

Investigating the Contribution of Home Gardening to Household Food Security with regard to Dietary Diversity

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ABSTRACT In many countries, South Africa in particular, health problems related to dietary excess is an ever increasing threat especially for pregnant woman, children and infants, as they cannot achieve their potential level of physical and mental development. Therefore, this study used nutritional diversity as a substitute to measure the contribution of home gardening to food security of low-income households. Fifty (50) respondents that consisted of gardening and non-gardening households were selected through stratified random sampling for the study. Female-headed households were dominant among gardening households and the majority were married. The findings show that household members from gardening households were more literate than non-gardening households, and as such they were more likely to be employed than their non-gardening counterparts. Households with gardens have a higher number of members than households without gardens. The results also revealed that the households that practice home gardening enjoy diverse diets as compared to non-gardening households. The majority of both gardening and non-gardening households regard diversifying their diets as slightly important. The majority of the gardening households indicated that they grow their own vegetables for consumption. Recommendations to overcome these challenges were suggested.

INTRODUCTION

According to Ruel et al. (2004), the rural poor are mostly affected by poor diets as they consume less diversified, standard and starchy meals. Their meals have limited amounts of fruit and vegetables, which then result in a number of nutrient deficiencies. Labadarios et al. (2009) found that numerous low-income households in South African households have low dietary variety. Poverty disrupts the achievement of dietary diversity, and Love et al. (2001) mention that affordability and availability have been identified as major constraints when it comes to fruit and vegetable consumption in their households. Labadarios et al. (2011) further suggest that in order to achieve the Food Based Dietary Guidelines (FBDGs), consumption of home grown vegetables and fruits needs to be promoted especially because they are socially acceptable and affordable. In addition, the poor can opt for home grown plants because they can easily adapt to harsh environments and can be grown using

simple technologies and inputs (Van Der Walt et al. 2005).

Home grown produce is not only the basis for food consumption but also for income provision through the sales of surplus produce, further improving household food security (Van Averbeké and Khosa 2007). This serves as an intervention to increase household nutrition in both rural and urban areas to improve production, availability and access to food. This will assist to increase and diversify eating to overcome, prevent and mitigate dietary deficiencies (Faber et al. 2002). To date, limited studies have been published on the contribution of home gardening to household food security with the specific focus on dietary diversity. Webb (2000) has called for in-depth research to demonstrate that home gardens offer a solution to malnutrition problems. Since there are a number of methods used to assess food security in South Africa, it is essential to determine specific methods that can be adopted by the Department of Agriculture to determine the impact of agricultural production to food security. Therefore, this study used Dietary Diversity as a proxy to measure the contribution of home gardening to food security of low-income households.

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Problem Statement

In many countries, South Africa in particular, health problems related to dietary excess are an ever-increasing threat. Black et al. (2008) asserted that pregnant woman, children and infants are affected the most, as they cannot achieve their potential level of physical and mental development. Possible causes for this could be those noted by Seligman et al. (2010), which is living in food insecure households, fruits and vegetables are typically the first groups reduced from the diet due to their higher prices and low shelf life compared to other foods. It has also been discovered that as many as 2.5 more people suffer from what is viewed as 'hidden hunger'. These people may seem to be getting enough to consume in calories, however, they are lacking essential micronutrients such as vitamins and minerals. The lacking nutrients are most needed for human health and their absence can cause physical and mental ill health (Food and Agricultural Organization (FAO) 2004).

Research Objectives

In order to achieve the main objective of the study, the following specific objectives are set:

- To establish whether Dietary Diversity is a useful indicator or proxy measure of good nutrition.
- To determine whether home gardens contribute to greater Dietary Diversity at the household level, and thus improved household food security.

Research Questions

- Do gardening households consume diverse diets as compared to non-gardening households of similar economic status?
- Is there a link between home gardening and improved health outcomes?
- What are the different perceptions regarding a diverse diet among households (households with and those without gardens)?

Literature Review

Dietary Diversity Definition and Measurement

Dietary diversity refers to an increase in the variety of foods across and within food groups (FAO/WHO 1998) capable of ensuring adequate

intake of essential nutrients that can promote good health (Ruel 2002). Furthermore, while inverse relationships have been found between dietary diversity and chronic non-communicable diseases (Azadbakht et al. 2005), it has a direct relationship with favourable nutritional status (Styen et al. 2006). Eating a diverse diet is an internationally accepted recommendation for a healthy diet.

