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"Enjoy a variety of foods": as a food-based dietary guideline for South Africa

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Abstract

Eating a diverse diet is an internationally accepted recommendation for a healthy diet. The food-based dietary guideline (FBDG) "Enjoy a variety of foods" aims to encourage people to consume mixed meals, to increase variety by eating different foods from various food groups, and to alter food preparation methods. This position paper suggests ways of measuring dietary variety, addresses the consequences of poor dietary variety in South Africa, and provides results pertaining to dietary variety in South African children and adults. The literature reveals that dietary diversity is best calculated by means of different food groups, which are based on the traditional eating patterns of the population under investigation. Ideally, the recall period should be three days. Two national surveys in South Africa have provided data on dietary diversity scores (DDS) in adults and children, of 4.02 and 3.6 respectively. It was shown that in children, DDS positively relates to weight-for-height z-scores, with a z-score above zero being achieved when DDS is > 4. However, an energy-dense diet is cheaper and lower in micronutrients and also positively associated with increased body mass index in women. Hence, dietary variety is essential in improving the micronutrient intake of the diet, and is also important in preventing obesity. Household food insecurity in South Africa remains a constraint on the implementation of this guideline. This FBDG should be used in conjunction with the other South African FBDGs, to ensure the sufficient intake of food that contains protective factors and the limited intake of food that is known to increase the risk of noncommunicable diseases.

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Introduction

The terms, "dietary diversity", "dietary variety", "dietary quality" and "nutrient adequacy" are frequently used to describe the diet of an individual or population. Dietary diversity refers to the number of food groups or foods which are consumed over a specific period. Dietary variety is also commonly used, and is regarded as being synonymous with diversity. Dietary quality generally refers to dietary adequacy, which, in turn, refers to a diet that meets all energy and nutrient requirements.^{1,2}

Why variety is important

A healthy diet contains sufficient water, energy, macronutrients and micronutrients to meet requirements. When these conditions are sustainably met, the person can be considered to be food secure. This is demonstrated by Figure 1 from Kennedy,² based on the United Nations Children's Fund conceptual framework.³ Household food security ensures an adequate individual dietary intake, which together with health status, influences nutritional status. Household food security itself is influenced by household dietary variety. If this is poor, then food security will be compromised. An individual needs many nutrients for optimal health. Unfortunately, no one food contains all of these nutrients, hence a variety of foods need to be consumed to guarantee the provision of

nutrients. Conversely, a diet that is low in variety is likely to be deficient in some nutrients and may result in food insecurity and consequent malnutrition. When people follow a monotonous diet, it is frequently based on starchy food, with few animal products and fruit and vegetables.⁴

A USA study that evaluated the five Food Guide Pyramid (FGP) groups and 22 subgroups showed that dietary variety increased the adequacy of intake of 15 nutrients in adults (4 969 men and 4 800 women) based on 24-hour recall data. After adjusting for energy intake and the number of FGP food group servings, all types of dietary variety were positively associated with mean nutrient adequacy across these 15 nutrients. The strongest associations were for commodity-based variety and for 22 FGP subgroup consumption servings.^{5,6} A national study on adults in Belgium (n = 3 245) that used 24-hour recall data also found a positive association between overall dietary diversity and dietary adequacy and balance.⁷ Similarly, a study on the elderly in a rural community of Iowa found that dietary variety was positively associated with the intake of a number of nutrients, energy and fibre.⁸ Data from the National Food Consumption Survey (NFCS) in South Africa showed that the dietary diversity and food variety of children were positively associated with dietary adequacy, as illustrated by the mean adequacy ratio of the diet.⁹

