



## **Fruit and vegetables: South African children found “wanting”...more**

The information explosion in the science of nutrition very often creates the impression that available information is contradictory. Consequently, it is no longer easy to distinguish between fact, misinformation and fiction. The Nutrition Information Centre of the University of Stellenbosch (NICUS) was established to act as a reliable and independent source of nutrition information.

***Children in South Africa are consuming inadequate amounts of fruit and vegetables, according to new findings, which describe for the first time fruit and vegetable consumption patterns at the national level.***

The hype about fruit and vegetable consumption persists as both international and national reports continue to highlight the importance of including adequate amounts of these plant foods in our daily diets. During the past decades a large number of studies have investigated the relationship between fruit and vegetable intake, disease prevention and health promotion, and scientific evidence linking fruit and vegetable consumption with health benefits continues to expand. Despite the emerging consistent evidence that supports and emphasizes the beneficial effects of fruit and vegetables consumption in human health, such consumption is inadequate in both the developed and developing world.

### **Fruit and Vegetable Intake in Children: South African Findings**

The new study was a secondary analysis of the data collected during the National Food Consumption Survey (NFCS), commissioned by the Department of Health (DOH) in 1999. The main aim of the NFCS was to quantitatively evaluate the nutrient intake and growth of children between the ages of 12 and 108 months, as well as to investigate their dietary intake and factors that affect it.

The study reported that fruit and vegetable intake per capita in children between the ages of 1 and 9 years, was considerably lower than the recommended levels. Both the consumption and the frequency of intake of fruit and vegetables by children in South Africa was poor, with intakes well below WHO guidelines nationally and provincially, and across the age range of 12 – 108 months. Children in households with a greater income and children whose mothers had a higher level of formal education had better, but still inadequate intakes.

### **Why the Flurry about Fruit and Vegetables?**

#### **Chronic disease**

Fruit and vegetable intake has been linked to decreased incidence of and mortality from a variety of chronic, non-communicable diseases, including hypertension, diabetes, cardiovascular diseases, stroke, cancer and obesity. Over the past 20 years, studies have shown an inverse association between fruit and vegetable consumption and risk of cancer. Consistent data supports the protective effect of greater fruit and vegetable consumption against cancers of the oral cavity, pharynx, oesophagus, stomach, pancreas, colon, lung and endometrium. In the United States population, poor intakes of fruit and vegetables have also been linked to the metabolic syndrome. High fruit and vegetable intake has been related to decreased rates of premenopausal bone loss in women. It has also been documented that fruit and vegetable intake can aid in the displacement of foods high in saturated fats, salt or sugar in the diet, which when consumed in excess are known to promote the diseases of lifestyle.

A realisation and awareness of the growing global burden of chronic, non-communicable diseases has been developing for more than 20 years and these increasing trends are reasonably well-documented. Cardiovascular disease remains the greatest cause of death in the world, whereas the prevalence of hypertension, diabetes and obesity continue to increase. The fact that these lifestyle diseases are a major contributing factor to the global burden of disease is widely accepted and a considerable amount of evidence shows that making a single dietary change and increasing fruit and vegetable intake, can contribute to stemming and/or reversing these trends.

### **Chronic disease and the nutrition transition**

It is now recognized that chronic degenerative diseases are no longer restricted to the developed world and are emerging within the developing countries, at unparalleled rates. This is especially true in countries, like South Africa, undergoing the nutrition transition and the accompanying rapid economic development and related changes in diets and lifestyles. Evidence suggests that among emerging populations in the nutrition transition, malnutrition in childhood is associated with an increased risk for the development of these degenerative diseases. For instance, in nations undergoing the nutrition transition, stunting appears to be associated with overweight in later life.

The nutrition transition is a progression of characteristic changes in nutrient intakes and dietary patterns related to social, cultural and economic changes during the demographic transition. In many developing countries, socio-economic status has a positive relationship with fat intake and risk of non-communicable disease. A number of studies have described the premise that fetal and childhood malnutrition may result in a higher susceptibility to the effects of overnutrition, when people are exposed to affluent lifestyles in adulthood. Therefore, it would appear that in order to prevent or possibly decrease the risk of developing non-communicable diseases in adulthood, it is necessary to prevent undernutrition in pregnant women and children as well as overnutrition in all stages of the lifecycle.