Diversity is the important principle underlying the construction of sustainable agricultural and food systems. In a study done in Philippines by Miura et al. (2003), the results revealed that participants consumed more fruits and vegetables, which in turn improved their diets and that the fruits and vegetables were home grown produce. The abundance of fruits and vegetables reduced the consumption of protein rich foods. In addition, the practice of home gardening did not increase vegetable consumption variety, rather the frequency of consuming a variety of foods did. Meaning, home grown produce has the potential to diversify energy dense and protein rich foods, which in turn leads to nutritional improvement as recommended by the World Health Organization (WHO 1998).

Many food based dietary guidelines aim to encourage people to consume mixed meals, to increase variety by eating different foods from various food groups, and to alter food preparation methods. Dietary diversity is best calculated using different food groups, which are based on the local eating patterns of the population under investigation. Literature reveals that an energy dense diet is cheaper but is lower in micronutrients, and therefore, dietary diversity is necessary in improving the micronutrient intake of the diet.

A majority of researchers have used the total of different foods or food groups consumed over recall period of one to three days (Drewnowski et al. 2009), although seven days and the previous month have also been used as an independent check. In addition, the recommended recall period should be at least three days, since one day may underestimate the true variability of intake. Under the operationalization of dietary diversity review, Ruel made some important recommendations namely that food group diversity is a better indicator than a count of individual foods. Furthermore, the number and type of food groups selected should be based on the dietary patterns of the specific population group being studied.

Factors Contributing to Poor Dietary Diversity in Low Income Households

Generally it is known how difficult it is to change eating behaviour by trying to teach populations on healthy food choices. There are numerous barriers resulting from poverty and food insecurity (healthier choices are not available, accessible or affordable) to peer pressure and aggressive marketing of food and beverage products leading to intakes of energy dense, micronutrient-poor, convenience and 'junk' foods and drinks that are becoming more affordable and available in developing countries.

Lack of Nutrition Education

Encouraging people to consume healthy meals, carrying out proper child feeding approaches and awareness are all interrelated activities, which form part of nutrition education (Nathan 2008). It is advisable to link nutrition education to these interrelated practices, for instance, when advising on the consumption of vegetables, provision of information on preserving methods and advice on proper cooking skills will be a bonus. The malnutrition crisis is worsened by lack of nutrition information (Keller and Lang 2008). Through a study conducted by Anderson et al. (2009) the women in the study area received little education and are lacking the necessary expertise on how to help their children improve weight gain. Nutrition education does not only apply to people with food acquisition challenges, but applies to people with adequate food as well as some of them lack the necessary information on how to combine and prepare meals for a balanced diet (Nsele 2014).

Inadequate Dietary Intake

A diet that is adequate in both quantity and quality is a prerequisite to the wellbeing of a healthy individual. If a diet is lacking these requirements then it is more likely to cause malnutrition. Steyn (2006:3) stated that the diet of rural woman is concentrated with carbohydrates, plant protein, fibre and magnesium comparing to that of urban woman who consume higher amounts of a diversified meal (Institute of Medicine (IOM) 2002).

High Unemployment Rate

Rural areas where sustainable livelihood approaches are limited, household food insecurity make low income households to be more poverty susceptible. According to Leatt (2006), households that are income dependent are the ones that are poverty stricken. Therefore, high unemployment levels impact poverty inclinations, and hence food insecurity.

Statistics show that women are less likely to be employed than men and household income is dependent on household size (Statistics South Africa (STATSSA) 2011). The same statistics proved that the majority of households cannot meet the food requirements and that is the major contributor to malnutrition. Approximately twenty-nine percent of black South Africans fall in the lowest group in household income, which suggests that household income is generally low in the country.