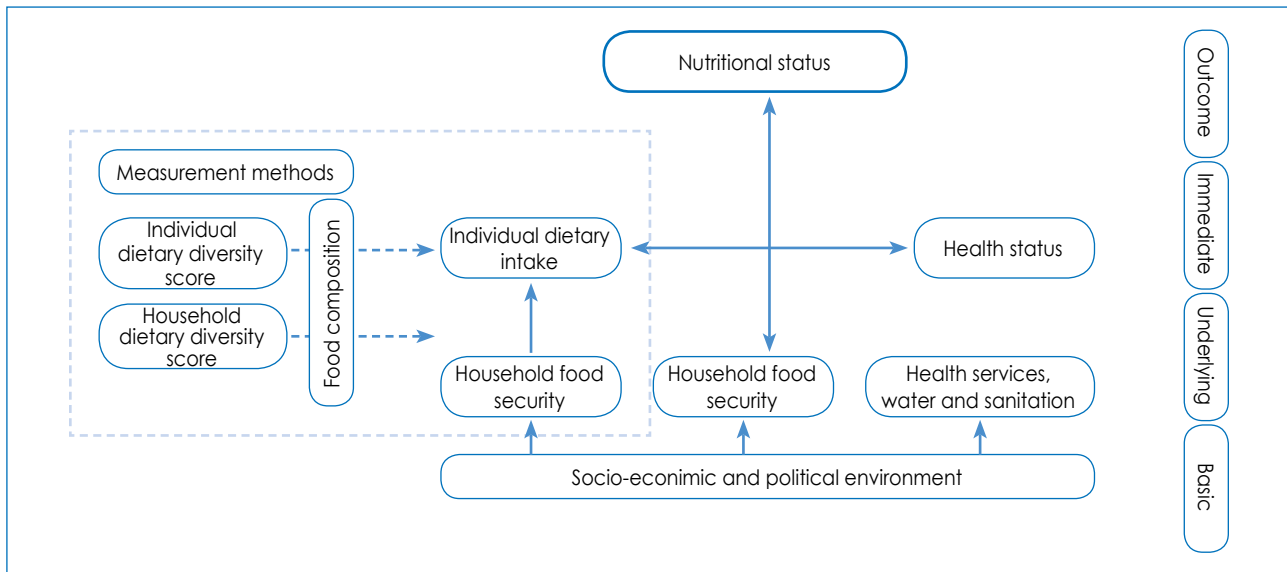


Figure 1: Adaptation of the conceptual framework of the causal model of nutritional status in order to show dietary diversity^{2,3}

Measuring dietary variety

To date, there does not appear to be consensus on the optimal method of measuring dietary variety. Numerous systems have been tested over the years. This has made it difficult to compare studies that have used different systems.

The majority of researchers have used the total of different foods or food groups consumed over recall periods of 1-3 days, although seven days have also been used.⁴ Drewnowski et al¹⁰ used data from one 24-hour recall, together with 14 days of food records, to measure dietary variety. Some researchers have used a simple food variety count, which comprises the total of different food items eaten by the group of participants,¹¹ while others have scored the number of food groups consumed. These have varied between four and 12 groups.¹⁰ Ruel reviewed the operationalisation of dietary diversity and made some important recommendations, namely that food group diversity is a better indicator than a count of individual foods.⁴ She suggested that the number and type of food groups selected should be based on the dietary patterns of the specific population group being studied, in terms of age and culture. She further recommended that the recall period should be at least three days, since one day may underestimate the true variability of intake.⁴

Nutrients that are deficient in the South African population

Micronutrient deficiencies are still rife in South Africa, despite concentrated efforts by the Department of Health to curb them. The most serious of these are iron, vitamin A, iodine, folate and zinc deficiencies. The prevalence of iron deficiency anaemia was 28.9% in 2005 in children under five years of age. Iodine deficiency was 19.2%, zinc deficiency 45.3%, and vitamin A deficiency 63.6% in children aged 1-9 years.¹² The prevalence of

iron deficiency anaemia was 28.9%, iodine deficiency 26.8%, and vitamin A deficiency 27.2% in adult women.¹² Numerous studies in adult women have shown the prevalence of folate deficiency in pregnant women.^{13,14} Despite not having biochemical measurements, the 1999 NFCS showed that numerous additional micronutrients were deficient in the diet of South African children and, by supposition, deficiency may also be found in the diets of adults. This encompasses thiamine, riboflavin, niacin, vitamin B₆, folate, vitamin B₁₂, calcium and vitamin C.¹⁵

