

SITUATION ANALYSIS AS INDICATOR OF FOOD SECURITY IN LOW-INCOME RURAL COMMUNITIES

Wilna H Oldewage-Theron, Sara S Duvenage* & AA Egal

OPSOMMING

Ernstige armoede heers in die Kwa-Kwa gebied van die Vrystaat provinsie waar ongeveer 73% van die stedelike en plattelandse bevolking onder die broodlyn leef. Navorsing onder skoolkinders (9-13 jaar) in 'n lae-inkomste gemeenskap in laasgenoemde gebied het op chroniese wanvoeding gedui agv onvoldoende nutriëntinnamte met gepaardgaande groeivertraging, waarvan sommige ernstig. Derhalwe is 'n verdere studie onderneem in drie gemeenskappe in die breër gebied, hierdie keer onder volwassenes. Die ondersoek het determinante ingesluit om die toegang tot, beskikbaarheid van, en die benutting van voedsel (insluitend water en sanitasie) te ondersoek. Die doel was om inligting in te win tov huishoudelike en individuele voedselsekureit in die teiken huishoudings.

Die dataversameling vir die kruisseksionele opname, wat 'n sosio-demografiese en ekonomiese vraelys (n=271 mans en vroue), 'n gestruktureerde 24-uur herroep voedselinname vraelys (n=383 vroue) en antropometriese metings (n=207 vroue) vir liggaamsmassa, lengte en middellynomvang ingesluit het, is tydens 2008 en 2009 afgehandel.

Resultate dui op 'n situasie waar 51,5% van huishoudings 'n vrou aan die hoof het. Omtrent die helfde van al die huishoudings in die studie (50,9%) het dan ook slegs een persoon aan die hoof gehad. Meeste van die huishoudings

(91,4%) het persone addisioneel tot gesinslede akkommodeer, wat 'n groter as gemiddelde huishouding meegebring het, nl. 5 lede. Ten spyte van die gevestigde gemeenskappe was huisgrootte baie beperk (47,9% \leq 4 vertrekke). Omstandighede was ook nie bevorderlik vir goeie sanitasie nie (87,4% van huishoudings het puttoilette, 96,5% met geen afvalverwyderingsdienste). Ongeveer 16,5% van huishoudings het dan ook nie water ontvang dmv pyleidings nie.

Voedsel is meestal mbv elektrisiteit op 'n tweeplaat stofie berei (53,5%), op 'n steenkoolvuur (20,5%), of 'n paraffienstofie (10,1%). Vroue was die belangrikste besluitnemers vir sake rakende voedselaankope (hoeveelheid spandeer 79,5%, tipe voedsel 78,2%), voedselbereiding (78,2%) en voeding van kinders (82,3%). In ongeveer 7,3% van huishoudings is die meeste van hierdie funksies deur kinders vervul.

Die hoë vlak van armoede is duidelik uit die hoë persentasie werkloosheid (75,7% versorgers en 67,5% gades). Die grootste deel van die gemeenskap (82,6%) moes met 'n huishoudelike inkomste van \leq ZAR1500/maand aan al hulle behoeftes voldoen. Meeste huishoudings (56,1%) het 85,7% van hulle totale maandelikse inkomste op voedsel spandeer, dit was ZAR5.71/persoon/dag. Huishoudings het dan ook aangedui dat hulle altyd (16,3%), dikwels (22,2%) of soms (42,8%) 'n te kort in geld ervaar het om kos of klere te koop. Voedselaankope is meestal een keer/maand by 'n

ketting- (71,7%) of spazawinkel (21,4%) gedoen.

Die verskeidendeid in voedselinname van vroulike versorgers was uiters beperk en gebaseer op stapelvoedsels: slegs stywe mielipap (88%), suiker (60%) en tee (50%) is meestal ingeneem, met gevolglike tekorte vir alle nutriënt op individuele vlak in meeste gevalle, behalwe koolhidrate (slegs 38,1% het tekorte vertoon). Verder is oorgewig (liggaamsmassa indeks ≥ 25 $\leq 29,9$) vir 26% en vetsug (liggaamsmassa indeks ≥ 30) vir 41,9% van respondente gemeet wat tekenend is van wanvoeding.

In gevolgtrekking is dit duidelik dat die bedrag van USD1/dag/persoon, wat internasionaal as riglyn gebruik word om armoede aan te dui, heelwat meer is as wat die deelnemende huishoudings beskikbaar gehad het om in hulle behoeftes te voorsien. Die hulpbronne tot die beskikking van hierdie huishoudings was dus nie voldoende om toegang te verleen tot geskikte voedsels vir 'n voedsame dieet nie. Hierdie huishoudings verkeer dus in 'n situasie van verhoogde voedselsekureit risiko waar negatiewe ekonomiese skommeling 'n wesenlike gevaar inhou.