### **Micronutrients and dietary diversity**

In addition to the association between inadequate fruit and vegetable intake and chronic disease, low fruit and vegetable consumption has been recognized as a key contributor to inadequate micronutrient intake and deficiencies in the developing world. According to the Global Progress Report on Vitamin and Mineral Deficiency, issued by the Micronutrient Initiative and UNICEF, moderate levels of vitamin and mineral deficiency are common in nearly all countries. This report recognizes the problem of diet as being central to the poor micronutrient status of populations.

In the developing world, poor dietary diversity is a major problem since diets are based largely on starchy staple foods and often include little or no animal products with fruits and vegetables being only consumed seasonally. Small amounts of more nutrient-rich foods are added to these staples, according to affordability and availability, but this addition is insufficient in terms of micronutrient needs. In South African the majority of the children's diets have a low food variety and dietary diversity scores.

### **Financial implications**

A study published in the USA in 2005 showed that higher intakes of fruit and vegetables were associated with lower mean annual and cumulative medical aid charges and savings of greater than \$US 2000 in total costs per person in the highest category of fruit and vegetable consumption compared with those in the lowest category.

### **What is the “magic bullet” in fruit and vegetables?**

The precise mechanisms through which fruit and vegetables contribute to disease prevention have not been fully identified. However, it is thought that disease prevention may not be attributable to any single nutrient, but rather to the additive and synergistic effects of the phytochemicals as well as to the interaction of nutritive and non-nutritive compounds found in fruit and vegetables. Greater consumption of fruit and vegetables has been associated with lower mortality rates in a dose-response relationship. Against this background, therefore, any assumption(s) that supplements, of any type, could be of equal or similar value in disease prevention would be erroneous and most

unfortunate, indeed a leap in faith, bearing in mind the complexity of the composition of foods in general and fruits and vegetables in particular.

### Why the Concern about Children?

According to the Medical Research Council Initial Burden of Disease Estimates, published in 2000, HIV/AIDS is the leading cause of death amongst children younger than 5 years. Importantly, this is followed by low birth weight, diarrhoeal diseases, lower respiratory infections and protein-energy malnutrition, which account for approximately 30% of childhood deaths, with a significant number of these deaths being preventable. The WHO defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. A central factor contributing to this state of health is good nutrition, which is a fundamental aspect of preventable deaths.

There is increasing evidence that fruit and vegetable consumption in children may protect against an array of childhood illnesses. A study of over 20 000 children in six European countries, published in 2003, found an association between symptoms of respiratory disease and low fruit and vegetable consumption.

### How Much is Enough?

A variety of guidelines for children regarding the consumption of fruit and vegetables are available and the recommended quantities are generally similar.

### 2004 WHO Comparative Quantification of Health Risks

The WHO Global Burden of Disease project in the 1990’s provided estimates of the numbers of deaths due to major diseases for various regions of the world and of the amounts of “disability-adjusted” loss of healthy life as a result of these diseases. Subsequently, the 2004 WHO Comparative Quantification of Health Risks was aimed at estimating the mortality and disability due to the main avoidable causes of these diseases. In this latter report, low fruit and vegetable consumption was identified as a major risk factor contributing to the global and regional burden of disease. Very simply stated, the average level of intake of fruit and vegetables deemed adequate to prevent disease (theoretical-minimum-risk distribution) was estimated to be **330 grams per day in children aged 0 - 4 years, 480 grams in children aged 5 - 14 years** and 600 grams/day in adults. The selection of diseases for this purpose was based on previous reviews of the literature which attributed a protective effect of fruit and vegetables against stroke, ischemic heart disease and cancers of the lung and gastrointestinal tract.

