of age, where

relevant. Final consensus on the wording of each guideline and the information included in the technical support papers, published in this supplement, was obtained during a meeting of the national working group on 26 June 2012.

The revised set of general FBDG messages for South African adults and children aged five years and older is listed in Table II.

The food guide, illustrating the food groups that should be eaten regularly, developed in parallel to the revision of the FBDGs, is shown in Figure 1. This food guide has been developed for South Africans with support from the FAO. It only shows food groupings that are necessary for healthy eating. It does not, like many other food guides, such as the widely used food pyramid, include items such as sugar, sweetened foods and drinks, or salt. The proportional size of the food group circles symbolically reflect the proportional volume that the group should contribute to the total daily diet.

Nutrition-related health outcomes in South Africa

One of the first principles in designing FBDG messages for a specific country or region is that the guidelines should address existing public health problems.[1-3] To revise the FBDGs, the MRC's comparative risk assessment for South Africa, published in 2007, was used to re-evaluate the appropriateness of the FBDGs. The assessment was based on the underlying causes of premature mortality and morbidity observed in South Africa in 2000.[12] The risk factors were identified based on the burden of disease, taking into account factors such as "likely to be among the leading causes of burden of disease or injury, evidence of causality, being potentially modifiable and availability of data".[12] In Table III, a summary of the contribution of 17 selected risk factors to percentages of total deaths, as well as total disability-adjusted life years, is shown.

Of the 17 selected risk factors, nine relate directly to nutrition as acknowledged in the MRC report, namely high blood pressure,[13] alcohol harm,[14] excess body weight,[15] high cholesterol,[16] diabetes,[17] low fruit and vegetable intake,[18] childhood and maternal underweight,[19] vitamin A deficiency[20] and iron deficiency anaemia.[21] Two of the risk factors, namely physical inactivity (leading to an energy imbalance and overweight), and unsafe water, sanitation and hygiene (leading to diarrhoeal diseases), indirectly relate to nutrition and are therefore also addressed by the FBDGs.

Table II: Revised general food-based dietary guidelines for South Africans, 2012

- Enjoy a variety of foods.
- Be active!
- Make starchy foods part of most meals.
- Eat plenty of vegetables and fruit every day.
- Eat dry beans, split peas, lentils and soya regularly.
- Have milk, *maas* or yoghurt every day.
- Fish, chicken, lean meat or eggs can be eaten daily.
- Drink lots of clean, safe water.
- Use fats sparingly. Choose vegetable oils, rather than hard fats.
- Use sugar and foods and drinks high in sugar sparingly.
- Use salt and food high in salt sparingly.

Figure 1: The South African food guide (Department of Health, Directorate Nutrition)

Table III: Contribution of selected risk factors to percentage of deaths and disability-adjusted life years in South Africa in 2000 (521 thousand deaths and 16.2 million disability-adjusted life years)[12]

Identified risk factor	% total deaths	% total DALYs
Unsafe sex and STIs (HIV/AIDS)	26.3	31.5
High blood pressure	9.0	2.4
Tobacco smoking	8.5	4.0
Alcohol harm	7.1	7.0
High BMI and excess body weight	7.0	2.9
Interpersonal violence (risk factor)	6.7	8.4
High cholesterol	4.6	1.4
Diabetes (risk factor)	4.3	1.6
Physical inactivity	3.3	1.1
Low fruit and vegetable intake	3.2	1.1
Unsafe water, sanitation and hygiene	2.6	2.6
Childhood and maternal underweight	2.3	2.7
Urban air pollution	0.9	0.3
Vitamin A deficiency	0.6	0.7
Indoor air pollution	0.5	0.4
Iron deficiency anaemia	0.4	1.1
Lead exposure	0.3	0.4

AIDS: acquired immune deficiency syndrome, BMI: body mass index, DALYs: disability-adjusted life years, HIV: human immunodeficiency virus, STIs: sexually transmitted infections

The relationship between overnutrition and NCDs (associated with the first six risk factors that relate directly to nutrition) is well established, and forms the basis for the WHO recommendations for the prevention of chronic diseases.[22] The last three risk factors directly relate to undernutrition and a lack of dietary variety.

Recently, Vorster et al[23] showed that the present nutrition transition, associated with economic development, urbanisation and modernisation in South Africa, is characterised by changes in dietary patterns and nutrient intakes that will increase the risk of diet-related NCDs. These changes include decreased intake of staple foods that are rich in starch and dietary fibre, increased consumption of food from animal origin which is rich in total and saturated fat, decreased intake of legumes and vegetables, and increased intake of energy-dense, micronutrient-poor snack and convenience foods (which are often very salty) and sweetened carbonated beverages. Although more fruit consumption was observed, the increased meat and fruit intake was insufficient to meet micronutrient needs.[23]

The primary nutrition-related conditions and risk factors in South African children include stunting, underweight, vitamin A deficiency, the risk of inadequate micronutrient intake, overweight and obesity, and the presence of early NCD risks.[24,25] Nationally representative studies have been conducted on South African children. In 1994, the South African Vitamin A Consultative Group (SAVACG) recruited children aged 6-71 months[24] and, in 1999, the National Food Consumption Survey (NFCS) group included children aged 1-9 years.[25] Similar results were reported by the investigators. In the SAVACG study, the national prevalence for underweight [weight for age < -2 standard deviation (SD)] was 9.3%, stunting (height for age < -2 SD) was 22.9%, and wasting (weight for height < - 2 SD) was 2.6%.[24]

In the NFCS, the national prevalence of underweight was 10.3%, stunting 21.6% and wasting 3.7%.[25] According to the NFCS,[25] dietary intake in most children was confined to a relatively narrow range of foods of low micronutrient density. Reported energy intakes were variable and were particularly inadequate in rural areas. While requirements were met for protein and macronutrients in general, inadequate intakes were reported for vitamins A, C, niacin, vitamin B_6, folate, calcium, iron and zinc.[25] However, it must be noted that these data were collected prior to mandatory fortification of staple foods in 2003.

In the SAVACG survey, vitamin A deficiency was identified as a public health problem, as 33% of the sampled children were marginally deficient (serum retinol < 20 mg dl/1).[24] Children in the age group 36-47 months were the most affected. In 2003, regulations for the mandatory fortification of all maize meal and wheat flour with vitamin A, thiamine, niacin, riboflavin, pyridoxine, folate, iron and zinc was introduced.[26] A randomised intervention trial was conducted thereafter in the North West province, to evaluate the effectiveness of vitamin-fortified maize meal in improving the nutritional status of one- to five-year-old malnourished children.[27] Despite the small sample size, after 12 months the study showed that fortified maize meal could significantly improve weight gain in children in the experimental group (4.6 kg vs. 2 kg). The micronutrient status of one- to three-year-old children was also superior.[27]

In the past, the problem of undernutrition in children may well have led to overweight not being investigated. In 1994, 9% of children aged 3-6 years from a representative sample of African children in Cape Town were reported to be overweight (weight for age z-score 2 SD), while 20.1% reflected weight for height z-scores > 2 SD.[28] More recently, combined overweight and obesity of 20.3% was observed in infants aged 6-12 months in the Eastern Cape and KwaZulu-Natal provinces, compared to 15% of children aged 12-24 months, with a low prevalence of underweight and wasting for all age groups.[29] Secondary data analysis[30] of the NFCS data collected in 1999, using the body mass index (BMI) reference percentiles recommended for use in children by the International Obesity Task Force to determine the prevalence of overweight and obesity, showed that 17.1% [confidence interval (CI): 15-19.2%] of the children had BMI ≥ 25 kg/m^2 (combined overweight and obesity range). These data show that in South Africa, the double burden of under- and overnutrition is already seen in young children, and call for innovative ways to tackle the problem of malnutrition.