'n Dieet met 'n beperkte voedselkeuse in kombinasie met stysel as stapelvoedsel, is tipies van 'n lae-inkomste begroting. Baie min vrugte en groente is dan ook ingeneem. Die voorsiening van voedsel was ontoereikend in hierdie huishoudings, wat beide beskikbaarheid sowel as hoeveelheid betref. Wanvoeding met hoër vlakke van vetsug word dikwels by vroue in lae-inkomste groepe aangetref. Die voorkoms van 'n gebrek aan voedselsekureit in kombinasie met vetsug is bevestig.

'n Gebrek aan voedselsekureit, op huishoudelike en individuele vlak, is duidelik waargeneem in die breë Kwa-Kwa gebied. Hierdie situasie dui op 'n omvangryke probleem,

wat moontlik kwesbaarheid tov gesondheidsrisiko's inhou. 'n Konsepsionele raamwerk is saamgestel as riglyn vir gemeenskapintervensies.

ACKNOWLEDGEMENTS

The following contributions are recognised with appreciation:

- South Africa-Netherlands Research Programme on Alternatives in Development (SANPAD) for funding;
- Centre of Sustainable Livelihoods, Vaal University of Technology, for creating the opportunity for the study;
- The chiefs, especially Chief Mr T Ntsane, and the respondents from the three rural communities in Qwa-Qwa, for their positive collaboration;
- The fieldworkers for their dedication and perseverance.

— *Dr SS Duvenhage**

Visiting Scientist

Centre of Sustainable Livelihoods

Vaal University of Technology

Mobile: +27 (0)79 961 9767

Fax: 086 667 0715

E-mail: sarie.duvenage@yahoo.com

** Corresponding author*

— *Prof WH Oldewage-Theron*

Senior Researcher

Centre of Sustainable Livelihoods

Vaal University of Technology

— *Dr AA Egal*

Director

Centre of Sustainable Livelihoods

Vaal University of Technology

INTRODUCTION

South Africa (SA) is a middle-income country, typified by contrasting living conditions ranging from wealthy suburbs to poorer, underdeveloped rural areas (Steyn et al, 2006). Owing to limited resources and rampant poverty, these areas often portray a scenario more descriptive of a less developed country. Even with an adequate national food supply, as is the case in SA (Department of Agriculture and Land Affairs, 2002), poverty may manifest in a lack of food security at household level (Koch, 2011).

According to the 1996 World Food Summit, food security exists 'when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life' (WHO, 2012). Within this context, the concepts of food availability (in sufficient quantities on a consistent basis); food access (sufficiency of resources to acquire suitable foods for a nutritious diet); and food use (proper use based on application of basic nutrition and care, adequate water and sanitation), are applicable (WHO, 2012).

At household level, food security is generally perceived as 'access by all household members to sufficient and nutritious food that is safe to eat as a prerequisite for sufficient dietary intake and meeting of food preferences for an active and healthy life' (FIVIMS, 2004). This entails the household's availability of, and access to, food based on household production, availability from the market and other community sources, as influenced by the availability of household income (Pelletier et al, 2001:704). The utilisation or consumption of food relates to individual food security, based on the availability of food and the household's access to food, but it is also dependent on the distribution of food within the household. Food acquisition and allocation behaviour within the household are involved (Pinstруп-Andersen, 2009).

Owing to the complexity and multi-dimensionality of food security, or the lack thereof, a combination of measures (often indirect) needs to be considered as relevant to the context and level of use (Kuzwayo, 2008:173; Pelletier et al, 2001:705). The households' socio-demographic situation and economic resources that influence food availability and access, as well as dietary intake and nutritional status as indicators of individual food consumption, are respectively linked to the household and personal food security situation of a community (Oldewage-Theron & Slabbert, 2008; Kuzwayo, 2008:174-175).

A lack of food security impacts unequally on individual household members, as adults, in an effort to shield children from the negative consequences of food insecurity, tend to absorb the effect as far as possible (Radimer et al, 1992; Pelletier et al, 2001:702). Adequacy of the nutritional intake of adults, specifically of female household caregivers, has been found to be indicative of the food security situation in low-income households (Kendall et al, 1996).

