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The impact of home gardens on pre-schoolers nutrition in Eatonside in the Vaal Triangle, South Africa

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Abstract:

Background: This study set out to determine the impact of home gardens on nutrient intake, access to food and dietary diversity of pre-school children.

Objective: To determine the impact of home gardens on nutrient intake, access to food and dietary diversity of pre-school children in an informal settlement in Gauteng, South Africa.

Design: Children aged two to five years (n=40) whose caregivers participated in a garden project participated in this study. Data was gathered using quantitative food frequency, 24-hour recall and dietary diversity questionnaires. The study compared the pre- and post-project food consumption frequencies, dietary diversity and nutrient adequacy.

Results: Access to food and food consumption improved with the addition of nutrient-rich produce from the garden. The increase in dietary diversity was statistically significant. The mean nutrient intakes of iron and vitamin A improved but energy and calcium intakes dropped marginally.

Conclusions: The level of malnutrition among the participating children was alarming at the start of the project. The home garden project in Eatonside improved access to food, providing readily available vegetables that improved the frequency of consumption of these vegetables and the dietary diversity of the participating children.

Keywords: dietary requirements, food consumption, malnutrition, macronutrients, micronutrient deficiencies

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Introduction

During the first five years of life, children develop the physical, social and mental capabilities necessary for a productive future. As children are still growing and developing, their nutrient needs are relatively higher than adult requirements (FAO, 1998; Napier, 2003; Glynn et al., 2005; and Hendriks, 2013). The quality of a child's diet is a key determinant of optimal growth, development and health. Poor nutrition not only retards growth and development but also increases children's risk of developing chronic diseases such as obesity, increased cholesterol levels and hypertension later in life (Boulton et al., 1995; Berenson et al., 1998; Skinner et al., 2004 and Schneider et al., 2007).

Access to food depends on a sufficient, steady and local food supply – influenced by many interacting factors including access to land, safe water, stable climate conditions, the availability of alternative food supplies, access to shops and cash to buy food (Steyn, 1993). Access to food and poverty are closely related. Poverty constrains consumption in general, and severely constrains dietary diversity. Therefore, an increase in dietary diversity is associated with socio-economic status and household food security – both access to available food and the income to purchase food (Hoddinott and Yohannes, 2002 and Hatloy et al., 2000).

Yet, children in low-income families typically consume monotonous diets of low nutrient quality and density. They have a high risk of hunger and malnourishment (Whitney and Rolfes, 2005). However, Faber, Venter and Benadé (2002) have reported that the diets of many children in developing countries consist principally of plant-based foods (often low in protein) with little variety. Dietary diversity in South Africa is generally low as is fruit and vegetable consumption (StatsSA, 2012; Faber et al., 2011 and Labadarios et al., 1999). The most commonly consumed foods in the 1999 NFCS study were maize, sugar, tea, whole milk and brown bread. Most households reported regular consumption of a narrow range of only nine foods (Maunder and Labadarios, 2005).

While national statistics on children's nutrition is not collected regularly in South Africa, scant and irregular national surveys show alarming deficiencies in young children's diets. The first national survey of children's nutrition in post-apartheid South Africa was conducted by the South African Vitamin A Consultative Group (SAVACG, 1996) in 1994.

The results showed that that 33 per cent of preschool children are vitamin A deficient, 21 per cent were anaemic and 10 per cent were iron depleted (SAVACG, 1996). The 1999 National Food Consumption Survey (NFCS) reported that most children aged one to nine years consumed diets deficient in energy and poor nutrient density (Labadarios et al., 1999). Faber *et al*. (2009) have shown that low dietary diversity was associated with households with few assets and faced food shortages among a sample of households in Sekhukhune (some of the poorest areas on the border between Mphumalanga and Limpopo Provinces). This has been confirmed by the StatsSA (2012) analysis of the General Household Survey data from 2002 – 2011.

Literature on the consumption of vegetables is even scarcer. The 1999 NFCS survey found that green leafy vegetables were only the 16th most frequently consumed food item for children between one and nine years old (Labadarios, 1999). In the same study, green leafy vegetables ranked as the fourth most regularly consumed food. Similar to the findings of the smaller study conducted on adults in Limpopo where green leafy vegetables ranked as the 5th most consumed food (Steyn et al., 2001).