Both nonexclusive breastfeeding and inappropriate complementary feeding are globally acknowledged to have a significant negative impact on the child mortality and disease burden.[31] South Africa does not have country trend data on key indicators to monitor breastfeeding and complementary feeding practices. The available literature shows that the initiation rate of breastfeeding is approximately 88%. However, only 8% of babies are exclusively breastfed at six months, and more than 70% of infants receive solids foods before the age of six months.[32] This indicates that there is cause for concern about the feeding practices of infants and young children in South Africa and specific paediatric FBDGs are certainly warranted. The paediatric working group agreed that a single set of FBDGs was not appropriate for this age group, and thus agreed that four age categories and associated FBDGs would be considered: 0-6 months, 6-12 months, 12-36 months and 3-5 years. Although the exact wording would need to be tested to ensure that the messages are clearly understood, suggested FBDGs for the four categories were proposed and are listed in Table IV.

It appears that little progress has been made in improving the nutritional status of South African children in the past two decades, with persistent high levels of stunting and growing concerns about overweight and obesity. These concerns are discussed in the technical support papers in this supplement.

Table IV: Proposed paediatric food-based dietary guidelines, still to be tested

0-6 months
• Give only breast milk, and no other foods or liquids, to your baby for the first six months of life.
6-12 months
• At six months, start giving your baby small amounts of complementary foods, while continuing to breastfeed to two years and beyond. • Gradually increase the amount of food, number of feeds and variety as your baby gets older. • Feed slowly and patiently and encourage your baby to eat, but do not force him or her. • From six months of age, give your baby meat, chicken, fish or egg every day, or as often as possible. • Give your baby dark-green leafy vegetables and orange-coloured vegetables and fruit every day. • Start spoonfeeding your baby with thick foods, and gradually increase to the consistency of family food. • Hands should be washed with soap and clean water before preparing or eating food. • Avoid giving tea, coffee and sugary drinks and high-sugar, high-fat salty snacks to your baby.
12-36 months
• Continue to breastfeed to two years and beyond. • Gradually increase the amount of food, number of feedings and variety as your child gets older. • Give your child meat, chicken, fish or egg every day, or as often as possible. • Give your child dark-green leafy vegetables and orange-coloured vegetables and fruit every day. • Avoid giving tea, coffee and sugary drinks and high-sugar, high-fat salty snacks to your child. • Hands should be washed with soap and clean water before preparing or eating food. • Encourage your child to be active. • Feed your child five small meals during the day. • Make starchy foods part of most meals. • Give your child milk, *maas* or yoghurt every day.
3-5 years
• Enjoy a variety of foods. • Make starchy foods part of most meals. • Lean chicken or lean meat or fish or eggs can be eaten every day. • Eat plenty of vegetables and fruit every day. • Eat dry beans, split peas, lentils and soya regularly. • Consume milk, *maas* or yoghurt every day. • Feed your child regular small meals and healthy snacks. • Use salt and foods high in salt sparingly. • Use fats sparingly. Choose vegetable oils, rather than hard fats. • Use sugar and food and drinks high in sugar sparingly. • Drink lots of clean, safe water and make it your beverage of choice. • Be active! • Hands should be washed with soap and clean water before preparing or eating food.

Considering the diet-related risk factors associated with mortality and morbidity in South African society, as well as the documented changes in dietary patterns and nutrient intakes by the majority of the South African population, it is clear that the double burden of both under- and overnutrition should be addressed by the FBDGs. All of the risk factors are addressed by at least one, and mostly by more than one, of the FBDG messages. It is important to note that many of these risk factors are inter-related, and that they share common pathways. Therefore, one dietary recommendation may impact on more than one risk factor, while some risk factors would need more than one intervention. For example, a recommendation to reduce total and saturated fat intake should address both excess weight gain and high blood cholesterol levels, while advice on increased intakes of wholegrain starchy foods, legumes, milk, *maas* and yoghurt, as well as vegetables and fruit, contributes to better micronutrient nutrition.

Specific dietary deficiencies and excesses that relate to these risk factors, and how the FBDGs will address them, are discussed in more detail in each of the technical support papers in this supplement.

Communicating nutrition messages to the public: barriers to the implementation of FBDGs

The purpose of FBDGs is to inform the public about healthy eating, and to motivate people to make the right choices that will result in adequate, balanced diets that will also protect against undernutrition, excess weight gain and other NCDs. This often means that people should eat improved quality diets, but in some cases they may also need to eat less of certain foods. Therefore, FBDGs aim to change dietary behaviour, which is known to be extremely difficult. This is evidenced by the worldwide obesity epidemic and increasing rates of NCDs in developing countries. Most of these countries still battle with the consequences of food and nutrition insecurity, and now have to simultaneously address direct dietary behaviour that leads to obesity and NCDs.

The problem of conveying balanced nutrition messages was recently analysed by Goldberg and Sliwa.[33] They point out that four sets of interlinked factors are major challenges in nutrition communication. These factors were grouped as:

- The evolutionary nature of the science on which recommendations are based.
- The many sources of communication of that science.
- The agenda or motivation of each source.
- The multifaceted nature of consumers, who are the recipients of these communications.

When designing any intervention programme with regard to use of FBDGs in the context of the South African situation

in order to promote healthier eating, these factors or barriers to implementation should be considered.

The changing and developing nature of nutrition science

As will be seen in the technical support papers, the best available evidence about the relationship between nutrition and health has been used to formulate each guideline. However, continued research, based on technological developments in methodologies as part of the advancement of science, often produce new knowledge that will change dietary recommendations.

For example, in the past, the established relationship between saturated fat intake, hypercholesterolaemia and heart disease led to a recommendation that polyunsaturated fat margarine should replace saturated fat in the diet. New knowledge about the detrimental consequences of the trans-fat content of these margarines, as well as the beneficial effects of omega-3 fatty acids, have influenced fat recommendations over the years. Today, margarine is manufactured to be trans-fat free, and more emphasis is placed on the quality of fat to ensure sufficient intakes of omega-3 fatty acids. There are many other examples, such as new knowledge about the beneficial effects of whole grains, dietary fibre, and pre- and probiotics, the potentially protective effects of antioxidant chemicals found in plant foods, the anti-cancer properties of some vegetables, the bioactive compounds in milk, and the contribution of added sugar to childhood obesity. All these developments have influenced revision of the South African FBDGs.