Cost of food is perceived as the primary determinant of food choice, in direct relation to the income and socio-economic status of consumers (EUFIC, 2005:2). Limited economic resources facilitate a shift towards the choice of more affordable, energy-dense, kJ-loaded dietary choices (Drewnowski & Specter, 2004). Within the SA context this translated into the choice of maize meal and bread as the most commonly consumed starch-based staples (Labadarios et al, 2008b:258). Characteristics displayed by the dietary intake in such circumstances include increased consumption of sugar and fat, while the intake of complex carbohydrates, dietary fibre, fruit and vegetables decreased (WHO, 2003). As the amount of money available is insufficient to purchase a basic nutritionally balanced diet in compromised economic circumstances, the implication is that physiological human needs are not adequately met (Rose

& Charlton, 2002), increasing short- and long-term health risks through malnutrition.

Malnutrition includes under-nutrition and/or over-nutrition. Under-nutrition refers to the consequences of insufficient dietary intake (energy, protein, vitamins and minerals) and/or repeated infectious diseases, while over-nutrition encompasses an energy intake in excess of energy expenditure, resulting in the accumulation of excess body fat (Das & Roberts, 2001:4; WHO, 1995). This could be the consequence of consuming more energy than the daily energy requirements, perhaps only of the wrong things such as fat, or sugar and fat, or not being active enough (Labadarios et al, 2008a:147). Under- and over-nutrition in adults are categorised and interpreted through the application of the body mass index (BMI) (Galuska et al, 2001:531; Mahan, 2004:424). The prevalence of obesity is increasing all over the world (Labadarios et al, 2008:147) and specifically in South Africa (Puoane et al, 2002; Steyn, 2006).

Qwa-Qwa, situated in the Free State province, is severely impoverished, with 73% of its population of 766 754 living below the poverty line for South Africa (Punt et al, 2005:8). A survey conducted in a rural Qwa-Qwa community revealed poor dietary intakes and malnutrition, including both under- and over-nutrition, as indicated by the prevalence of severe stunting (2,8%), stunting (11,3%), overweight (12%) and obesity (2,8%) in primary school children (Oldewage-Theron & Egal, 2010). It was not clear, however, whether these findings were indicative of a lack of food security in the broader population and region. Consequently, the study was expanded to investigate the situation in three additional communities.

To describe and interpret the situation in the three communities, socio-demographic and economic determinants, dietary intake and nutritional status were investigated as indicators of household and individual food (in)security in

order to plan the way forward.

METHODS

Ethical considerations

The protocol was developed in accordance with the guidelines of the Medical Research Council of SA and the Declaration of Helsinki for research on human beings (Medical Research Council (MRC), 1993; World Medical Association, 2004) and approved by the University of the Witwatersrand's Medical Ethics Committee for Research on Human Beings (M080931). Only participants who granted informed written consent to participate in this study after the objectives and study procedures had been explained to them were recruited for voluntary participation in the survey. All fieldwork was conducted according to these guidelines.

Sampling

The following power calculation was applied to determine sample size (The survey system, no date):

$$\text{Sample size} = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Where:

Z = Z value (1.96 for 95% confidence level)

p = expressed as a decimal, 0.5 used for this study

c = confidence interval, 6.0 used for this study

A sample size of at least 257 was required for representative data, but an extra 14 respondents were recruited to allow for attrition (n=271). The sample consisted of women and men, randomly selected according to the inclusion criteria of age (between 21 and 60 years), permanent residence in rural Qwa-Qwa, and signing of in-

formed consent forms.

Procedures

Ten postgraduate students from the local Qwa-Qwa tertiary institution were recruited and trained as fieldworkers for the completion of the questionnaires on socio-demographic and economic determinants and dietary intake. The anthropometric measurements were taken by a registered dietician and public health nutritionist.

Not all measurements could be taken on the same day owing to the scope of the study, logistical arrangements and time allocated for data collection. All data, including the first set of 24-hour recall data, were collected during one visit over three consecutive days. This was mainly due to irregular attendance by the respondents during the process. Two additional sets of data were gathered for the 24-hour recall on different week and weekend days on separate occasions.