Improvements in nutrition are often key motivation for the introduction of agricultural projects. However, there is little empirical evidence that home gardens improve children's nutrition in poor communities (USAID IYCN, 2011). Review of agricultural projects spanning 30 years showed significant improvements in household incomes and access to food, but do not significantly improve the nutritional status of young children in poor communities. Where improvements are seen, there are usually to dietary intakes (especially where vitamin A-rich foods are produced) rather than improvements in anthropometry (USAID IYCN, 2011). Hellen Keller International found that agricultural projects in Bangladesh only had significant impact on malnutrition when families sold surplus produce and purchased foods that improved energy and macronutrient intakes. Similar findings are reported from a review of South African literature (Hendriks, 2003).

Micronutrient deficiencies may be addressed by increasing the availability of, access to, and ultimately consumption of foods that are rich sources of micronutrients. Home gardening could reduce micronutrient deficiencies by providing nutrient-rich foods (Shisanya and Hendriks, 2011). Home gardening can provide households with direct access to sustainable food supplies that can be harvested, prepared and consumed daily by household members. Indeed, one of the recommendations of the 1999 NFCS (Labadarios et al., 1999) was that food production at household level must be advocated and the contribution that home gardens can make to children's diet should be recognised and appreciated. Moreover, Tonstisirin *et al.* (2002) have stated that strategies that promote household production reduce the need for long-term welfare and external financial support.

Despite all the benefits reported in the available literature, very little empirical evidence of the impact of home and community gardens on food security is available (Hendriks, 2003 and Berti et al., 2004). The available studies have not used consistent approaches and their study designs do not always evaluate food security indicators directly (Hendriks, 2003). Even less is reported on the direct nutritional impacts of home gardens – most probably due to the lack of baseline data and weak programme/project design. The scant available international literature shows that home gardens can improve nutrition (dietary intake and anthropometric indicators), although exceptions have been reported observed (Webb, 2000). For example, (Miura et al., 2003) reviewed three case studies of home gardens in southern Africa and showed a tenuous link between food gardens and nutrition (Hendriks, 2003). Home gardens improved the variety of diet vegetables and fruit consumed among participants in a study in the Philippines (Faber and Benadé, 2002). The study showed an increase in diversity and consumption of carbohydrate-rich foods but a worrying reduction in the consumption on protein-rich foods occurred, possibly showing substitution of these foods with the garden produce.

The study of home-gardens in two rural areas of KwaZulu-Natal showed that the mean serum retinol concentration of children in the experimental village improved significantly compared to the baseline ($p = 0.0078$) and a control group ($p = 0.0050$) (Faber, 2002). Crop-based interventions focusing on improving vitamin A intake increased consumption of yellow/orange-flesh and dark-green leafy vegetables (i.e. linked to pro-vitamin A) among participating children in Ndunakazi, KwaZulu-Natal (Faber et al., 2002; Faber, 2011 and Oldewage-Theron et al., 2003). The seasonal variation in the vitamin-A-rich foods consumed (including traditional leafy vegetables to supplement shortages during some times of the year) showed the need for promotion of the traditional foods to ensure year-round consumption and highlights the constraints of home production related to seasonality. The authors also acknowledge the need for a more comprehensive approach, rather than focusing on interventions on a single nutrient (such as vitamin A).

CHARACTERISTICS OF THE STUDY AREA

The current study formed part of a larger community engagement project in Eatonside (ward 39 of the Sedibeng District Council), which is one of the poorest and oldest informal settlements in Gauteng Province, South Africa. The Vaal Triangle is an industrial area situated approximately 70km south of Johannesburg with a population of 1.5 million. Approximately 42 per cent of households in this area live in poverty (Oldewage-Theron and Rutengwe, 2002).