Therefore, it is possible that the public could lose confidence in dietary recommendations because they change over time. This barrier should be seen as a challenge to educate the public and establish the understanding that nutrition science is evolutionary and dynamic and that new research findings for which there is convincing evidence may lead to new dietary recommendations. This illustrates the importance that dietary recommendations should be made responsibly, and only when there is convincing evidence that the advice will benefit consumers, address public health problems and cause no harm.

Conflicting sources of nutrition information

There are many sources of dietary information (people and organisations, and their communication material and channels). These sources include scientists, health professionals, scientific and professional societies, academic institutions, scientific journals, government departments, the United Nations agencies involved in nutrition (WHO, FAO, UNICEF and the International Council of Nutrition), non-government organisations, the food and beverage industry, and a growing multitude of social, printed, radio and electronic media. The way in which nutrition information is presented by, and in, these sources, varies, and is often not in a format that aims to inform the public.

Unfortunately, the agendas and motivations of the many sources of nutrition information also differ. For some, ideally, the motivating factor could be the responsibility of improving health, while for others it could be the promotion and sale of specific products. Consequently, the same set of nutrition knowledge may be communicated to the public in totally different ways. This information may be difficult to understand, and misleading. Consumers who must make food and beverage choices could be so bombarded by conflicting information that they simply choose what is affordable, what they like, or what is the most convenient.

Food labels on packaged products provide some useful, standardised and quality-controlled nutrition information,[34] but not always in a way that is easily understood by many consumers, or that can easily be converted into guiding relevant choices and appropriate portion sizes. Most suppliers of fresh foods and pre-prepared, ready-to-eat meals and convenience take-away foods do not provide nutritional information. In South Africa, doing so becomes mandatory when a claim is made, and many consumers have little understanding of the nutritional contribution of these foods to a healthy or unhealthy diet.

Aggressive and clever advertising and marketing of specific products to specific consumers during particular times and events may further influence food and beverage choices. An example is the many worldwide efforts to limit advertisements about sugary and salty snack foods to children during prime-time television.[35] The impact of these interventions on children's health in South Africa is unknown.

In South Africa, the challenge is the establishment in the mind of consumers of which nutrition information sources can be trusted to provide unbiased, objective and responsible information, based on scientific evidence of beneficial effects, in a way that consumers can understand and be motivated enough by to change their buying and eating behaviour. This would mean the development of skills to translate complex scientific information into meaningful health promotion strategies.[36] The use of FBDGs as the basis or starting point for all nutrition communication from different sources of information is a step in the right direction. But it means that all role players must adopt a science-based health agenda for their nutrition communication. They should work together in partnerships to improve the food and beverage environment in South Africa by making healthy choices affordable and available, by influencing consumers to make healthier choices, and by ensuring consistent messaging that does not deviate from the FBDGs.

The multifaceted nature of consumers

Universally, humans inherently prefer palatable diets[37] that contain foods that are rich in fat and cream, are refined, and are sugary and salty. This is a major barrier to the adoption of a more varied, healthier diet that contains sufficient unrefined, minimally processed plant foods.

Factors such as differences in levels of education, socio-economic status, age, gender, fashion, peer pressure, culture and tradition, also complicate the implementation of FBDGs and should be taken into account when specific groups are targeted.

It should also be remembered that when previously disadvantaged people who were hungry or food insecure at any time of their life are suddenly confronted with a wide variety of affordable and palatable food, their choices are not necessarily governed by what is healthy.

The previous set of FBDGs was tested on women in KwaZulu-Natal and the Western Cape.[8] We recommend that the new guideline on milk, *maas* and yoghurt consumption, and perhaps the ones which are differently formulated to what they were previously, are tested in the same way in various culture groups in different parts of the country. The paediatric FBDGs also require testing.

A holistic FBDG programme

Taking all of the above into account, it is clear that for successful implementation of FBDGs, a holistic approach is necessary, in which all stakeholders or role players work together to improve the food environment and empower consumers to make healthier choices. A national working group has now revised the existing set of FBDGs for South Africa, a food guide has been developed and specific paediatric FBDGs have been proposed. The technical support papers published in this journal explain and promote the FBDG messages to health professionals, and are one set of educational material that can be used to support the FBDGs. Additional educational material for specific target groups should now be developed. This material must address the particular needs of target groups. It must also be arranged in a format that they will easily understand, and to which they can relate and practically implement. It is important that educational materials address the problem of the affordability of food for those suffering from poverty-related food insecurity. For example, they should indicate alternative sources of available food for the needy.

The next step would include designing implementation programmes, for example, by applying social marketing principles to promote the FBDGs in order to improve eating behaviour. It is important that as part of their design, these interventions should include monitoring and evaluation components. The evaluation components must make provision for process, outcome, impact and efficiency evaluations,[38] which should indicate if adjustments to the programme are needed. The monitoring and impact evaluation of the use of FBDGs could form part of regular surveillance of the nutritional status of all South Africans.

Conclusion

South Africans are continually exposed to confusing and misleading dietary information. The revised FBDGs are evidenced-based recommendations on how a healthy diet can be chosen. The technical support papers in this supplement explain how and why each guideline will contribute to a healthier diet in more detail. The FBDG messages are qualitative, but the technical support papers provide information on the amounts (frequency and weight or volumes of portion or serving sizes) recommended for healthy eating. The papers also provide practical advice on how to overcome barriers for the implementation of each guideline. If used correctly, FBDGs can be a powerful tool for addressing nutrition-related public health problems in South Africa.

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7 "Have milk, *maas* or yoghurt every day": a food-based dietary guideline for South Africa

Vorster HH,[1] DSc, Professor in Nutrition; **Wenhold FAM**,[2] PhD, RD(SA), Senior Lecturer; **Wright HH**,[1] PhD, RD(SA), Senior Lecturer
Wentzel-Viljoen E,[1] PhD, RD(SA), Professor in Nutrition; **Venter CS**,[1] DSc, RD(SA), Professor in Nutriton
Vermaak M,[3] BDiet, Postgrad Dipl Hosp Diet, RD(SA), Dietitian
[1]Centre of Excellence for Nutrition, North-West University, Potchefstroom
[2]Department of Human Nutrition, University of Pretoria, Pretoria
[3]Consumer Education Programme of Milk SA, Menlo Park
Correspondence to: Hester Vorster, e-mail: este.vorster@nwu.ac.za
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Abstract

A national working group recently reached consensus that a guideline message for milk consumption should form part of the set of revised food-based dietary guidelines (FBDGs) for South Africa. The message was formulated as: "Have milk, *maas* or yoghurt every day". This paper provides scientific support for this FBDG, based on the nutrition and health profile of South Africans; addresses concerns about possible detrimental effects of milk consumption, such as lactose intolerance, saturated fat and trans-fat content, milk allergies and dental caries in children; and identifies barriers to increased consumption. The guideline refers to milk, *maas* and yoghurt, and not all dairy products. This is based on the nutrient contribution of these products to a healthy diet. Milk (and some dairy products) has a low sodium-to-potassium ratio, as well as bioactive peptides, which may protect against the development of noncommunicable diseases. There is some evidence that the calcium in milk and dairy plays an important role in the regulation of body weight and bone mineral content in children. Available data show that milk and calcium intake in South Africans is low. Identified barriers include perceptions about lactose intolerance, taste, price, lack of knowledge on the nutritive value of milk and milk products, and possibly cultural taboos. As a result, increasing the consumption of milk, *maas* and yoghurt of South Africans will require active, multifaceted and multilevel promotion.