Measurements

Characteristics of participants A socio-demographic and economic questionnaire, previously tested for reproducibility (Oldewage-Theron & Slabbert, 2008), was used for data collection. All respondents were interviewed by the fieldworkers, applying a one-on-one technique. The questionnaire addressed demographic household characteristics (language used by the household, highest education level, date of birth or identity number, gender, marital status, and type of household head); accommodation and sanitation (persons other than family members also living in the house, permanence of household members, duration of stay in current house, building material of which house was mainly constructed, house ownership, size of house, and sanitation (toilet facilities, household waste removal, pests); household assets and fuel use for food preparation; responsibility for household food decisions (household role of decision maker, who decides how much is spent

on food and on type of food bought, who is mainly responsible for food preparation and for feeding or serving the child); source of water for household use; cultivation of home gardens and use of produce; household income profile (paid employment status of caregivers and spouses, duration of unemployment of caregiver, number of contributors to household income, total household income per month); and food purchasing practices (frequency of buying food, where, how much is spent on food per week, frequency of shortages of money for the purchasing of food or clothing, and number of meals eaten per day).

Dietary assessment A structured 24-hour recall questionnaire, previously validated in a study in a similar community (Oldewage-Theron, 2001:105), was administered only to female caregivers as they were perceived to experience the most compromised dietary intake in low-income households (Kendall et al, 1996). As there were often two women living in one household, namely the mother and grandmother, the dietary intake data were collected for both the mother and the grandmother to accommodate differences in intake for age. The number of questionnaires (383) completed thus amounted to more than the sample size of 271 households for each of the three repetitions. Quantitative, descriptive information about dietary intake patterns was obtained through the use of food models to demonstrate food items and quantify portion sizes.

Anthropometric indices Anthropometric measurements included body weight and height and waist circumference, measured according to standard procedures (National Health and Examination Survey 111, 1988:3-14). Body weight, in light clothing with no shoes, was determined to the nearest 0,1 kg on two new portable Philips electronic bathroom scales, model HF350. Height was measured to the nearest 0,5 cm with a Scales 2000 portable stadiometer. Waist measurements were taken using a Seca

non-stretch tape. All measurements were taken twice and the average was recorded.

Analyses A total of 271 questionnaires on socio-demographic and economic determinants and 383 full sets of 24-hour recall questionnaires (each set consisting of three repetitions of the 24-hour recall questionnaire for a specific respondent over time) were completed, as well as anthropometric measurements for 207 women. The questionnaires on socio-demographic and economic determinants were analysed using the Statistical Package for Social Sciences (SPSS) program for Windows, version 18,0. Descriptive statistics (frequencies, means, standard deviations and confidence intervals) were determined.

Dietary intake data were analysed by a registered dietician, using the Foodfinder® version 3 software program, based on the South African food composition tables (Wolmarans et al, 2010), and developed by the Medical Research Council. Mean dietary intake over the three occasions was calculated for the whole group (n=383) for the respondents who consumed the different foods (n=varied). The 20 foods consumed in the highest quantities (g) on a daily basis were identified accordingly. Daily nutrient intakes were reported as means and standard deviations. Frequencies were used to determine the percentage of subjects with nutrient intakes below 100% of the Dietary Reference Intakes (DRI) (Institute of Medicine (IoM), 2003), specifically the Estimated Average Requirement (EAR) and adequate intake (AI), where no EAR values were available. EAR is recommended for use in groups of a specific gender at a certain life stage and reflects the estimated requirements of 50% of individuals in the group. The Recommended Dietary Allowances (RDAs) are used for individual intakes and not for groups (IoM, 2003).

Body mass index (BMI) was calculated using weight (kg) divided by height squared (m²) and categorised according to the cut-off points for

underweight (<18,5), normal weight (≥18,5 ≤24,9), overweight (≥25 ≤29,9) and obesity (≥30) (Galuska et al, 2001:531; Mahan, 2004:424). The waist-to-height ratio (WtHR) was calculated and 0,5 was used as the cut-off point for health (Hsieh et al, 2006; Lee et al, 2008; Maffei et al, 2008).

RESULTS AND DISCUSSION

Socio-demographic and economic profile

Socio-demographic characteristics The caregivers in these mainly Sotho-speaking communities (96,1%) displayed a relatively average education level as most (85,7%) obtained only some form of primary (32,6%) or secondary school education (Table 1). Average respondent age was 44,3 ±15, ranging from 21 to 60 years, and the sample consisted mainly of females (88,8%).

Approximately half of the households (50,9%) were single-headed, and/ or female headed (51,5%), possibly signifying a higher vulnerability of these households to fluctuating economic conditions (Markets and Economic Research Centre, 2008:1).