Eatonside is located in the north east of Vereeniging, with Vlakfontein in the east, Ironsyde in the north, Evaton Township in the west and Waterdal agricultural holdings to the south of Vereeniging. Eatonside was originally known as Evaton Estate with a settlement of ± 300 white residents. Evaton Estate was established in 1904 - the same year as Evaton Township, next to the freehold farm in the Wildebeestfontein district, Potchefstroom. The ward has a population of ± 6000 people.

The settlement was selected for the baseline survey on the basis that it reflected - in size (n = 1260) and geographical positioning - a typical informal settlement in Gauteng Province, South Africa (Kennedy et al., 2011).

MATERIAL AND METHODS

This study set out to conduct an in-depth and comprehensive empirical analysis of the benefits of a home garden project on children's nutrient intakes, access to food and dietary diversity in an informal settlement in the Vaal Triangle in South Africa. The larger project was motivated by the prevalence of household food insecurity and malnutrition identified in this settlement. A community meeting was called for caregivers of young children between the ages of two to five years with the help of local councillors. At the meeting, the project was explained and volunteers were identified who were willing to start home gardens.

This study forms part of a larger community development project in this community. This part of the study collected information on socio-demographic information about the children and their care-givers and the children's food consumption pre- and post-project implementation. Ethical consent for the survey was obtained and the consent of the care-givers and children's to provide information as secured before each interview.

Food consumption and dietary diversity was based on a 24-hour recall of the child's consumption, as reported by care-giver. Food samples were used as visual aids to assist the care-givers in estimating the amount of food the child has consumed.

The dietary diversity questionnaire recorded consumption of food from 16 food groups: cereals, vitamin A-rich vegetables, white tubers and roots, dark green leafy vegetables, other vegetables, vitamin A-rich fruits, other fruits, organ meat, flesh meat, eggs, fish, seeds, nuts and legumes, milk and milk products, oils, sweets, coffee and tea during the last 24 hours. These groups were derived from the FAO guidelines for measuring dietary diversity (Scharf, 1994). This provided a recall and validity check against the 24-hour food intake recall. The food consumption score was calculated as the sum of different foods consumed in the recall period.

A pilot test was carried out with a representative sample of ten households who completed the questionnaires four times, to assure quality (reproducibility, reliability and validity) and standardisation of the questionnaire before administration to the study population. The exercise ensured that the training of the field workers was

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adequate. These households were not included in the sample for the study.

A number of analyses were conducted to compare the children's pre- and post-project consumption dietary diversity. First, a simple food count was carried out to determine food consumption. Second, dietary diversity scores were estimated.

Thirdy, the data was analysed on the computer package Dietary Manager® to establish nutrient intakes (Scharf, 1994). The minimum, mean and maximum intakes of pre-school children were analysed and compared to key requirements and recommendations for their age. Children's dietary intakes were compared to Dietary Reference Intakes (DRIs).

Although it is recognised that compulsory fortification of maize and wheat products in South Africa may improve the nutrient intakes of foods, the software programme version used would not have been accounted for this. This study did not seek to determine the absolute intakes of all food consumed by the children.

The purpose of the study was to determine if the agricultural project had an impact on their food consumption (i.e. a change occurred). Lastly, paired sample t-tests (a non-parametric tool) were carried out to determine the significance of pre- and post-project data.

RESULTS AND DISCUSSION

All the households had access to running water and toilet facilities, located outside the homes in their yards. All but one household had a flush toilet and sewage removal facilities. Only two households had access to regular household waste removal facilities. Four households were located on tarred roads, while the other households were situated on gravel roads.

Thirty-six of the caregivers were woman. The level of education of the caregivers was low and unemployment high. Almost half of the households reported spending less than eight rand (just over one US dollar according to the exchange rate in 2005) per day on food, indicating that a large number lived in poverty.

At the start of the home garden project, the foods consumed most often by the children were tea, maize meal and milk (Table 1). Animal protein was only the 14th most frequently consumed food. Milk was regularly consumed but only in tea and coffee. The children's consumption levels were far below that recommended by the South African Food Based Dietary Guidelines – especially for fruit and vegetables. The only fruits reportedly consumed (Table 1) were oranges, apples, bananas and peaches (there were peach trees at the homesteads). Tomato and onion stew was the only source of vegetables reported in the pre-intervention phase.