Through the Integrated Nutrition Programme, The Department of Health utilises three strategies to curb micronutrient deficiencies. These are micro-nutrient supplementation, food fortification and dietary diversification.^{16,17} The risk of deficiency of the abovementioned micronutrients, with the exception of calcium and vitamin C, is addressed by supplementation and fortification programmes. In terms of micronutrient supplementation, iron supplements are provided to children under five years of age (in the presence of pallor) as part of the Nutrition in the Integrated Management of Childhood Illnesses programme.¹⁷ Pregnant women with a blood haemoglobin level of < 10 mg/dl should take 200 mg ferrous sulphate and 5 mg folic acid per day during the first trimester of pregnancy as a precaution against the development of foetal neural tube defects. Haemoglobin assessment must take place at the first antenatal visit, and again at 28 and 36 weeks.¹⁷

Great progress has been made with regard to the fortification programme. Fortification of salt with iodine and bread flour and maize meal with vitamin A, thiamine, riboflavin, niacin, pyridoxine, folic acid, iron and zinc is mandatory in South Africa.¹⁷ This has been successful in reducing the prevalence of iodine and folate deficiencies.

Fortification with folate has resulted in a reduction in the incidence of neural tube defects from 1.41 per 1 000 births to 0.98 per 1 000 births.¹⁸ However, the results of

supplementation and fortification with other micronutrients are in need of long-term assessment.

There is a paucity of data on health promotion regarding dietary diversification at health facilities and in communities. South Africa developed and implemented its own food-based dietary guidelines (FBDGs) in May 2003, after extensive testing.¹⁹ The FBDG, "Enjoy a variety of foods" was intended to promote dietary diversity. These guidelines were encapsulated in health promotion materials to be used in nutrition education opportunities linked to nutrition interventions taking place at healthcare facilities. They extended to growth monitoring and promotion, support for breastfeeding and infant feeding, and micronutrient supplementation.

However, the use and promotion of the FBDGs has not been tested in South Africa, and the level of implementation may depend on the degree of interest by the health educator. Fortunately, one of the government's priorities includes improved household food security to address malnutrition. Various government departments support the establishment of vegetable gardens, which contribute to increasing the consumption of micronutrient-rich foods at household and community level. Currently, there are numerous school gardens and more than 1 200 clinic gardens. The Department of Agriculture and Rural Development also supports the establishment of community gardens. However, the extent to which such gardens alleviate micronutrient deficiencies has not yet been evaluated (Moeng L, personal communication, June 8, 2011).

How diverse is the diet of South Africans?

A cross-sectional study, representative of adults ($n = 3\ 287$) from all provinces, geographic localities and socio-economic strata in South Africa, was undertaken in 2009 in order to test dietary variety.²⁰ Trained interviewers visited participants at their homes during the survey, and dietary data were collected by means of an unquantified 24-hour recall. A dietary diversity score (DDS) was calculated based on nine food groups. A DDS of < 4 was regarded as a reflection of poor dietary diversity and hence poor food security, while a score of 9 represented a very varied diet. Each food group was only counted once when calculating the DDS.

The nine groups used were:

1. Cereals, roots and tubers
2. Meat, poultry and fish
3. Dairy
4. Eggs
5. Vitamin A-rich fruit and vegetables
6. Legumes
7. Other fruit
8. Vegetables (other than legumes)
9. Fats and oils.

The results included calculation of the proportion of people who had consumed items from a food group at least once, and showed that, at national level, the mean DDS was 4.02 [confidence interval (95% CI): 3.96-4.07], and that there were significant provincial differences (Figure 2).²⁰ The four provinces with the highest prevalence of poor dietary diversity (DDS < 4) were the Eastern Cape (59.6%), KwaZulu-Natal (40.8%), North West (44.1%) and Limpopo (61.8%). Differences in DDS according to ethnicity indicated that the black ethnic group had the lowest mean DDS of 3.63 (CI: 3.55-3.71) and constituted the highest percentage (50%) of individuals with a DDS of < 4 , which was significantly lower than that of all the other ethnic groups (p -value < 0.05). By contrast, the white ethnic group had the highest mean DDS of 4.96 (CI: 4.82-5.10) and constituted the lowest percentage (9%) of individuals with a DDS < 4 (p -value < 0.05).