Accommodation and sanitation Households in these rural communities, as defined by a single person living alone or more persons living together and provisioning themselves jointly with food and/or other essentials for living (Statistics South Africa (StatsSA), 2003), consisted of 4,9 (five) members on average. This figure indicated a larger household size than the three to four typically reported for such communities (StatsSA, 2005) and the 3,4 persons reported for average household size in South Africa (StatsSA, 2012), but smaller than the 5,3 reported for sub-Saharan Africa (Bongaarts, 2001:266).

It is also notable that nearly all households (91,4%) accommodated additional persons apart from family members, mostly on a permanent basis (98.9%).

Most respondents (81,9%) had been living in their houses for longer than five years, signifying established communities. This perception is strengthened by the fact that most of the houses were owned by the occupants (88,6%) and of a more permanent nature (made of brick or rock) (82,3%). Although house sizes varied, for approximately half of collaborating households (47,9%) conditions were cramped, as space was provided for barely more than the basic needs of the average household (Table 2).

Regarding sanitation, an average of 57% of households in SA are equipped with flush/ sewage toilets (StatsSa, 2012) in comparison with the very few (6,1%) in use in these rural communities. This resulted in pit latrines being used by most households (87,4%), as against the 19,3% in SA (StatsSA, 2012). This situation is not ideal for the promotion of sanitary practices and health, especially in view of the almost non-existent waste removal services in these communities and the fact that most households experienced a problem with mice or rats (62%) (Table 2).

Main household assets and fuel choice
According to the wealth measure segmentation

TABLE 1: DEMOGRAPHIC HOUSEHOLD CHARACTERISTICS

Household language	Frequency	%
Sotho	261	96,1
Xhosa	2	0,8
Zulu	6	2,3
Pedi	2	0,8
Total	271	100
Highest education level	Frequency	%
None	32	11,6
Primary school	88	32,6
Secondary school	144	53,1
College	6	2,3
Other post-school	1	0,4
Total	271	100
Gender	Frequency	%
Female	241	88,8
Male	30	11,2
Total	271	100
Marital status	Frequency	%
Single	81	29,9
Married	131	48,3
Widowed	51	18,8
Divorced	6	2,2
Other	2	0,8
Total	271	100
Head of household	Frequency	%
Father	105	38,8
Mother	126	46,3
Child	23	8,6
Grandfather	3	1,1
Grandmother	14	5,2
Total	271	100

TABLE 2: ACCOMMODATION AND SANITATION (n = 271)

Occupants	Frequency	%
Persons other than family members living in house	248	91,4
Only family members living in house	23	8,6
Total	271	100
Permanency of household members	Frequency	%
All permanent residents in house	268	98,9
Not all permanent residents in house	3	1,1
Total	271	100
Duration of stay in current house	Frequency	%
<1 year	9	3,5
1-5 years	40	14,7
>5 years	222	81,9
Total	271	100
Type of house	Frequency	%
Brick	222	81,9
Zinc/shack	23	8,5
Clay	13	4,8
Other	10	3,7
Grass	2	0,7
Rock	1	0,4
Total	271	100
House ownership	Frequency	%
Own house	240	88,6
Other	26	9,6
Rented house	5	1,8
Total	271	100
Size of house	Frequency	%
≤2 rooms	45	16,6
3-4 rooms	85	31,3
>4 rooms	141	52,1
Total	271	100
Sanitation: Toilet facilities	Frequency	%
Pit latrine	237	87,4
Flush/ sewage	16	6,1
Bucket system	18	6,5
Other	0	0
Total	271	100
Sanitation: Waste removal	Frequency	%
Yes	9	3,5
No	262	96,5
Total	271	100
Sanitation: Pests	Frequency	%
Mice/rats	168	62
Cockroaches	14	5,2
Ants	23	8,5
Other pests	0	0
Total	205	75,7

TABLE 3: HOUSEHOLD ASSETS AND FUEL FOR FOOD PREPARATION (n = 271)

Household assets	Frequency	%
Bed with mattress	249	91,8
Mattress only	105	38,6
Lounge suite	123	45,3
Dining room suite	115	42,6
Radio	221	81,5
Television	183	67,6
Electrical iron	179	66,1
Electrical kettle	178	65,5
Refrigerator	166	61,4
Freezer	32	11,7
Hotplate	163	60
Primus or paraffin stove	137	50,6
Electrical stove	108	39,7
Microwave	75	27,7
Gas stove	41	15,2
Fuel usually used for food preparation	Frequency	%
Electricity	145	53,5
Coal	56	20,5
Paraffin	27	10,1
Food fire	25	9,3
Gas	18	6,6
Total	271	100

tool developed by the South African Advertising Research Foundation (SAARF) based mainly on durable goods and services enjoyed by individuals, the SA consumer market was profiled in ten relatively homogeneous groups (SAARF, 2006). The consumers of least status according to living standards are indicated within the first segment of the universal living standard measure (LSM 1), and those of highest status within the LSM 10 segment. The three segments of lowest status (LSM 1 to 3) comprise 17% of the South African population, and are perceived as marginalised consumers (SAARF, 2011).