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Introduction

The first set of food-based dietary guidelines (FBDGs) for South Africa,[1] published in 2001, did not include a separate FBDG for milk and other dairy products. At the time, the rationale focused on cost and affordability by a large section of the population. Milk and dairy products were part of the FBDG on animal foods, which included meat, chicken, fish and eggs. Another reason for this decision was concern about lactose intolerance in Africans and the low prevalence of osteoporosis in elderly South Africans. It was also argued at the time that since the guidelines were formulated for people older than seven years of age, other food sources could contribute the nutrients needed for an adequate diet.

However, in the light of consistent reports of low calcium and potassium intakes by the South African population,[2-4] and the high prevalence of hypertension[5] and other noncommunicable diseases (NCDs),[6] a national working group that revised the South African set of FBDGs recommended a separate FBDG for milk for South Africans.

The national working group examined the milk and dairy guidelines of 56 different sets of FBDGs in Africa, Asia, Europe and the Americas,[7] and recommended that the FBDG should specifically promote milk, either fresh or powdered, and the traditional fermented milk product *maas* (also known as *amasi*), as well as unsweetened yoghurt, to prevent an increase in the intake of saturated fatty acids (SFAs), sodium and sugar, which are found in many highly processed dairy products. Cheeses are not included in the guideline, and are also not featured in the South African food guide. The guide only shows examples of foods in the food groups that must be eaten regularly to meet nutrient needs. If questions are raised about where cheeses should fit into the different food groups, it should be noted that their origin, protein and fat content makes it suitable for them to be classified as food products from animals, as are fish, chicken, meat and eggs. Blends and non-dairy creamers are explicitly omitted.

The aim of this paper is to provide a rationale for the FBDG on milk for South Africans. This was achieved by discussing the nutrient composition and other attributes of milk and dairy products, which led to an overview of the evidence of the health benefits associated with milk and dairy product consumption, and a discussion of the perceived and possible adverse health effects of milk and dairy. A review of current milk consumption patterns in South Africa is followed by an examination of barriers to increased milk and dairy consumption, and lastly, recommendations on how these barriers should

be addressed in the implementation of this FBDG. The ultimate purpose is to improve the nutritional status and health of all South Africans.

South Africa has separate paediatric FBDGs for infant and child feeding,[8] which are also currently being revised. The present guideline[8] includes detailed advice on breastfeeding, in which international guidelines on exclusive breastfeeding for six months are followed, with continued breastfeeding for two years and beyond.[9] FBDGs for the general population are recommended for children aged five years and older. Because of separate technical report papers on infant feeding, the advantages of breastfeeding and milk consumption by children younger than five years of age will not be covered in this paper, other than to reiterate that because of the rapid growth and high energy needs of infants under two years of age, reduced-fat milk is not recommended as the main source of milk food for this age.

The health benefits of milk and dairy consumption

The main purpose of FBDGs is to guide the population to choose healthy diets, meaning diets that are adequate, which meet all nutrient requirements and which also protect against diet-related NCDs. There is no doubt that historically, the production and consumption of milk and dairy products played an important role in human development and well-being.[10] In order to make a responsible recommendation on milk and dairy consumption and its role in health and disease prevention in contemporary South Africa, its nutrient contribution and attributes and the role that it plays in the development of NCDs should be taken into account, as well as any possible adverse effects associated with milk and dairy consumption. These aspects will now be considered, using the most recent evidence.

The nutrient composition of milk and dairy products

The nutrient composition of milk of varying fat content and some selected dairy products, as detailed in the South African food composition tables,[11] is summarised in Table I. These products and nutrients were included in the table to illustrate that milk and dairy products are excellent sources of several micronutrients, as well as being relatively low in sodium and high in potassium.

Milk is a good source of high-quality protein, and contains useful amounts of all the indispensible (essential) amino acids.[12] Milk can be used to complement foods with lysine-deficient protein, such as maize and wheat. Adding milk or other dairy products to these foods results in a meal with all the amino acids, and is beneficial in populations where maize and bread are staples.

The 400-500 ml low-fat milk per day recommended for adults will provide 480-610 mg calcium, which is 48-61% of the recently revised dietary reference intake for calcium. On average, 1 000 mg of calcium is appropriate for women aged 19-50, and men up to the age of 70 years.[13]

Table I: Summary of the nutrient composition of selected dairy products (per 100 g)[11]

Nutrient	Unit	Fresh milk (full fat)	Fresh milk (2% fat)	*Maas*/ fermented milk	Yoghurt (plain, low-fat and unsweetened)	Yoghurt (fruit, fat-free and sweetened)	Cottage cheese (fat-free)	Cheddar cheese
Energy	kJ	262	213	270	254	375	266	1 646
Protein	g	3.2	3.3	3.3	4.3	3.8	10.5	24.7
Fat	g	3.4	2.0	3.7	1.9	1.5	0.1	32.3
SFAs	g	1.90	1.28	2.35	1.16	0.94	0.09	18.43
Cholesterol	mg	10	7	11	8	7	1	115
CHO	g	4.8	4.9	4.5	6.5	15.0	4.9	1.8
Iron	mg	0.10	0.10	0.10	0.10	0.10	0.60	0.07
Calcium	mg	120	122	162	149	145	120	788
Potassium	mg	157	152	190	194	197	185	82
Sodium	mg	48	46	71	66	74	161	487
Vitamin A	µg RE	47	24	40	22	25	2	390
Thiamine	mg	0.02	0.02	0.02	0.02	0.02	0.04	0.04
Riboflavin	mg	0.16	0.16	0.15	0.19	0.15	0.21	0.36
Niacin	mg	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Vitamin B_{12}	µg	0.4	0.4	0.4	0.5	0.3	0.7	0.8
Vitamin D	µg	0.03	0.01	0.03	0.01	0.01	0.08	0.25

CHO: total carbohydrates (including added sugar), RE: retinol equivalents, SFAs: saturated fatty acids

The same amount of low-fat milk will provide 608-760 mg potassium, which is 30-38% of the recommended adequate intake of 2 000 mg potassium per day.[14] The substantial contribution of milk to potassium intake is important for the nutrient adequacy of populations that do not meet the vegetable and fruit intake recommendations. The sodium content of milk is relatively low (46 mg per 100 ml for low-fat milk). A daily intake of 400-500 ml contributes 184-230 mg sodium, which is 9.2-11.5% of the maximum of 2 g/day recommended for the prevention of high blood pressure.[15]

Table I further shows that the energy content of sweetened yoghurt, and the energy and sodium contents of cheeses (except cottage cheese), is increased through a concentration effect, or by the addition of sucrose and fruit, justifying the focus of the new FBDG on milk, *maas* and yoghurt alone. The reason why cottage cheese was not included in the formulation of the FBDG was to avoid possible confusion why some, but not all, cheeses may replace milk, *maas* or yoghurt. Low-fat products should be considered in situations in which overweight and obesity are of concern, for example South African adults.[16]

Other attributes of milk and dairy

In addition to a unique nutrient composition, milk and some dairy products have attributes that are not reflected in traditional food composition tables. These include bioactive peptides, specific fatty acids, the low pH of fermented milk, and the low sodium-to-potassium ratio of milk and *maas*. These attributes may be responsible for some of the health benefits associated with milk consumption.