Limited Resources and Lack of Access to Healthy, Affordable Foods

According to Tonstisirin et al. (2002), one should encourage household production approaches because they are more sustainable as they are more independent of external financial support. Livestock and crop production still takes place in rural areas as subsistence farming but food is mostly purchased (Mauder and Meaker 2007). Households obtain more than seventy percent of their food supplies from supermarkets but if the cost and food expenditure were decreased then that would lead to households consuming more diverse and nutritious diets. Altman et al. (2009) mention that social grants maybe a temporal solution to improve household security status of both children and adults, and may suppress suffering in the short-term. However, the long-term solution to the problem is to address it by implementing and monitoring sustainable solutions to support the livelihoods.

Limited Access to Healthcare

A majority of low-income households lack access to basic healthcare, or if healthcare is available, it is of substandard quality. This result therefore causes failure of early detection and treatment of evolving long-lasting health problems.

Achievement of Affordable Nutrition

Dietary guidelines have a tendency of highlighting good nutrition, and they rarely take food preferences, prices or diet costs into account. Nowadays, food choices are largely driven by taste, cost and convenience. The ability to follow a healthy diet depends on having sufficient knowledge, money and time. As a result, low-income families often lack these basic social and material resources. In turn, limited access to healthy foods may be one reason why low-income households suffer from malnutrition. However, rising food costs are a problem and not only for the poor.

Contribution of Home Gardening to Household Food Security

Household food security is defined as the ability to secure adequate food for meeting the dietary needs of all members, whether from its own production or through purchases. Food insufficiency is an aspect of food insecurity, describing lack of access to sufficient quantity, quality of food, and anxiety in procuring food (Bickel et al. 2000). Home gardens make important contributions to household food and nutrition security, but their contribution to the overall food supply is undermined as a generally overlooked but an essential technique for food production (Koyenikan 2007). Leroy et al. (2008) mentioned that surplus produce can be sold for additional income, which can be used for other important household needs such as other food, clothing and education, purchase of seeds, tools and fencing.

Making Food more Diverse and Nutritious

With gardening, an average family is provided a considerable amount of fresh food that has the potential to improve the quality and quantity of nutrients consumed by the whole family. Research shows that households with gardens obtain more than a half of their vegetable supply from their gardens (Marsh 1998). The priorities for family food supplies should be an adequate quantity and sufficient variety. The household needs to consume a balanced diet with enough staple food, but also enough of the right kind of other foods. A variety in the home garden produce has the potential to provide different foods with essential nutrients. An addition of fruits and vegetables in a meal often makes

other foods more palatable and can lead to overall increased food intake.

METHODOLOGY

The study was carried out in Colesberg in the North Eastern part of the Northern Cape Province of South Africa. A stratified random sampling procedure was used to select respondents. This technique seeks to ensure adequate representation of the populations of interest. In this study, individual households with and without gardens in the Towervallei location of Colesberg were the main respondents. A list was made with all households with gardens. In addition, all the neighbouring households without gardens from the same location were listed. Then, 25 were randomly chosen households from each list and were selected using simple random sampling, and that made a total of 50 households for the survey. One round of interviews was conducted where the interviewer used a structured questionnaire with some open-ended questions. Part A consisted of questions, which gathered data on the General Household information. Part B was used to gather information about the Household Diet, where the respondents were asked to recall the foods prepared and consumed in the household as well as the source of the food. Part B therefore also served as the basis for calculating a dietary diversity score for each household. Part C was used to gather data on the perceptions of the gardening and non-gardening households on diversifying their diets and the importance of good nutrition. Data from the 24-hour, three days and four weeks recall of food consumption was entered into a Microsoft Excel spreadsheet for analysis. The number of different food groups consumed was calculated to better reflect a quality diet. Knowing what households eat, for example, an average of four different food groups indicates that their diets offer some diversity in both macro- and micronutrients. This is a significant indicator than knowing that households consume four different foods, which might all be cereals. The following set of 12 food groups is used to calculate the Household Dietary Diversity Score (HDDS), that is, cereals, fish and seafood, roots and tubers, pulses/legumes/nuts, vegetables, milk and milk products, fruits, oil/fats, meat, poultry, offal, sugar/honey, eggs and miscellaneous. Data analysis included using descriptive statistics. The 12 food groups were used to determine dietary diversity scores, where food items consumed per

food group were counted. Average dietary diversity scores were calculated for the previous 24 hours, three days and four weeks. The Pearson correlation coefficients were calculated to determine whether the dietary diversity scores increased due to the consumption of home grown vegetables. After the share mean of unhealthy members for both gardening and non-gardening households was calculated, the results were used to interpret the health status of household members.