Almost all of the households participating in the study (91,8%) possessed a bed with a mattress, while 38,6% mentioned the presence of a mattress only (Table 3). This could possibly indicate a second bed. When compared with the average size of five household members, it is not clear how the sleeping arrangements for all persons were accommodated. Nearly half of the households reported owning a lounge suite (45.3%)

and a dining room suite (42,6%), possibly indicating these as items of higher 'status'.

Electrical equipment available in two thirds of the households (Table 3) included televisions (67,6%), irons (66,1%), kettles (65,5%) and refrigerators (61,4%). The possession of these more durable goods is probably indicative of a slightly higher income (LSM 2) than the lowest income group (LSM 1) (Bishop, 2011:2; SAARF, 2010). It is not clear, however, whether these items were purchased by the households themselves or were received as gifts from others, such as grown children residing elsewhere and earning an income. The latter was observed as a general trend in similar communities. Although most households owned radios (81,5%), this possibly included the use of batteries as an alternative power source to electricity, which is descriptive of the LSM 1 group.

Electricity (53,5%) and coal (20,5%) were indicated as main sources of energy for food prepa-

ration. In comparison, more households (66,5%) used electricity for cooking at national level (Community Survey 2007 as quoted by Labadarios et al, 2008a:128). A dearth of money could impact on the availability of electricity for household use. Electricity could also be used selectively, e.g. for cooking (if preferred) and radio/television, but not for other purposes.

Most households (60%) possessed a two-plate electrical hotplate (stove without an oven) and/or a primus or paraffin stove (50,6%) as a means of preparing food. Electrical stoves (39,7%), microwave ovens (27,7%) and/ or gas stoves (15,2%) were present in fewer households, possibly only those of higher income.

Responsibility for decisions on household food

The role of the female as household caregiver seems to be strongly established in these rural communities (Table 4). Making decisions about food was a mainly female function and included the amount that was spent on food (79,5%), which types of food were bought (78,2%), food preparation (78,2%) as well as the main responsibility of feeding the children (82,3%). It is of concern that a small but consistent percentage of children was responsible for heading the household (8,6%), making decisions about the type of food bought (7,3%) and food preparation (7,3%).

Source of water for household use Almost all respondents (83,1%) had easy access to water, either from a tap in the yard (59%) or inside the house (24,1%). These figures compare well with the national average of 88,6% of households that have access to piped water, as indicated by the Community Survey 2007 report (Labadarios et al, 2008a:128). Although none of the households was dependent on spring, river or dam water, it is of concern that 16,5% were dependent on water sources from elsewhere (Table 5), which does not necessarily indicate a source that was trustworthy and safe or easy to access at all times.

Cultivation of home gardens Most respondents (91,3%) cultivated vegetables in a home garden. In observation it was noted that these gardens encompassed an area of approximately 2m², mostly utilised for the limited production of a choice of carrots, green beans, beetroot, onions, spinach and cabbage. Vegetables produced were used mostly for household consumption (84,7%) (Table 6).

Household income profile With an employment/income rate of only 24.3% (including retirees), with most (79,3%) of those unemployed having been in this status for a period exceeding three years, and only 24% of spouses/partners employed in some capacity, a situation emerged where 60,4% of these households are classifiable as very poor (\leq ZAR400/month) or poor (\leq ZAR1000/month) (StatsSA, 2000; Duvenage et al, 2010). At date of compilation, USD1 equalled ZAR8.25 (ABSA Indices, 2012).

The figure depicting prolonged unemployment is roughly comparable to the number of households with only one or no person/source contributing to household income (69,4%) (Table 7).

Because of household size, an approximate income/capita/day of \leq ZAR6.80 was realised for most of the households (60,4%) to meet all needs. This amount translates into $<$ USD1/capita/day, equalling the international poverty line indicator (IDA 14, 2004:1). In this rural setting education does not necessarily seem to be a safeguard against unemployment as even persons with an education higher than primary school level (33,5%) were unemployed (Table 1).

Food-purchasing practices Food purchasing was usually conducted once a month (78,2%), mostly at a supermarket (71,7%) or spaza shop (an informal convenience shop selling small quantities of household necessities like soap and maize meal, but often more expensive than retail outlets) (Wikipedia, 2012a) (21,4%).