A comparison of geographic areas showed that formal urban areas had the highest mean DDS of 4.42 (CI: 4.34-4.50), while tribal areas had the lowest mean score of 3.17 (CI: 3.05-3.29), which was significantly lower than that of any other group (p -value < 0.05). Just over one third of households nationally, and just under two thirds of households in tribal areas, had a DDS < 4 . The most commonly consumed food groups, in terms of percentage of people consuming food at least once from each group per day, were cereals and roots, meat and fish, dairy, and vegetables (other than vitamin A-rich vegetables), while eggs, legumes and vitamin A-rich fruit and vegetables were the least consumed.²⁰

The results of the preceding national study are similar to those reported by Drimi and McLachlan²¹ who, in 2010, estimated that 40% of the South African population was characterised as being deficient (ate from 0-3 food groups), 50% as sufficient (ate from 4-6 groups) and only 10% as food diverse (ate from 7-9 groups).²¹ Furthermore, an assessment of dietary diversity in women living in an informal settlement in the Vaal area showed that the mean DDS (out of six groups) was only 3.17 [standard deviation (SD) 1.21].²² An elderly population in Sharpeville had a mean DDS of 3.41 (SD 1.34).²³

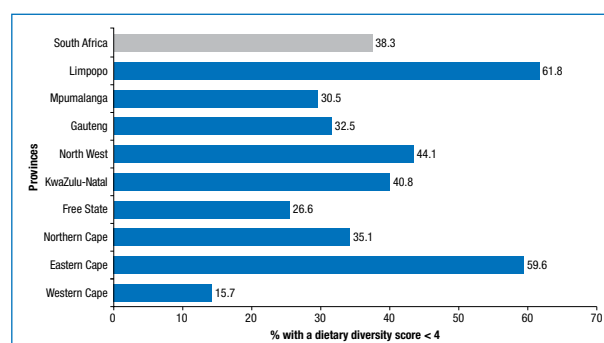


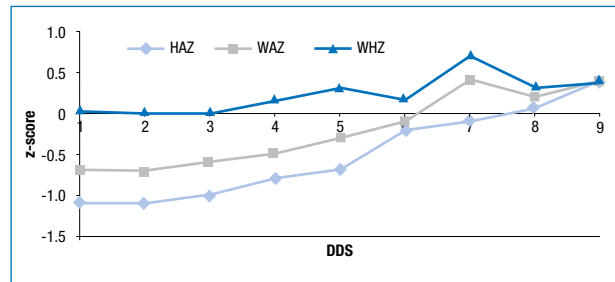
Figure 2: Percentage of population in each province having a dietary diversity score < 4 ²⁰

The dietary diversity of children was also evaluated nationally in South Africa. The calculated DDSs were validated against the anthropometry of the same children.⁹ Secondary data analyses were undertaken on the data of 1- to 8.9-year-old children (n = 2 200) studied in the NFCS in 1999. The average food variety score (FVS) (mean number of different food items consumed from all possible items eaten) and DDS (mean number of food groups out of nine possible groups) was calculated. The nutrient adequacy ratio (NAR) is the ratio of a subject's nutrient intake to the estimated average requirement of that nutrient calculated using the Food and Agriculture Organization of the United Nations/World Health Organization (2002) recommended nutrient intakes for children.⁹ The mean adequacy ratio (MAR) was calculated as the sum of NARs for all evaluated nutrients, divided by the number of nutrients evaluated, expressed as a percentage. MAR was used as a composite indicator of micronutrient adequacy. The relationship between MAR and DDS, and between anthropometric z-scores and DDS, was evaluated.

The children had a mean FVS of 5.5 (SD 2.5) and a mean DDS of 3.6 (SD 1.4). The mean MAR (ideal is 100%) was 63.3% (SD 19.4), and was lowest (57.3%) (SD 25.2) in the 7- to 8-year-old group. The most frequently consumed items were from the cereal, roots and tuber group (99.6%). Items from the dairy group were consumed by 55.8% of subjects, from the meat group by 54.1%, from the fat group by 38.9%, from the vegetables other than those rich in vitamin A group by 30.8%, from the vitamin A-rich vegetable group by 23.8%, from the other fruit (not vitamin A-rich fruit) group by 22%, from the legumes and nuts group by 19.7%, and from the eggs group by 13.3%. There was a high correlation between MAR and both FVS ($r = 0.726$, p -value = 0.0001) and DDS ($r = 0.657$, p -value = 0.0001), indicating that either FVS or DDS could be used as an indicator of the micronutrient adequacy of the diet. Furthermore, MAR, DDS and FVS showed significant correlations with height-for-age and weight-for-age z-scores, indicating a strong relationship between dietary diversity and indicators of child growth. A DDS of 4 and an FVS of 6 were shown to be the best indicators of MAR < 50%, since they provided the best sensitivity and specificity (Figure 3).⁹