### MyPyramid guidelines

MyPyramid, the most recent USA guidelines issued by USA Department of Agriculture’s (USDA) food guide, are guidelines intended to meet the nutritional requirements of almost every person, so they are designed to meet the Recommended Dietary Allowances (RDA) or Adequate Intake Levels. The fruit and vegetable recommendations from these guidelines are found in the table below.

**Daily recommendations for fruit and vegetables from the USA MyPyramid Guidelines, using the Dietary Recommended Intakes per age group, for a sedentary activity level**

Age (years)	Fruit (cup measure*)	Vegetables (cup measure*)	Total Fruit and Vegetables (cup measure*)	Total Fruit and Vegetables (grams)
	Daily recommendation	Daily recommendation	Daily recommendation	Daily recommendation*
2 - 3	1 cup	1 cup	2 cups	320 grams
4 – 8	1 to 1½ cups	1½ cups	2½ to 3 cups	400 to 480 grams

\* Assuming ½ cup equals 80 grams

## **Fruit and Vegetable Consumption: The Global Picture**

In the 2004 WHO Comparative Quantification of Health Risks, the levels of average dietary intake (calculated in grams per day) of fruit and vegetables (excluding potatoes), was quantified by nine sub-regions globally. In the African sub-region of which South Africa was a part, the mean daily intake in children aged 0 – 4 years was 91 – 94 grams and in children aged 5 – 14 years was 181 – 193 grams per person. In a recent publication it was found the majority of Americans eat less than recommended amounts of fruits and vegetables. The average daily intake of fruit and vegetables in children aged 2 – 3 years was approximately 328 grams. The average daily intake in 4 – 8 year old boys and girls amounted to approximately 272 grams and 280 grams, respectively.

## **The South African Picture**

In the South African study, it was found that daily average fruit and vegetable intake amounts to 110 and 205 grams per capita in children aged 1 – 9 years, according to the two different methods of measuring dietary intake that were used in the national survey. Even though the absolute values of intake by the two methods differed, the findings of both methods were supportive of the inadequate intake of fruit and vegetables.

Although the intake of fruit and vegetables was below the recommendations in all the provinces, it varied greatly between provinces. Factors which could play a role in this variation would include the differential in socio-economic development and wealth as well as the diversity in climate and access to water, which would influence provincial fruit and vegetable production, prices, availability and accessibility of these foods.

The consumption by defined age groups (1 – 3 years; 4 – 6 years; 7 – 9 years) showed that fruit and vegetable intake increased as the children got older, but remained under recommended levels, indicating a poor consumption across the age spectrum. Irrespective, the results showed that fruit and/or vegetables were eaten by most South African children and that more children consumed vegetables than fruit. Nationally, the frequency of intake of fruit and vegetables was low (approximately twice per day). The same low frequency of fruit and vegetable consumption was seen across all age groups. Fruit is not eaten every day by all children whereas vegetables are eaten approximately once daily on average. Importantly, undernourished children with poor growth patterns consumed less fruit and vegetables both in quantity and frequency.

On the other hand, an important emerging public health concern is the increasing prevalence of childhood obesity, both in industrialised and developing nations, including South Africa. Childhood and adolescence are critical periods for individuals to lay the foundation for their future good health and are also important periods in the development of obesity, since a large proportion of children track their dietary intake patterns from childhood into adolescence. A study in China found that nearly half of children who initially consumed a high fruit and vegetable diet still consumed such a diet 6 years later when they became adolescents. Similarly, a large proportion of children initially consuming a high fat diet continue with this type of diet into adolescence. Studies in developed nations have shown that children are not eating enough fruit and vegetables and have diets high in sugar, fat and refined carbohydrates, which is a dietary pattern associated with the growing obesity epidemic and is also a contributing factor in many chronic diseases. In the South African study, overweight children had a higher mean fruit and vegetable intake than children with normal weights, but the intake by overweight children was still lower than the levels recommended by the WHO and the USA MyPyramid guidelines.

## **Factors Influencing Fruit and Vegetable Consumption**

Dietary behaviour, as with all human behaviour, is shaped within an ecological milieu, which includes environmental, social and cultural factors as well as personal preferences. Food supply is influenced by economic, agricultural and political factors and impacts on food availability and cost, which in turn influences individual food choices.