Bioactive peptides

The bioactive peptides are defined by Choi et al[17] as "hydrolysates with specific amino acid sequences that exert a positive physiological influence on the body. They are inert within the native protein, but once cleaved from the native protein by microbial or added enzymes and/or gastrointestinal enzymes during the digestive process, they apply their beneficial traits. Dairy products, particularly fermented products, are potential sources of bioactive peptides". One of these beneficial traits is that they act as inhibitors of angiotensin 1-converting enzyme, which may explain the protective effects of milk on raised blood pressure.[18,19]

Calder at al[20] reviewed dietary factors that influence low-grade inflammation in relation to overweight and obesity, and concluded that dairy consumption has beneficial effects on markers of low-grade inflammation (C-reactive protein and adiponectin) in obese subjects. They speculated that possibly, these effects may be explained by the actions of the casein-derived bioactive tripeptides in milk.

Specific fatty acids in milk

Milk fat is a complex natural fat. Its triacylglycerols are synthesised from 400 different fatty acids.[21] In addition to the monounsaturated fatty acids (approximately 25% of the total), and the SFAs (roughly 60% of the total), milk fat contains several other fatty acids with possible beneficial effects against the risk of acquiring NCDs. These include the short-chain fatty acid, butyric acid, and the sphingolipids. The trans-fatty acids and rumenic and vaccenic acids in milk need to undergo more biological research before a judgement on their beneficial and/or detrimental effects can be made. These fatty acids are thought to be anticarcinogenic and anti-atherosclerotic, and may play a role in the prevention of obesity.[22-24]

Fermented milk (*maas*)

Milk products that are soured in calabashes, clay pots, milk sacks, stone jars or baskets are part of traditional South African cuisine. *Maas (amasi)* is the common name for the most popular fermented milk, originally prepared by storing unpasteurised whole cow's milk in these containers, seeded with a microbial inoculum for fermentation. Lactic acid bacteria, especially *Leuconostoc*, *Lactococcus* and *Lactobacillus,* dominate the microflora.[25] *Maas* is also produced commercially by fermentation with *L. lactis* and *L. lactis cremoris,* after which it is pasteurised. It has a shelf life of 21 days at 4°C and is an ideal vehicle for the delivery of probiotics.[26] The incorporation of probiotics in fermented milk has beneficial health effects, such as the improvement of lipid profiles.[27] Haug et al[28] reviewed the health benefits of bovine milk in human nutrition, and mentioned that the low pH of fermented milk may help to delay gastric emptying, with a resultant beneficial effect on glycaemic responses and perhaps also on appetite regulation. The perception that dairy is acid producing has no scientific foundation. Milk and dairy products do not produce acid upon metabolism, they do not cause metabolic acidosis, and systemic pH is not affected by diet.[29]

The low sodium-to-potassium ratio in milk and *maas*

The high potassium and relatively low sodium content of milk and *maas*, which leads to a low sodium-to-potassium ratio, is important in the light of emerging evidence that this ratio may be important for the prevention of hypertension and cardiovascular disease.[30-33] The World Health Organization (WHO) recommends an increase in potassium intake and a decrease in sodium intake to reduce blood pressure, cardiovascular disease, stroke and coronary heart disease and improve bone density.[34]

Milk, dairy products and calcium in NCDs

For many years, the consumption of milk and dairy products were suspected to contribute to NCDs, based

on their SFA content. However, during recent years, many publications have emerged that have indicated that milk and dairy intake may actually protect against some NCDs.

Cardiovascular disease and cancer

Alvarez-Leon et al[35] critically reviewed the epidemiological evidence that dairy consumption is associated with the risk of several NCDs. They selected 14 meta-analyses or systematic reviews from 85 000 articles on dairy consumption. Of these, six were on dairy and cancer, six on cardiovascular disease and two on bone health. The authors concluded that there is an inverse association between dairy intake and colorectal cancer, hypertension and stroke. They found no evidence that dairy intake relates to breast cancer, but found some evidence that a high intake of dairy is associated with an incremental risk of prostate cancer.

Bone health

The same review[35] also reported that at this stage, evidence of a protective relationship between dairy and bone health is weak, and recommended that more prospective studies should be carried out to examine this relationship. Nevertheless, in the latest revision of dietary reference intakes, the Institute of Medicine[36] concluded that available scientific evidence supports the importance of calcium and vitamin D in skeletal health, consistent with a cause-and-effect relationship. A systematic review and meta-analysis of 21 randomised controlled trials designed to determine the impact of the dietary intake of calcium, dairy-associated nutrients and dairy products on bone mineral content in children, revealed that an increased intake of these nutrients and products, with and without vitamin D, significantly increased total body and lumbar spine bone mineral content. In all likelihood, calcium and dairy intake has a much more profound impact on bone accretion in children than presently appreciated, particularly in those with dietary intakes below currently recommended levels.[37]

A review of numerous intervention and observational studies in many countries showed that milk intake reduced morbidity in stunted children in developing societies, whereas its long-term consequences were less clear in well-nourished children.[38] Clearly, the relationship between dairy intake and bone health is very complex, resulting in discordant publications.[39] This confirms the need for more well-designed studies, particularly in countries with a high prevalence of stunting. Nevertheless, overall, the consumption of milk and other animal-source foods by undernourished children in low-income countries improves their anthropometric indices, cognitive performance and levels of physical activity, while simultaneously reducing micronutrient deficiencies. This results in lower morbidity and mortality.[40]

Hypertension

Approximately 50% of the reduction in blood pressure associated with the Dietary Approaches to Stop Hypertension (DASH) diet has been attributed to dairy. Conversely, the low consumption of milk in the National Health and Nutrition Examination Survey (NHANES) I study was associated with a high incidence of hypertension.[41] The calcium in dairy offers several potential mechanisms with which to explain the positive effect on blood pressure,[19] particularly in people with low dietary intakes of calcium.[42]

Overweight and obesity

Evidence from prospective cohort studies suggests that dairy intake may have a protective effect on the development of overweight and obesity.[43] Whey protein and other bioactive components of dairy could induce satiation and satiety.[44,45] An emerging body of literature suggests that dietary calcium may play a role in the regulation of body weight and body fat, and the development of the metabolic syndrome.[46,47] These beneficial effects may be linked to dairy specifically, although methodological and other challenges hinder the ability to draw final conclusions.[48]