RESULTS AND DISCUSSION

The result shows that common causes of death in Africa are household food insecurity and malnourishment, especially amongst woman and children. In fact, malnutrition is considered as both, a source and a result of poverty. In addition, the results also reveal that nutrition is a precondition for human and economic success. More so, dietary quality and diversity is an important factor contributing to improved nutritional status in Towervalley. Policies and programs to alleviate under-nutrition should place greater emphasis on strategies such as homestead food production that improve the availability and access to micronutrient rich foods. This study aims to fill a gap through an empirical analysis of the benefits of homestead food production in the small town of Colesberg.

The results reveal that female-headed households are dominant among gardening households. This is likely because men are less interested in gardening than woman. Among gardening households, thirty-eight percent are married and nineteen percent are single, whereas among non-gardening households its forty-six percent that are married and twenty-six percent that are single. The level of education in the study ranges from participants with no formal education to those with a tertiary qualification. However, they show that household members from gardening households are more literate than non-gardening households, and as such they were more employed than their non-gardening counterparts. Therefore, the results yield a positive relationship between education and employment status.

Socioeconomic Characteristics of the Samples

Multiple and different socio-demographic factors such as age, gender, level of education and marital status must be captured in order to

measure the degree of poverty as well as the bearing that these factors have on socioeconomic wellbeing of selected households. A socio-demographic questionnaire was used as a measuring tool (Napier 2006).

The outcome presented in Table 1 displays that sixteen percent of gardening households were male-headed whereas eighty-four percent were female-headed. Among the non-gardening households, forty percent were male-headed versus sixty percent that were female-headed. Therefore female-headed households were dominant among gardening households. This is likely because men were less interested in gardening than women. Among gardening households, thirty-eight percent were married and nineteen percent were single, whereas among non-gardening households forty-six percent were married while twenty-six percent were single. This result supports Zenda (2002), who stated that married households have an advantage because they have partners to work with them in the garden. Households with married people are able to share household activities such as agricultural production, harvesting of fruits, weeding, fetching of water, while divorcees, single and widowed household heads have to do all the household activities, as they do not have all the support unless from their older children who are fit

Table 1: The main characteristics of the sample (percentage)

	Gardening		Non-gardening	
	Male-headed	Female-headed	Male-headed	Female-headed
<i>Household Headship</i>	16	84	40	60
<i>Marital Status</i>				
Single	25	19	20	26
Married	50	38	40	46
Widower	0	19	10	7
Divorced	0	5	0	7
Separated	0	9.5	10	7
Cohabiting	25	95	20	7
Sub-total	100	100	100	100
<i>Education</i>				
No school	0	24	20	40
Primary	25	29	20	537
High School	50	33	40	0
Tertiary	25	14	20	100
Sub-total	100	100	100	100
<i>Occupation Status</i>				
Employed	75	57	30	20
Unemployed	25	43	70	80
Sub-total	100	100	100	100

Source: Field survey

to assist with the household activities (Zenda 2002).

According to Muchara (2010), people who are better educated are able to understand information better. Illiteracy is one of the major factors that limit development in less developed countries. According to some studies, households' dietary diversity increases with the highest level of education of the head of the households (Variyam et al. 1998). It may be that educated people are more concerned about their nutritional balance and diets and hence, dietary diversity will increase in their household. In this study, the level of education ranges from those who do not have any formal education to those who have attained tertiary education. The respondents from gardening households that had high school education were fifty percent male and thirty-three percent females. The number of households that had primary education was twenty-five percent male and twenty-nine percent female. Most of these respondents that had tertiary education were twenty-five percent male and fourteen percent female. However, twenty percent of the female respondents had no formal school education but were actively involved in home gardening. The respondents from the non-gardening households that had high school education were forty percent male and seven percent females. The number of households with primary education was twenty percent male and fifty-three percent female. Respondents that had tertiary education were twenty percent males and no female. However, twenty percent male and forty percent female of the respondents had no formal school education.