Table 1: Most frequently consumed foods by mass (n=40) before and after the implementation of home gardens, Eatonside, 2004

	Pre-home gardens			**Post-home gardens**		
Frequency Rank	**Number of children consuming this food**	**Food**	**Average intake per day**	**Number of children consuming this food**	**Food**	**Average intake per day**
1	23	Tea, brewed	208 ml	7	Apple, average	10 g
2	18	Maize meal, stiff	14 g	4	Atchar, mango	5 g
3	24	Full cream milk	80 g	7	Banana	10 g
4	19	Maize meal, soft	20 g	15	Beef (mince)	18 g
5	17	Mabella (sorghum)	20 g	23	*Beans*	12 g
6	15	Orange	10 g	12	Bread, brown	30 g
7	20	Apple	10 g	2	Bread, white	30 g
8	23	Bread, brown	12 g	4	*Cabbage (fried)*	10 g
9	14	Fruit juice	50 ml	3	*Carrot (boiled)*	12 g
10	17	Rice, white	55 g	23	Chicken (fried)	30 g
11	17	Cold drink, carbonated	60mℓ	16	Coffee	125 ml
12	38	Banana	15 g	1	Cold drink, squash	200 ml
13	15	Maize meal crumbly	20 g	18	*Swiss chard* (with tomato, onion and fat)	15 g
14	32	Chicken, boiled	15 g	32	Tomato onion stew	8 g
15	17	Peach, raw	10 g	1	Drinking yoghurt	125 ml
16	8	Coffee	150 g	12	Maas	60 ml
17	8	Mango	20 g	8	*Beetroot*	5 g
18	8	Tomato, onion stew	25 g	34	Offal	35 g
19	20	Oats, cooked	15 g	20	Pumpkin (candied with margarine)	7 g
20	14	Drinking yoghurt	50 ml	17	Liver	20 g

Analysis of the nutrient intakes of the children at the start of the project showed that average intakes for all nutrients were below requirements and recommendations for sound nutrition (refer to table 2), except for protein that was strangely almost double (almost 90 per cent above) the RDA and Vitamin A (that was close to 46 per cent above the RDA for the age of the children). This showed a distressing level of general malnutrition in this settlement at the start of the project, indicating considerably low energy diets with an unexpectedly high protein intake. Energy, fibre and calcium intakes were almost half the daily reference and adequate intakes. Carbohydrate intakes

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were, on average, just over 12 per cent below the RDA for the age of the children. This indicates that the children's diet does not comply with the South African FBDG and the RDA, as there were imbalances.

However, food consumption patterns changed with the introduction of the gardens. The consumption frequency ranking of vegetables grown in the gardens is indicated in italics in Table 1. Beetroot, cabbage (although of no real nutritional value), carrot and Swiss chard ranked among the top 13 most frequently consumed foods at the end of the project. More children ate a greater variety of foods by the end of the project (Table 3). The consumption of vitamin A-rich foods improved the most, with all children consuming vitamin A-rich vegetables at the end of the project, compared with just over half at the start of the project. One child reportedly ate two vitamin A rich vegetables within 24 hours in the post-project survey.

Table 2: Comparison of mean nutrient intakes and recommended values

	Energy kJ/day (% of DRI)	Protein g/day (% of RDA)	Fat g/day (% of RDA)	CHO g/day (% of RDA)	Fibre g/day (% of AI)	Ca mg/day (% of AI)	Fe mg/day (% of RDA)	Vitamin A µg/day (% of RDA)
RDA/DRI /AI*	6354.00	16.00	35.00	130.00	22.00	480.00	8.00	350.00
Mean intake pre-project	3427.72 (-46.05)	30.39 (+89.94)	22.67 (-35.23)	113.63 (-12.59)	9.36 (-57.45)	219.89 (-54.19)	6.46 (-19.25)	509.76 (+45.65)
Mean intake post-project	3150.85 (-50.41)	31.5 (+96.88)	25.7 (-26.57)	140.56 (+8.12)	15.35 (-30.23)	219.77 (-54.21)	8.60 (+7.5)	550.22 (-57.21)
Mean change	-276.87	1.11	3.03	26.93	5.99	-0.12	2.14	40.46

Note: [dark grey shading] Indicates an intake below that required or recommended; [light grey shading] Indicates an intake above that required or recommended

Note too: RDA = Recommended Daily Intake, DRI = Dietary Reference Intake and AI = Adequate intake.