TABLE 4: RESPONSIBILITY FOR DECISIONS ON HOUSEHOLD FOOD (n = 271)

Role in household	Frequency	%
Father	25	9,2
Mother	184	67,9
Grandfather	10	3,7
Grandmother	28	10,3
Other	24	8,9
Total	271	100
Who decides how much is spent on food?	Frequency	%
Father	45	16,7
Mother	187	69,0
Child	5	1,9
Grandmother	29	10,5
Grandfather	1	0,4
Other	4	1,5
Total	271	100
Who decides on the type of food bought?	Frequency	%
Father	9	3,1
Mother	210	77,3
Child	20	7,3
Grandfather	6	2,3
Grandmother	27	10,0
Total	271	100
Mainly responsible for food preparation?	Frequency	%
Father	12	4,3
Mother	209	77,2
Child	20	7,3
Grandfather	3	1,2
Grandmother	27	10
Total	271	100
Mainly responsible for feeding/ serving the child?	Frequency	%
Father	5	2,0
Mother	198	72,9
Child	37	13,7
Grandfather	1	0,4
Grandmother	26	9,4
Other	4	1,6
Total	271	100

TABLE 5: SOURCE OF WATER FOR HOUSEHOLD USE (n = 271)

Source of water for household use	Frequency	%
Tap in the house	65	24,1
Tap outside the house but in the yard	160	59,0
Borehole	1	0,4
Spring/ river/ dam	0	0
Fetch water from elsewhere	45	16,5
Total	271	100

TABLE 6: CULTIVATION OF HOME GARDENS AND USE OF PRODUCE (n = 271)

Vegetable garden	Frequency	%
Yes	247	91,3
No	24	8,7
Total	271	100
If yes, what do you do with the vegetables?	Frequency	%
Household consumption	229	84,7
Selling	21	7,8
Preserving for the future	7	2,5
Give away to family, etc.	14	5,0
Total	271	100

TABLE 7: HOUSEHOLD INCOME PROFILE (n = 271)

Paid employment status of caregivers	Frequency	%
Employed	36	13,3
Unemployed	205	75,7
Retired	30	11,0
Total	271	100
Duration of caregiver unemployment	Frequency	%
≤ 12 months	35	13,0
1 to 3 years	21	7,7
> 3 years	215	79,3
Total	271	100
Paid employment status of spouse (partner)	Frequency	%
Employed	65	24,0
Unemployed	183	67,5
Retired	23	8,5
Total	271	
Number of contributors to household income over last 12 months	Frequency	%
≤ 1	188	69,4
2	54	20
≥ 3	29	10,6
Total	271	100
Total household income/month (ZAR)	Frequency	%
≤ 1000	164	60,4
1001 to 1500	60	22,2
1501 to 2000	25	9,1
2001 to 2500	7	2,6
> 2500	15	5,7
Total	271	100

These figures exclude the non-availability of food in retail as a reason for not purchasing for most households, as sufficient quantities were available on a consistent basis (Table 8). These findings correlate with the broader SA context, where 83% of LSM 1 consumers engage in bulk monthly shopping (Bureau for Food and Agricultural Policy (BFAP), 2008).

The fact that travel costs represent a major expense for low-income households (Hersey et al, 2003), specifically in rural areas, could be a possible reason for food purchasing being undertaken only once a month. These excursions are often planned to coincide with other activities such as collecting of pensions or grants and visits to a clinic. It stands to reason that the more limited the household income, for example, when totally/mainly dependent on grant income, the more purchasing actions will overlap with these occasions.

Most respondents (56,1%) spent \leq ZAR200 on food for the household/week, indicating the availability of a maximum average amount of ZAR5.71/person/day. This represents approximately three to four slices of brown bread and a small cup of milk if you buy at supermarket prices and have no transport costs. Limited household income and food expenditure is inextricably linked. For a household spending ZAR200/week on food, the total of ZAR857.14/month represents 85,7% of the total household income, without any other needs provided for. These findings are confirmed by the reported frequency of a shortage of money for buying food or clothing (81,3%) (Table 8).

Food intake

A good distribution of meals over a day was reported, mostly varying between two (29,7%) and three meals (62,9%). Very few households consumed only one meal/day (4,2%) (Table 8). These findings are comparable with what was found in other low-income households (Oldewage-

Theron et al, 2005).