Employment status plays a prominent role in the overall household food security status. In the study the results show that the majority of the gardening households are more employed than the non-gardening households. Among the gardening households seventy-five percent of males are employed and only twenty-five percent are unemployed, whereas fifty-seven percent females are employed and forty-three percent are unemployed. In the non-gardening households thirty percent of males are employed and seventy percent are unemployed, whereas twenty percent of females are employed and eighty percent are unemployed. The results further show that diversity of income sources in gardening households potentially improves their household food security.

Monthly Food Expenditure

The quantity and quality of a household's expenditure patterns are highly correlated with the purchasing power of the household. Altman et al. (2009) mention that the extension of social grants to household members can improve food security status of both adults and children, which might decrease suffering in the short-term but the long-term solution to address the issue is through sustainable and maintainable solutions for supporting livelihoods. Healthy food is generally more expensive compared to foods based on refined grains, added sugars and fats that are readily available in low-income neighbourhoods (Drewnowski and Darmon 2005). Households with limited resources to buy enough food often try to stretch their food budgets by purchasing cheap, energy-dense foods that are filling. They try to maximize their calories per Rand in order to alleviate hunger (Despres et al. 2005; Jennifer 2014). The reliance on less expensive, energy-dense foods typically means lower nutritional quality, and has been linked to malnutrition. It is therefore important to assess the food expenditure patterns of Towervallei community members, as it is expected that households with gardens spend less on food purchases compared to non-gardening households.

The outcome presented in Table 2 shows that about a half of the households spent less than R800 on food per month. In addition, an average household size of five people spent R5.33 per person per day on food. This amount is far less than the international one dollar a day per person poverty line, which matches findings by Oldewage-Theron et al. (2006).

Table 2: Household monthly expenditure

<i>Monthly food expenditure</i>	<i>Gardening (%)</i>	<i>Non-gardening (%)</i>
R 0	0	0
R1-R199	0	0
R200-R399	20	20
R400-R799	28	32
R800-R1100	24	20
R1200-R1799	28	28
R1800+	0	0

Number of Eating Occasions

Eating less or skipping meals to stretch one's food budget may result in overeating when food

becomes available. Ill health could be experienced due to the chronic ups and downs (Bruening et al. 2012). This situation is especially a problem to mothers who find themselves having to sacrifice their own nutrition in order to protect their children from hunger.

The findings regarding the gardening status of a household did play an important role in the number of meals eaten daily within the household. From the gardening households, four percent of households consumed two meals per day, seventy-two percent consumed three meals, and twenty-four percent had more than three meals a day. Whereas in the non-gardening households, sixteen percent of households consumed two meals per day, sixty-four percent consumed three meals, and twenty percent had more than three meals a day.

Household Size

Household's size is an important factor of food diversity. Household's dietary diversity increases with the household size (Lee and Brown 1989). It was hypothesized that household size can have a positive impact on food security and dietary quality due to more diverse income sources, which is in line with the findings by Toulmin (1986). On the other hand, Haddad et al.'s (1994) findings show that a larger household size is negatively associated with food security due to increased food expenditure and competition for other limited household resources.

The findings of the study presented in Table 3 show that households with gardens have a higher number of members than households without gardens. This could help in sharing garden responsibilities among household members.

Table 3: Average household Size

<i>Number of people in the household</i>	<i>Households with gardens</i>	<i>Households without gardens</i>
1	3	4
2	3	7
3	7	4
4	8	4
5+	4	6
Total	25	25

Households Dietary Diversity Status

Household dietary diversity is often used as a proxy indicator for nutritional adequacy in the household. Torheim et al. (2004) showed that dietary diversity is useful as an indicator of nutrient adequacy and it is important to examine how various food groups contribute to the nutrient adequacy of the diet in rural areas. Many studies have shown that an increase in dietary diversity score is related to increased nutrient adequacy of the diet. With regards to the determinants of dietary diversity, many social, economic and demographic characteristics are associated with the households' dietary diversity.