Metabolic syndrome

Metabolic syndrome is a group of metabolic disorders characterised by abdominal obesity, hypertension and dyslipidaemia. In a meta-analysis by Elwood et al that links dairy to morbidity and mortality from metabolic disease,[49] the conclusion was reached that the relative risks of developing metabolic syndrome and myocardial infarction in high milk intake groups were 0.74 [95% confidence interval (CI): 0.64-0.84] and 0.84 (95% CI: 0.66-0.99), respectively. In prospective studies, the relative risks of stroke and ischaemic (coronary) heart disease in the high milk intake group were 0.79 (95% CI: 0.75-0.82) and 0.84 (95% CI: 0.76-0.93), respectively, where "milk intake" referred to low-fat milk in the latter. The relative risk in the high milk intake group was 0.92 (95% CI: 0.86-0.97) for incident diabetes mellitus.[49] This provides evidence of an overall survival advantage associated with milk and dairy intake.

The intricate relationship between dairy products and metabolic syndrome is illustrated in Figure 1. It shows that many interlinked mediators are present, some with promoting and others with protective effects. On the one hand, dairy as "exposure" can refer to specific nutrients, foods or other compounds, individually or in interaction. On the other, metabolic syndrome as an "outcome" is a disorder that is characterised by a complex interaction among many risk factors.

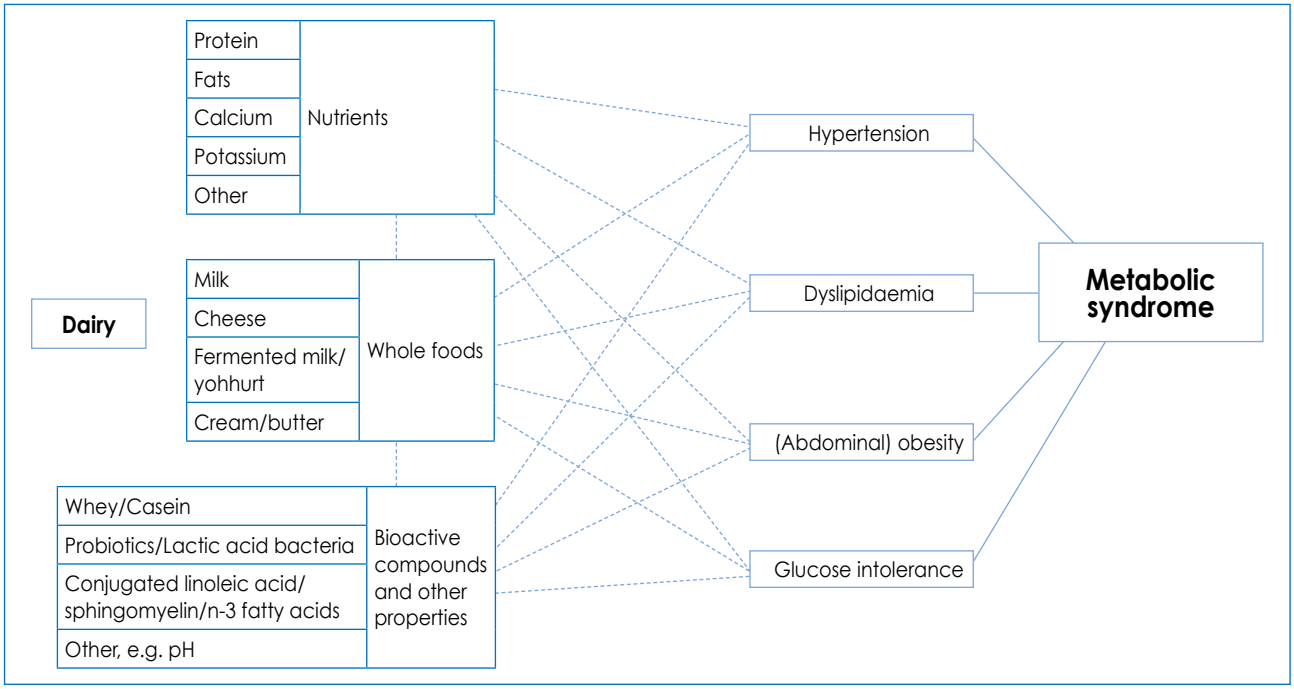

Figure 1: Dairy products and metabolic syndrome

Health concerns about dairy consumption: possible negative effects

Lactose intolerance

Lactose or "milk sugar", the dipeptide carbohydrate in milk, is digested to the monosaccharides glucose and galactose by the enzyme lactasephlorizin hydrolase,[50] which is reduced by up to 90-95% in individuals with lactase non-persistence, a condition known as lactose intolerance. These individuals, mainly from South-East Asia, the Middle East and parts of Africa, cannot digest lactose in the small gut, which results in the fermentation of lactose by bacteria in the large gut. This is associated with symptoms such as flatulence, diarrhoea, abdominal bloating and pain.

Lactase persistence is common in people of European ancestry, probably because of a genetic mutation that maintains the functionality of lactase production into adulthood. Itan et al[51] examined the conservation of the responsible lactase gene, haplotype, and found that the derived allele is recent in origin, that it has a strong positive selection, and that lactase persistence possibly co-evoluted with dairy farming in Europe in the last 5 000-10 000 years.

Lactose intolerance is often given as a reason for non-compliance with recointakes of milk and dairy, making it very difficult to meet calcium needs. Therefore, several groups have studied the consequences of milk ingestion by lactose-intolerant individuals. Savaiano et al[50] conducted a meta-analysis of studies in which this phenomenon was examined, and concluded that the intake of one cup (250 ml or equivalent of other dairy products) was not a major cause of symptoms in lactose maldigesters. Keith et al[52] determined self-reported lactose intolerance and its influence on dairy consumption in African American adults, and found that it was lower than commonly reported. Beyers and Savaiano[53] reiterated that lactose-intolerant individuals can consume at least one cup of dairy without experiencing symptoms. Tolerance can be improved by consuming milk with a meal, by choosing yoghurt or other fermented milk or hard cheese in which lactose has been digested, by consuming lactose-reduced milk, or even by using lactase supplements. Lawrence[21] advises that up to two cups of milk a day can be consumed by lactose-intolerant individuals if taken with food at separate meal times. She also mentions that tolerance improves with regular milk consumption. Unfortunately, no recent data on lactose intolerance in South African population groups are available. Given the above, as well as the fact that *maas* or fermented milk can replace fresh milk, it is unlikely that lactose intolerance should pose a real problem to milk consumption in South Africa.

Saturated fatty acids in dairy

It is accepted that dietary SFAs with a chain length of 12-16 carbon atoms increase serum low-density lipoprotein (LDL) cholesterol, and thus the risk of coronary heart disease. However, Griffin[18] pointed out that "there has always been a lack of evidence to link dairy foods with cardiovasular diseases, and that there is rather evidence of a protective effect of dairy". The protective effects of dairy on LDL cholesterol and high-density lipoprotein (HDL) cholesterol, as well as blood pressure, are now thought to

relate to the calcium and biopeptides in milk.