All the children consumed cereals and fats/oils daily pre- and post-project. The number of children consuming seeds, nuts and legumes doubled over the project period. More than a quarter more children ate dark green leafy and other vegetables by the end of the project. Another noteworthy improvement was in the number of children consuming fish and eggs – almost a quarter more - at the end of the project. The consumption of these foods may explain some of the findings of the improvements in vitamin A intake but did not have the same significant impact on other nutrients investigated.

Paired sample t-tests showed statistically significant ($p \leq 0{,}01$) changes in the consumption of vitamin A-rich vegetables; other vegetables; seeds, nuts and legumes;

cereals; dark green leafy vegetables; eggs; meat; organ meats and milk (in decreasing order – refer to Table 3).

Table 3. Summary of statistics for proportion of children consuming foods from each group and results of the paired sample t-test, Eatonside, 2004 (n=40).

Food groups	Number of children consuming foods		Percentage change for the sample over the six month period	Mean daily consumption frequency	t-value	df	Sig. (2-tailed)
	Pre-project	Post-project					
Cereals	40	40	0	-0.47500	-3.219	39	0.003**
Dark green vegetables	28	38	25	-0.22500	-2.683	39	0.011**
Eggs	19	27	20	-0.17500	-2.479	39	0.018**
Fats/oils	40	40	0	0.15000	1.233	39	0.225
Fish	9	19	25	-0.17500	-1.862	39	0.070
Flesh meat	29	35	14.5	-0.20000	-2.449	39	0.019**
Milk	34	36	5	-0.25000	-2.037	39	0.048**
Organ meats	34	38	10	-0.10000	-2.082	39	0.044**
Other fruits	10	10	0	-0.02500	-0.374	39	0.711
Other vegetables	26	38	30	-0.30000	-3.365	39	0.002*
Seeds, nuts and legumes	17	34	44.5	-0.30000	-3.365	39	0.002*
Sweets	39	40	2.5	-0.02500	-0.274	39	0.785
Vitamin A- rich fruits	11	14	7.5	0.07500	0.771	39	0.446
Vitamin A rich vegetable	22	40	45	-0.45000	-5.152	39	0.000*
White tubers and roots	7	11	10	-0.05000	-0.703	39	0.486

Note: * denotes statistically significant at 99 % of statistical significance and ** denotes significant at the 95 % level.

Most children (38 of 40) consumed cabbage, carrots and spinach by the end of the project. Thirty-one children ate beans by the end of the project, but only a third had eaten beetroot during the recall period. This was reportedly due to children not liking the colour of beetroot.

Garden produce increased dietary diversity, with 10 children eating at least one more vegetable per week more than at the start of the project. Nine children were eating at least 2 more types of vegetables per week, six children ate three more and five children were eating four more vegetable per week. Five children had increased their consumption of vegetables by more than five types of vegetables. The increase in dietary diversity was highly statistically significant (t = -8.949, df = 38 and sig. (2 tailed) = 0.000), showing a direct positive impact of the home gardens on nutrient intake and dietary diversity among the children. On the surface, the results show a positive benefit on nutrition.

To deepen the analysis, adequacy of consumption was investigated using recommended intakes as a reference point. The results of this analysis are presented in Table 4. Children's intakes of vitamin A and iron increased by the end of the project except for one child, showing that the vegetables grown in the gardens (beans, beetroot, cabbage, carrots and Swiss chard) had a positive impact on the children's dietary quality. For at least two-thirds of the children, an encouraging increase was evident in the intake of macro- and micronutrients relative to standard requirements, except for calcium and carbohydrates. While just over half the children's intake of calcium increased, but their intakes were still less than half the requirement for their ages.