Various determinants of fruit and vegetable consumption have been recognized and these are known to influence households and individuals in different ways. Identified determinants of fruit and vegetable consumption include:

- household income
- prices and availability of fruit and vegetables relative to other prices
- household members' preferences
- the cost to the household and feasibility of fruit and vegetable production, and
- the decision-making power of the women relative to men in the household

According to the literature, predictors of low fruit and vegetable intake include:

- low income
- poor nutrition knowledge
- low level of education
- living in an underprivileged neighbourhood, and
- low socio-economic status

### **Education**

In South Africa it was found that more fruit and vegetables were being consumed more frequently by children whose mothers had formal education and in particular in the households where mothers had a tertiary education. The higher consumption of fruit and vegetables by children of more formally educated mothers may be due to these mothers having an increased nutritional knowledge and/or awareness of health. It may also be due to these mothers having a higher income and consequently there being a greater availability of fruit and vegetables in the household.

### **The curse of the cost**

The South African study documented a clear association between household income and total fruit and vegetable intake. Accordingly, a greater proportion of children in homes with a higher monthly income consumed these plant foods, and in particular fruit, a consumption that was also more frequent in more affluent than in the poorer households.

Primary determinants of dietary intake in food secure households differ from those in lower income households. Research in affluent countries has shown that the environmental determinants of fruit and vegetable intake in children include parental fruit and vegetable intake, knowledge of intake recommendations and media exposure. Therefore, in higher income homes, poor food choices are more likely to lead to diets high in sugar, fat and refined carbohydrates and low in fruit and vegetables. In lower income homes however, the primary determinant of dietary intake is more likely to be the price of food. A study published in 2002 found that cost constraints influence food selection in such a way that the consumption of nutrient dense foods decreases leading to the nutritional inadequacy and unhealthy eating patterns often documented in lower socio-economic groups. In this regard, it should be borne in mind that the cost, determined on a per calorie basis, makes fruits and vegetables a great deal more expensive in comparison to fats and sweets, whilst refined cereals, added fats and added sugars provide dietary energy at a relatively low cost. This consideration may largely explain why the demand for and consumption of fruit and vegetables is smaller in poorer households.

In essence therefore, it would appear that nutrition education on its own may be ineffective as a means of increasing fruit and vegetable intake if such education campaigns are not combined with economic interventions directed at improving the affordability of and accessibility to a more varied diet.

### **Moving Forward to Fruitful Solutions**

In view of the inadequate and low frequency of fruit and vegetable intake described in this study and the importance of adequate fruit and vegetable consumption in children in relation to disease prevention and micronutrient security it would be necessary to consider interventions in both the micro- and the macro-environments in which the population lives. In this regard, interventions to improve fruit and vegetable intake in children should, among other considerations, aim to improve the availability of these foods in school environments and should aim to improve preferences for fruit and vegetables. With this in mind and the available literature regarding school fruit and

vegetable programs, the implementation of a school fruit and/or vegetable program by the South African government needs due and serious consideration.

The role of effective nutrition education in improving fruit and vegetable intake, within the available financial setting, should not be underestimated and should be continued and developed within the national, provincial and local health structures in the country. Good household practices in relation to food procurement and household resource allocation can make the best use of existing resources to promote better health and nutrition in young children. The South African Department of Health's Integrated Nutrition Program has eight identified focus areas which include micronutrient malnutrition control, and nutritional promotion, education and advocacy. Strategies identified in terms of the management of micronutrient malnutrition include dietary diversification, nutrition promotion, education and advocacy and supporting and promoting agricultural interventions to increase the availability of micronutrient rich foods. Adequate fruit and vegetable intake is therefore highly relevant in the context of both the INP and the general nutritional health of the South African population.

**For further, personalized and more detailed information, please contact NICUS or a dietitian registered with the Health Professions Council of South Africa.**

*References from the scientific literature used to compile this document are available on request.*

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