Lorenzen and Astrup[54] showed an attenuation of the effect of SFAs on serum lipids by milk in a clinical trial, probably because the calcium in milk binds and sequesters SFAs and bile acids in the gut, similar to the mechanism of action of cholesterol-lowering drugs and some dietary fibre. Givens[55] emphasised that simply reducing milk and dairy intake to limit SFA intake is unlikely to have an effect on serum lipids and NCD risk.

It has been established that the fatty-acid profile of milk can be changed by feeding cows[56] and sheep[57] modified diets, creating the possibility that milk with less SFAs can be produced if required or demanded.

Trans-fatty acids in milk

The trans-fatty acids in milk are sometimes used as an argument to avoid dairy products. Trans-fatty acids are known to have adverse effects on health and increasing the risk of NCDs. These include increasing the total HDL cholesterol ratio, lipoprotein(a), cardiovascular disease risk, systemic inflammation, abdominal obesity, weight gain, insulin resistance, and type 2 diabetes, and adverse effects on haemostasis.[58,59] However, there is evidence, reviewed by Tardy et al,[59] that the origin of trans-fatty acids may result in different biological effects. Industrial trans-fatty acids, produced by partial hydrogenation of vegetable oils, differ from ruminant-derived trans-fatty acids that are found in milk. More information is needed before conclusions can be reached on the effects of ruminant trans-fatty acids on human health. Given the overwhelming evidence of the beneficial effects of milk consumption, it is unlikely that these trans-fatty acids have major detrimental effects in the amounts consumed with the recommended milk intake.

The WHO scientific update on trans-fatty acids[60] specifies that "there is convincing evidence that trans-fatty acids from commercial partially hydrogenated vegetable oils increase coronary heart disease risk factors and coronary heart disease events", but more research is needed on ruminant trans-fatty acids.

Milk allergies

Cow's milk allergy, an adverse reaction that is mediated by an immunoglobulin E mechanism upon exposure to milk allergens, is the most common food allergy in children. It affects 2-5% of children in the first three years of their lives,[61] and could be a major cause of inadequate nutrient intake and retarded growth in small children.[62] Only children with a milk allergy that was confirmed by a double-blind, placebo-controlled food challenge should avoid dairy proteins.[63] Treatment consists of total avoidance of exposure to the allergens through elimination diets, and replacing cow's milk with soy or rice milk. Children often outgrow cow's milk allergy by 3-5 years of age, but symptoms may persist beyond childhood in some.[61]

Dental caries

In a recent review, Aimutus[64] mentioned that lactose cariogenicity has been debated for many years, "but the buffering capacity and potential bioactive components present in food that contains lactose offer tooth enamel protection from cariogenicity". In breastfed infants, dental care practices contribute more to dental caries than breast-milk *per se*, and improved parental personal and oral hygiene could mitigate potential problems. However, regularly putting children to bed with a bottle of milk is discouraged.[65] The role of nutrition in oral health, including dental caries, in children under five years of age is reviewed by Naidoo[65] in this issue of the journal.

The consumption of milk and dairy products in South Africa

In the motivation of milk consumption as part of the FBDG on animal foods, the 2001 technical support paper[66] reviewed milk consumption in South Africa, and concluded that although milk and dairy products are consumed by many South Africans from all ethnic groups, mean intakes for adults in six different studies from 1988-1989 were low, with mean intakes far below the 400 ml per day recommended for adults.

The mean baseline intakes of rural and urban African adults participating in the 12-year Prospective Urban and Rural Epidemiological (PURE) study are shown in Table II (Wentzel-Viljoen E, personal communication, 14 November 2012). These values confirm the previously reported low intake and emphasise the need for active promotion of the milk guideline. The table shows that fresh milk (all types, including *maas*) was consumed by the most people and in the largest quantities. In the Transition and Health during Urbanisation of South Africans (THUSA) study,[67] mean intakes varied from 133 g/day for men in informal settlements to 375 g/day for women living on commercial farms. Non-dairy creamers and milk powder blends were popular and used by men and women in both urban and rural areas. Women and, to a lesser extent, men, from the urban areas, regularly consumed a variety of dairy products (e.g. cheese, yoghurt, custard, milk drinks and ice cream), but consumption of these in rural areas was low, and probably related to availability and affordability.

Barriers against increased consumption of milk, *maas* and other dairy products

The perceived negative effects of milk and dairy are often reported as barriers to adequate consumption. Concerns about low calcium intakes have motivated research on

Table II: Average intakes in g/day of milk and other dairy products by urban and rural subjects who participated in the Prospective Urban and Rural Epidemiological (PURE) study*

Group	Fresh milk (all types)	Milk powder (all types)	Canned milk (all types)	Cheese (all types)	Non-dairy creamers and milk blends	Yoghurt (all types)	Milk products (custard and milk beverages)	Ice cream (all types)
Urban men**	354	5	4	88	68	80	93	66
Average	143.6	7.4	17.9	3.1	6.8	27.2	9.8	
SD	123.2	5.3	14.8	10.1	7.9	27.9	30.8	
Urban women**	556	7	3	168	101	209	224	155
Average	146.1	6.6	24.0	3.0	6.8	29.1	7.8	18.2
SD	119.1	6.2	33.7	4.5	8.0	27.3	14.2	24.4
Rural men**	170	1	0	3	155	0	1	0
Average	106.9	4.0	-	2.3	6.4	-	3.6	-
SD	131.7	-	-	0.9	4.5	-	-	-
Rural women**	317	5	1	4	304	3	7	0
Average	91.4	16.3	35.7	2.4	7.6	21.4	73.4	-
SD	108.8	17.5	-	2.0	7.7	19.9	118.6	-

SD: standard deviation
* Reported intakes from a validated quantitative food frequency questionnaire during baseline in 2005 (unpublished, data provided by the PURE research team)
** Number of consumers [1 397 subjects, n = 524 (men) and n = 873 (women)]

these barriers.

Jarvis and Miller[68] found that a low intake of milk and dairy in African Americans related to perceived lactose intolerance, but that culturally determined food preferences and dietary practices learned early in life played a bigger role. Zablah et al[69] interviewed 90 African American women in a grocery store and found that perceived negative taste and association with digestive problems, and the belief that they were already achieving adequate calcium intakes, were the main reasons for low milk intakes. Substituting soft drinks for milk was mentioned as a barrier to adequate calcium intake.[70]

A New Zealand study[71] that examined barriers to milk consumption in adult men and women showed that consumption related to what was important in the lives of the respondents. Concern about the fat content of milk was the main barrier for the women. There was less awareness by the men of the nutritional benefits of milk, and therefore less appreciation of its value in their diets.

A study on the acceptance of milk by 8- to 16-year-olds[72] showed that within the flavoured milk category, children preferred lactose-free cow's milk, rather than soy-substitute beverages.