Twenty-six children's carbohydrate intake increased. However, an alarming number of children's nutrient intakes actually decreased over the project relative to their requirements at their particular stage of development. This is of great concern, indicating deterioration in nutritional status during a very important growth phase.

Table 4: Change in nutrient intakes

Nutrients	Number of children who increased and decreased intake of nutrients (figures in brackets indicate the percentage of the sample)							
	Energy	**Protein**	**CHO**	**Fat**	**Fibre**	**Calcium**	**Iron**	**Vitamin A**
Increased intake	27 (68%)	28 (70%)	26 (65%)	28 (70%)	30 (75%)	21 (53%)	39 (98%)	39 (98%)
Decreased intake	13 (32%)	12 (30%)	14 (35%)	12 (30%)	10 (25%)	19 (47%)	1 (2%)	1 (2%)

Next the children's intakes were compared to DRIs. Intakes of calcium and energy remained 50 per cent below requirements. The average protein intake increased by only one per cent, but was still high and above requirements. The implementation of the garden does not explain this finding. Fibre intake increased by 27 per cent, although intakes were on average above the RDA before the project. Vitamin A intake increased, although intake was above the RDA before the project.

Paired sample t-tests were used to compare the average food consumption frequencies before and after the project. These tests showed that the only statistically significant increases in intakes were vitamin A and iron (Table 5). The high intakes of vitamin A prior to and during the study could be attributed to cereal-based diets (bread and maize meal that are fortified in South Africa). No significant changes in the consumption of macronutrients and fibre were found through paired samples t-tests. This demonstrates the need for caution in studies of this nature where counts and frequencies show improvements in consumption but empirical analyses render very few statistically significant results.

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Table 5: Summary statistics for paired sample t-tests of nutrients for pre- and post-project implementation, 2004 (n=40)

Nutrient	Mean	t- value	Df	Sig. (2-tailed)
Iron	-0.18225	-6.756	39	0.000*
Vitamin A	-0.38400	-8.325	39	0.000*
Protein	-1.83750	-0.647	39	0.522
Carbohydrates	-5.79875	-.0565	39	0.575
Fibre	-0.33800	-0.488	39	0.628
Fats and oils	-0.81875	-0.292	39	0.772
Calcium	-5.97150	-0.265	39	0.792
Energy	5.58725	0.025	39	0.980

Note: * denotes significant at the 99 % level of statistical significance.

It is concerning that the intake of carbohydrates did not improve significantly enough to satisfy even half the energy requirements of the children. Intakes of energy, fat, fibre and calcium remained inadequate by the end of the study, raising concern for their health and development.

CONCLUSION AND RECOMMENDATION

The level of malnutrition among the participating children was alarming at the start of the project. The home garden project in Eatonside improved access to food, providing readily available vegetables that improved the frequency of consumption of these vegetables and the dietary diversity of the participating children. However, few results were statistically significant and deepening the analysis revealed many concerning inadequacies. Low consumption of key nutrients including low energy, fat, calcium and fibre raises concern - both for the children’s growth and development.

This study contributes empirical findings to a scarce body of literature on the nutritional impact of home gardens. Given the widespread promotion of these interventions, this study provides much-needed evidence of the dire need for careful design of gardening projects for addressing food insecurity and malnutrition and careful empirical evaluation of the benefits.

Firstly, although not directly attributable to the garden – as starchy staples were not included in the package - significantly improve the children’s intake of carbohydrates was not evident. Their consumption was on average less than half the energy requirements of the children, despite significant changes in the consumption patterns and the frequency of consumption of cereals.

Food gardens (especially back yard gardens) are often not large enough to produce starches (maize, potatoes, sweet potatoes, etc.) that can significantly increase the availability of these foods. Seasonality of many such crops also constrains year-round availability and a lack of or poor storage means the crops cannot be stored for long periods. Therefore, targeting food gardens at children whose consumption of the basic energy they require is very low is unwise. Such children need increased intakes of energy that is not likely to be produced in a small garden.