Table 4: Average household dietary diversity scores

<i>Food recall period</i>	<i>Gardeners</i>	<i>Non gardeners</i>
24hours	2.24	1.92
3 days	3.6	2.72
4 weeks	3.08	2.8

With regard to the average household dietary diversity scores Table 4 confirms that households that practice home gardening enjoy diverse diets as compared to non-gardening households. On the 24-hour recall the average dietary diversity score of gardening households is 2.24, whereas the average dietary diversity score of the non-gardening households is 1.92. The results also show that on the three-day recall, both gardening and non-gardening households had a slightly higher dietary diversity score than in the last 24 hours with gardening households having 3.6 and households without gardens at 2.72. The previous four weeks were captured as an independent check on the frequency of fruit and vegetable consumption. Gardening households had an average dietary diversity score of 3.06, which is higher than the 2.8 recorded for households without gardens. An increase in the average number of different food groups consumed provides a quantifiable measure of improved household food access. Another way of appreciating the contribution of home gardening to dietary diversity is by examining the Pearson correlation coefficients between the Hard Disk Drives (HDDs) and the number of foods consumed from the garden. For the 24-hour reference period, this coefficient is 0.302 (which is statistically different from zero at below the 10% significance level), while for the

3-day reference period it is 0.628 (which is statistically different from zero at below the 0.1% significance level).

These results further indicate that the three-day measure is more sensitive than the 24-hour measure, at least in the sense that it picks up more of the difference in the eating habits of gardening versus non-gardening households. In general, an increase in household dietary diversity reflects an improvement in the household's diet and thus improved nutritional status at household level.

Frequency of Home Grown Products' Consumption

Dietary diversity in the gardening households is better than in households whose consumption is dependent solely on purchasing. It may be that households who have their own production system might choose to diversify their home grown crops to increase the food diversity. Others might lack access to diverse food items due to lack of time to purchase or minimum availability or the distance that exists between the location and market.

With reference Table 5, the average of home produce consumption in the gardening households in the previous 24 hours is 0.52, while for the three days prior the interview the average is slightly higher at 1.36 and the average of home produce consumption is the highest at four weeks at 1.84. This means that gardening households do enjoy diverse and nutritious diets every now and then because looking at the previous four weeks, the frequency of fruits and vegetables consumption is increasing.

Table 5: Frequency of home produce consumption

<i>Reference period</i>	<i>Home grown average</i>
24 hours	0.52
Three days	1.36
Four weeks	1.84

Table 6 suggests why it is that home gardens contribute to higher dietary diversity scores in gardening households. This result is indicative of the higher frequency and the contribution that home gardens have on dietary diversity and household food security status aiding in food acquisition and access as well utilization.

A Link between Home Gardening and Improved Health Outcomes

A majority low-income households lack access to basic healthcare, or if healthcare is available, it is of substandard quality. This result therefore causes a failure of early detection and treatment of evolving long-lasting health problems. It was expected that households with home gardens have improved nutrition and better health outcomes.

The results regarding the association between home gardening and health outcomes while considering gardening as 0.55 and non-gardening as 0.48 share of unhealthy members fail to support the theory; however, neither of the difference is large enough to prove the contrary. The statistical test (not shown) indicates that the population means are not different at the five percent significance level. The result further indicates that four percent of the gardening households resort to self-help, and for the non-gardening households it was sixteen percent. In addition, twenty-four percent of non-gardening households can afford to pay for private doctors, whereas in the gardening homes the affordability is as low as sixteen percent. Rather, the gardening households are dependent on nearby clinics for help and many of them (12%) have not had any help. Only four percent of them have visited the traditional healers to help them with their health issues.

Table 6 offers possible explanation to the adverse results regarding the relative health of gardening households in comparison to the non-gardening households.

Table 6: Health care facilities

<i>Sought help from</i>	<i>Gardeners</i>	<i>Non-gardeners</i>
Self	4	16
doctor	16	24
clinic	36	32
hospital	8	0
Traditional healer	4	0
spiritual healer	0	0
family member	0	0
home based care givers	0	4
have not had help	12	4

Perceptions Regarding a Diverse Diet

Low-income families lack basic social and material resources and that limits their access to

healthy food, and as a result, they suffer from malnutrition. Food choices are driven by taste, cost and convenience. The ability to follow a healthy diet depends on having sufficient knowledge, money and time. The poor rather focus on food quantity rather than quality, and therefore a need arises to investigate their perceptions on good nutrition and on diversifying their diets.