The price of milk and dairy may be a barrier to consumption in developing countries. In the 2001 technical paper that supported the South African FBDG on animal foods,[66] the reasons why milk and dairy products were relatively expensive in South Africa were discussed. These were based on deregulation of the dairy industry and the fact that the industry is only protected by import tariffs. However, the price of milk and dairy, compared to that of other commodities, should be calculated based on its nutrient content. For example, when the price of 100 mg of calcium from different sources was calculated, it was found that this amount of calcium (provided by whole fresh milk) was R0.62, compared with R1.27 from by canned pilchards in brine, and R5.74 from frozen broccoli. This comparison was made using prices in June 2011, obtained from a "middle-priced" supermarket by the working group, in order to motivate the need for a separate FBDG for milk during the national consensus meeting.

Another barrier to consumption relates to culture and religious taboos and practices, also discussed in the previous technical support paper.[66] For example, consumption is affected by the fasting practices of different religions. Although milk, and especially fermented milk, have always been a favourite food of black South Africans, numerous taboos influenced consumption in the past. Only small children and the elderly drank fresh milk. A man could only drink milk in his own household, or in that of a paternal or maternal relative. A woman could only drink milk from her husband's herd after she had been accepted by her husband's family. "Impure" women (menstruating or having had a miscarriage) had to avoid all milk and milk products.

Adequate calcium intake is difficult to achieve with dairy-free diets, even when other nutrient recommendations are

met.[73] Furthermore, milk is a good source of the so-called "shortfall nutrients" of many consumers.[74] To meet calcium requirements and benefit from other health attributes of milk, it is necessary to promote increased consumption of milk and *maas* in South Africa.

Barriers to consumption must be overcome in order for South Africans to realise that "milk matters". A start could be made by explaining the core nutrient contribution of dairy,[52] but should also address salient misconceptions and perceptions,[75,76] as well as recent research findings. The promotion of dairy intake has to come from many angles, employing multiple techniques and involving all stakeholders; from producers, industry and government, to health professionals, caregivers and consumers.

Conclusion

The inclusion of milk (especially calcium and potassium) in the diet is essential in order to meet the nutrient needs of most South Africans. In addition, milk, *maas* and yoghurt have many other attributes which recent studies have indicated may be protective against some NCDs, including overweight and obesity. As stated in the introduction paper of this series of technical support papers to the South African FBDGs,[77] the nutrition-related NCDs are already responsible for unacceptable high rates of morbidity and mortality in South Africa, justifying efforts to improve the dietary intake of the population. Milk, *maas* and yoghurt can play an important role in meeting this objective, yet concerted promotion efforts, which must also address concerns about milk and dairy consumption, are still required.

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You can obtain 1 CEU for reading the review article ***"An introduction to the revised food-based dietary guidelines of South Africa including paper on Have milk maas or yoghurt"*** and answering the accompanying questions.
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1. Complete your personal details below.
2. Read the article titled ***"An introduction to the revised food-based dietary guidelines of South Africa including paper on Have milk maas or yoghurt"*** Vorster HH et al. 2013. SAJCN. 26(3) S of the Consumer Education Project of Milk SA and answer the questions.
3. Indicate your answers to the questions by making an "X" in the appropriate block at the end.
4. You will earn 1 CEU if you answer 70% or more of the questions correctly. A score of less than 70% will unfortunately not earn you any CEU's.
5. Make a photocopy for your own records in case your answers do not reach us.
6. Cut and paste the area indicated below into an e-mail message and e-mail it to maretha@dairycep.co.za or post to P.O. Box 36332 Menlo Park 0102
7. The closing date for this activity is 30 December 2017. Answer sheets received after this date will not be processed. Certificates will be sent within two months from receipt of the answer sheet.

PLEASE ANSWER ALL THE QUESTIONS
(There is only one correct answer per question.)

1. FBDGs are science-based policy recommendations in the form of guidelines for healthy eating. They are a translation of the evidence-based nutrient recommendations into _____ that should guide the general population to consume a healthy, optimal diet.
[a] food or dietary patterns
[b] food groups
[c] food guide

2. The food guide does not, like many other food guides, such as the widely used food pyramid, include items such as _____.
[a] sugar
[b] sweetened foods and drinks
[c] salt
[d] all of the above

3. The decreased intake of staple foods that are rich in starch and dietary fibre, increased consumption of food from animal origin which is rich in total and saturated fat, decreased intake of legumes and vegetables, and increased intake of energy-dense, micronutrient-poor snack and convenience foods (which are often very salty) and sweetened carbonated beverages are all associated with an increased risk of dietary related non-communicable diseases.
beverages.
[a] true
[b] false

4. According to the national food consumption survey, the national prevalence of underweight was (a), stunting 21.6% and wasting 3.7% and the dietary intake in most children was confined to a relatively narrow range of foods of low micronutrient density with (b) of children having vitamin A deficiency.
[a] (a) 9.3% (b) 35%
[b] (a) 3.7% (b) 3.3%
[c] (a) 10.3% (b) 33%

5. Because dietary recommendations change over time it is possible that the public could lose confidence in dietary guidelines. This barrier should be seen as a challenge to educate the public and establish the understanding that nutrition science is evolutionary and dynamic and that new research findings for which there is convincing evidence may lead to new dietary recommendations.
[a] true
[b] false

6. Milk can be used to complement foods with _____deficient protein, such as maize and wheat. Adding milk or other dairy products to these foods results in a meal with all the amino acids, and is beneficial in populations where maize and bread are staples.
[a] isoleucine
[b] leucine
[c] lysine

7. Dairy products, particularly fermented products, are potential sources of bioactive peptides. This beneficial trait acts as inhibitors of angiotensin 1-converting enzyme, which may explain the protective effects of milk on.
[a] raised blood sugars
[b] raised blood pressure
[c] cardio vascular disease

8. Maas is commercially produced by fermentation with *L. lactis* and *L. lactis cremoris*, after which it is pasteurised. It has a shelf life of 21 days at 4°C and is an ideal vehicle for the delivery of probiotics. Its associated beneficial health effects such as _____ as well as due to the low pH of fermented milk, it also helps to _____.
[a] improvement of lipid profiles
[b] delay gastric emptying, with a beneficial effect on glycaemic responses and appetite regulation
[c] a and b

9. Evidence from _____suggests that dairy intake may have a protective effect on the development of overweight and obesity. Whey protein and other bioactive components of dairy could induce satiation and satiety and also suggests that dietary calcium may play a role in the regulation of body weight and body fat, and the development of the metabolic syndrome.
[a] case-control study
[b] randomised control studies
[c] prospective cohort studies

10. Milk and dairy education should include explanation of the type and amount of dairy for optimal nutrition by focusing on:
[a] correct choices; serving sizes; cost considerations; label literacy
[b] correct educational tools
[c] using the nutrition guide of SA

Consumer Education Project of Milk SA - CPD activity for Dietitians

"An introduction to the revised food-based dietary guidelines of South Africa including paper on Have milk maas or yoghurt" Ref number: DT/A01/2017/00100

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