Secondly, such gardens do not produce fats and oils necessary to increase the energy density of children’s foods and provide the fat-soluble vitamins required for sound growth and development. Low incomes constrain the purchase of plant and animal fats essential for children’s nutritional requirements.

Thirdly, children notoriously dislike vegetables. Their relatively small stomachs mean they need to eat regularly to ensure they take in enough food to meet their requirements.

The low intakes show that portion sizes may have been small and the type of vegetable included in the garden packs may not have been suitable for small children.

The caregivers reported that the children did not like the colour of beetroot. Cabbage has virtually no nutrition value (especially when cooked). The inclusion of root (such as potato) in home garden projects could improve the carbohydrate intake of children.

Fourth, until the impact of home gardens on children's nutrition can be systematically and empirically established, caution should be exercised in promoting home gardens as the ultimate solution to food insecurity and malnutrition. Home gardens are not intended to improve the macronutrient intakes. This significant limitation needs to be considered before home gardens are promulgated as the cure-all for children's malnutrition.

Home gardens can only be effective as part of a comprehensive programme to improve household incomes in general and the caregiver's income in particular along with improved health care and sanitation and health and nutrition education.

References

Berenson GS, Srinivasan SR, Nicklas TA. 1998. "Atherosclerosis: A nutritional disease of childhood". American Journal Cardiology; 82: 22T-29T.

Berti PR, Krasavec J and Fitzerald S. 2004. "A review of the effectiveness of agricultural interventions in improving nutrition outcomes". Public Health Nutrition 7: 559-609.

Boulton T, Magarey AM and Cockington RA. 1995. "Tracking of serum lipids and dietary energy, fat and calcium intake from 1 to 15 years". ACTA Paediat. 84: 10050-55.

Faber M and Benadé AJS. 2002. "Integrated home gardening and community-based growth monitoring activities to alleviate vitamin A deficiency in rural village in South Africa". URL: http://www.fao.org//DOCREP/005?y8346mo4.htm [Accessed May 2005].

Faber M, Phungula MAS, Venter SL, Dhansay MA and Benadé AJS. 2002. "Home gardens focusing on the production of yellow and dark green leafy vegetables to increase the serum retinol concentrations of 2-5 year old children in South Africa". American Journal of Clinical Nutrition. 76: 1048-1054.

Faber M, Scwabe C, Drimie S. 2009. "Dietary diversity in relation to other household food security indicators". International Journal of Nutrition, Food Safety, and Public Health. 2 (1): 1 – 5.

Faber M, Venter SL and Benadé AJS. 2002. "Increased vitamin A intake in children aged 2-5 years through targeted home-gardens in a rural South African community". Public Health Nutrition; 5:11-16.

Faber M, Witten C and Drimie S. 2011. "Community-based agricultural interventions in the context of food and nutrition security in South Africa". South African Journal of Clinical Nutrition; 24(1): 21 – 30.

Food and Agriculture Organisation (FAO). 1998. "The right to food in theory and practice". Publishing Management Group: FAO Information Division, Rome.

Glynn L, Emett P, Team TAS. 2005. "Food and nutrient intakes of 7-year old children in south west of England in 1999/2000 – What difference does gender make?" Journal of Human Diet; 18: 7-19.

Hatloy A, Halland J, Diarra M and Oshaug A. 2000. "Food variety, socio-economic status and nutritional status in urban and rural areas in Koutiala (Mali)". Public Health Nutrition; 3:57-65.

Hendriks SL. 2003. "The potential for nutritional benefits from increased agricultural production in rural KwaZulu-Natal". South African Journal of Agricultural Extension; 32: 28-44.

Hendriks SL. 2013. "Will Renewed Attention and Investment in African Agriculture Ensure Sound Nutrition?" European Journal of Development Research; 25: 36-43

Hoddinott J. & Yohannes Y. 2002. "Dietary diversity as a food security indicator". Food and Nutrition Technical Assistance Project (FANTA), Washington DC.

Kennedy G, Ballard T and Dop MC. 2011. "Guidelines for measuring household and individual dietary diversity". Nutrition and Consumer Protection Division, Food and Agriculture Organization of the United Nations, Rome.