The findings regarding the perceptions of diverse diets show that both gardening and non-gardening households regard diversifying their diets as slightly important with fifty-two percent of gardening and forty-eight percent of non-gardening households, respectively. There is a twelve percent similarity in both gardening and non-gardening households who are not even sure about the importance of diverse diets and ironically forty percent of non-gardeners believe that diverse diets is very important and that number is slightly higher than thirty-six percent gardeners who regard diversity in diets as very important.

The findings pertaining to the main reason for practicing home gardening show that the majority of the gardening households indicated that they grow their own vegetables for consumption, meaning that having their own produce enables them to save money they would have used to purchase vegetables or any other food items either from the supermarkets or local shops. Only twenty-three percent of them mentioned nutrition as one of the major reasons for practicing home gardening. Nutrition education facilitates in understanding the relationship between proper nutrition, good health as well as the importance of consuming nutrient rich foods on a daily basis to prevent malnutrition (Nsele 2014).

CONCLUSION

There is a negative relationship between household food security and total food expenditure. The households were below the poverty line, where they are seen to be spending less than the internationally recommended dollar per person per day. Healthy food is generally expensive and therefore low income households resort to cheaper refined foods. The outcome showed that about a half of the households spent less than R800 on food per month. In addition, an average household size of five people spent R5.33 per person per day on food. The results

showed that the gardening status of a household did play an important role in the number of meals eaten daily within the household. This means that the gardening households are "safe" from skipping meals as they eat at least three meals a day. The results also show that households with gardens have a higher number of members than households without gardens. This could help in sharing garden responsibilities among household members. The results show that larger household sizes are associated with a positive food security status.

According to the results, the households that practice home gardening enjoy diverse diets as compared to non-gardening households. Dietary diversity scores have been positively correlated with increased mean micronutrient adequacy of complementary foods. The results further indicate that the three-day measure is more sensitive than the 24-hour measure and it is better than the 24-hour and the previous four-week measure. The results also show that the higher the average of consumption of home grown products, the higher the dietary diversity scores in the gardening households. This shows a positive contribution of home gardening to access, acquisition and better utilization of food items in the household.

The results also indicate that both gardening and non-gardening households regard diversifying their diets as slightly important with fifty-two percent gardening and forty-eight percent non-gardening households, respectively. The results failed to support the theory about the link of home gardening to better health outcomes. The gardening households had a far greater share of unhealthy household members as compared to gardening members. The statistical test shows that the population means are not different at the five percent significance level. Figure 6 offers possible explanation to the adverse results regarding the relative health of gardening household in comparison to the non-gardening households, where four percent of the gardening members resort to self-help, for the non-gardening households it was sixteen percent. In addition, twenty-four percent of non-gardening households can afford to pay for private doctors, whereas in the gardening homes the affordability is as low as sixteen percent. Rather, the gardening households are dependent on a nearby clinic for help and many of them (12%) have not had any help. Only four

percent of them have visited the traditional healers to help them with their health issues.

The results show that the majority of both gardening and non-gardening households regard diversifying their diets as slightly important. However, there is a significant twelve percent that feel indifferent and are not sure how important good nutrition is. The results further show that the majority of the gardening households indicated that they grow their own vegetables for consumption, they went on to say that that helps them save money they would have used to purchase vegetables or any other food items either from the supermarkets or local shops.

RECOMMENDATIONS

There must be a better understanding of the relationship between diets and better nutrition outcomes. There also needs to be an understanding of which food groups are most important as well as at what level. More research is needed to conclude at which lifecycle stages such dietary improvements are effective. All types of interventions, from sector-wide policies (to improve dietary diversity), to interventions focused on specific food markets or populations (home gardening, nutrition education), must be assessed.

Regarding the role of home gardening in enhancing food security in low-income households, it is discovered by the experimental results that the government can intervene by engaging more development strategies in low-income areas. In this way, the poor can be taught about basic and simple agricultural activities, in order for them to actively participate in home gardening. They also need to be taught that selling of surplus produce should be prioritized only after the consumption needs are met.

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