The cost of a nutrient-dense diet

Energy-dense foods are relatively cheap sources of energy, but typically have low micronutrient density. Therefore, people with a low income may select a relatively less healthy diet because of the cheaper cost. A study based on the French national food consumption study estimated the cost of food consumed by adult participants.²⁴ Participants in the lowest quartile of energy cost had the highest energy intake (highest energy density) and the lowest daily intake of key micronutrients. On the other hand, those in the highest quartile of energy cost had the lowest energy intake and the highest intake of micronutrients. Micronutrient-dense diets were consequently associated



DDS: dietary diversity scores, HAZ: height for age, WAZ: weight for age, WHZ: weight for height

Figure 3: The relationship between the anthropometric z-scores of children in the National Food Consumption Survey (1999) and their dietary diversity scores⁹

with higher food costs. Lo et al²⁵ confirmed the fact that a higher DDS, in the range of 0-6, is synonymous with higher food cost. In nutritionally vulnerable elderly Taiwanese, it was found that the food expenditure of those with a DDS of 6 was 2.2 times greater than that of subjects with a DDS < 3 when mean national food prices were used. Similarly, a study that was undertaken in Cape Town found that a healthy diet was approximately 69% more costly than the cheaper, energy-dense one.²⁶

A high energy-dense diet is also associated with obesity. This was shown using data from adults in the 1999-2002 National Health and Nutrition Examination Survey (NHANES).²⁷ Energy density was significantly associated with higher body mass index in women, and with a greater waist circumference in men and women. It was also independently associated with elevated fasting insulin and metabolic syndrome. Hence, a diet low in variety can have numerous consequences over and above deficiency in micronutrients.

Recommendations to overcome barriers to a diversified diet

This FBDG needs to be understood in the context of the other FBDGs, and to be applied with the assistance of appropriate food guides that have been developed for South Africa. Graphic formats to provide a consumer-friendly framework have to be developed, so that consumers can select a variety of foods without necessarily having specific knowledge of nutrients. Dietary diversity can be improved by choosing from a variety of foods within and across food groups that are displayed in a food guide.²⁸

Food policies and food aid may push consumption patterns towards a diverse diet. The consumption of a variety of low energy-dense foods (at least 20-30 biologically distinct foods) per week, drawn from all food groups, should be encouraged.²⁹ A diverse diet can be promoted by utilising healthy traditional foods and dishes within provinces, as well as from cuisine from other provinces and countries. Dishes that are vegetable and legume based should be emphasised. Similarly, healthy modern and functional foods must be promoted as part of a diverse diet.²⁹ Consumer messages for this FBDG should

contain an explanation as to how to build a healthy meal through diversity, eating foods that give the right amount of energy, limiting the intake of sugars and fats to manage energy and prevent overweight and, when possible, enjoying meals together as a family or with friends.³⁰

Unique use of the term "enjoy"

South Africa is one of a few countries that uses the term "enjoy" with regard to eating. This encourages families to share meals and to view meal times as occasions in which to interact and relax, which are all measures of coping with stress.³⁰ Another country that uses the word "enjoy" is Korea. Its FBDG is: "Enjoy our rice-based diet, and enjoy every meal, and do not skip breakfast".³¹ Larson et al found that young adults enjoyed eating meals with others, but many did not find the time to sit down to a meal.³² Eating dinner with others is associated with better markers of dietary intake.³² Furthermore, enjoying meals is also associated with improved metabolic effects.³³ Regular eating is associated with a lower energy intake, greater postprandial thermogenesis and lower fasting total and low-density lipoprotein cholesterol levels. Regular eating has beneficial effects on fasting lipid and postprandial insulin profiles and thermogenesis in healthy obese women.³³

Conclusion

Overall South Africans do not have sufficient variety in their diet. This has been shown by the high prevalence of certain micronutrient deficiencies. Hence, the FBDG "Enjoy a variety of food" is an important one, since it is hoped that it will sensitise and encourage people to select a more diverse diet.

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