Labadarios D, Steyn N, Maunder E, MacIntyre U, Swart. 1999. "The National Food Consumption Survey (NFCS): Children aged 1-9 years, South Africa." Department of Health: Directorate of Nutrition, Pretoria. 1046pp.

Maunder EMW and Labadarios D. 2002. Chapter 6: Dietary intake: Qualitative Food Frequency method. In: Labadarios D. (ed). "The National Food Consumption Survey (NFCS): Children aged 1-9 years, South Africa, 1999". Department of Health: Pretoria, p143. URL: http://www.sahealthinfo.org/nutrition/foodconsumption.htm [Accessed on 7 March 2005].

Miura S, Kunii O and Wakai S. 2003. "Home gardening in poor communities of the Philippines". International Journal of Food Sciences and Nutrition; 54: 77-88.

Napier C. 2003. "Nutritional status and food consumption patterns of children in Vaal Triangle". M Tech Dissertation, Vaal Technology, Vanderbijlpark.

Oldewage-Theron WH and Rutengwe RM. 2002. "Planning a community based integrated nutrition research project for informal settlement dwellers: A strategy for promoting public health nutrition". Paper presented at a Nutrition Congress, in Pochefstroom, 5-9 November.

Oldewage-Theron WH, Dirks EG, Napier CE and Rutengwe RM. 2003. "Demographic and health profile of informal settlement dwellers: is poverty a factor?" Vaal University of Technology, Vanderbijlpark.

Scharf O. 1994. Dietary Manager®, Computer Programme for nutrient analysis, based on the South African Food Composition Tables. Version 40E. Oskar Sharf, Bromhof, South Africa.

Schneider M, Norman R, Parry C, Bradshaw D, Plüddemann A. 2007. "South African Comparative Risk Assessment Collaborating Groups". S Afr Med J. Aug; 97 (8 Pt 2): 664-72.

Shisanya SO and Hendriks SL. 2011. "The contribution of community gardens to food security in the Maphephetheni uplands, determined by the Household Food Insecurity Access Scale". Development Southern Africa; 28 (4): 509-526. http://www.tandfonline.com/doi/abs/10.1080/0376835X.2011.605568?journalCode=cdsa20

Skinner JD, Bounds W, Carruth BR, Morris M, Ziegler P. 2004. "Predictors of children's body mass index: A longitudinal study of diet and growth in children aged 2-8 years".

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International Journal of Obesity Relationship Metabolism Disorder; 28: 476-82.

South African Vitamin A Consultative Group (SAVACG). 1996. "Anthropometric, vitamin A, iron and immunisation coverage status in children aged 6-71 months in South Africa, 1994". South African Medical Journal; 86:354-7.

Statistics South Africa (StatsSA). 2012. "Food Security and Agriculture 2002-2011: In-depth analysis of the General Household Survey data". GHS Series Volume IV. StatsSA, Pretoria.

Steyn NP, Badenhorst CJ and Nel JH. 1993. "The meal patterns and snacking habits of school children in two rural areas of Lebowa". South African Journal of Food Science Nutrition; 5(1)5-9.

Steyn NP, Burger S, Monyeki KD, Alberts M and Nthangeni G. 2001. "Seasonal variation in dietary intake of the adult population of Dikgale". S. Afr. J. Clin. Nutr; 14: 140-145.

Tonstirin K, Nantel G and Bhattacharee L. 2002. "Food-based strategies to meet the challenges of micronutrient malnutrition in the developing world". Proceedings of the Nutrition Society; 61 (2):243-50.

United States Agency for International Development's Infant and Young Child Nutrition Project (USAID IYCN). 2011. "Nutrition and Food Security Impacts of Agricultural Projects: A review experience". USAID IYCN, Washington DC.

Webb NL. 2000. "Food-gardens and nutrition: Three South African case studies". *Tydskrif vir Gesinsekologie en Verbruikerswetenskappe*; 28, 62-67.

Whitney E and Rolfes SR. Understanding Nutrition. 2005. Chapter 20: Hunger and the Global Environment 700-711. 11th Edition. Prentice Hall, New Jersey, USA.