The 20 foods consumed in the highest quantities, by those of the sample who consumed the food (Table 9), highlight the importance of maize meal porridge and bread as starch-based staple-type foods in the diet of these low-income consumers. Stiff maize meal porridge (1) and bread (3) were indicated as the most important in this category, followed by soft maize meal porridge (4), rice (9), potato (16), scones (17) and potato fries (20). Chicken (5), milk (6), dried beans (10) and maas (or amasi, a sour milk product for drinking) (Wikipedia, 2012b) (12), are rich in protein but were consumed by only a very limited number of respondents (Table 9). However, for those that consumed these foods, the portion sizes were satisfactory.

Stiff maize meal porridge (88%), tea (50%), bread (43%), soft maize meal porridge (28%) and chicken (30%) were indicated as the five foods consumed in the highest quantities by the target population (Table 9). When compared with the five foods most often consumed in South Africa, namely maize, sugar, tea, bread and milk (Labadarios et al, 2008b:258), a close correlation is found.

Overall, only stiff maize meal porridge (88%), sugar (60%) and brewed tea (50%) were consumed by more than half of the population, indicating severely limited overall variety in food intake. These results concur with the findings reported by the National Food Consumption Survey (Labadarios et al, 1999), indicating that the majority of SA households consume a limited variety of foods, consisting mainly of staples, as available in the household.

Spinach, cabbage (relatively low in bio-available nutrients) and tomato and onion gravy were the only vegetables consumed. Although intakes of spinach and cabbage were satisfactory for those who consumed it, and the tomato and onion gravy made a smaller contribution, these foods

TABLE 8: FOOD-PURCHASING PRACTICES (n = 271)

Frequency of buying food?	Frequency	%
Every day	14	5,2
Once a week	21	7,7
Once a month	212	78,2
Other	24	8,9
Total	271	100
Where do you buy food?	Frequency	%
Spaza shop	58	21,4
Street vendor	3	1,1
Supermarket	194	71,7
Other	16	5,8
Total	271	100
How much money is spent on food per week?	Frequency	%
R0 to R50	67	24,7
R51 to R100	62	23,0
R101 to R150	23	8,4
R151 to R200	26	9,6
R201 to R250	14	5,0
R251 to R300	14	5,0
>R300	24	8,8
Do not know	42	15,5
Total	271	100
Frequency of not having enough money to buy food or clothing	Frequency	%
Always	44	16,3
Often	60	22,2
Sometimes	116	42,8
Seldom	36	13,2
Never	15	5,4
Total	271	100
How many meals do you eat per day?	Frequency	%
1	11	4,2
2	81	29,8
3	170	62,9
>3	8	3,1
Total	271	100

were consumed by a very limited number of respondents. These results correspond to previous research findings that significantly fewer servings of fruit and vegetables are consumed by women in food-insecure households (Kendall et al, 1995).

Dietary intake

Although a good daily distribution of meals was reported for the majority of households (Table 8), the nutrient analysis of the 24-hour recall

data (only women) reported deficient intakes of all nutrients, except for carbohydrates and chromium, when compared with the estimated average requirements (EAR) for those consuming the particular foods (Table 10). Despite the mean adequate intakes, 38,1% and 70,1% of the respondents did not meet the EAR for carbohydrates and chromium respectively. Most respondents did not meet the EAR for all/most nutrients, indicating the widespread shortfalls in dietary intake in this community. Note that the comparison for EAR was made against guide-

lines for females in the age group of 31 to 50 years. The mean age of this group of female respondents was 42 years, which is different from the findings reported for the mixed respondent group on which the findings for the socio-demographic and economic profile are based (Tables 1 to 9).

The mean (\pm SD) intake/capita reported for all nutrients (Table 10), highlights the overall poor mean dietary intake.

When compared with the guidelines for dietary intake of 45–65% for carbohydrates, 10–30% for protein and 25–35% for fat (Wenhold et al, 2008:448), the overall contribution of macronutrients to the total energy intake indicated a balanced diet, with 58,1% carbohydrates (including dietary fibre), 14,4% protein and 26% dietary fat for the total group. But the overall dietary intakes were not sufficient to be nutritionally adequate.

Nutritional status

Anthropometric measurements are recognised

as parameters for the interpretation of nutritional status (Mahan et al, 2004:448). The results in Table 11 indicate over-nutrition as the major challenge in the group of female respondents. Only 0,9% were underweight, compared with 26% and 41,9% overweight and obese respondents respectively. These indices were confirmed by the WtHTR of $0,56\pm 0,49$ in the overweight group and $0,64\pm 0,67$ in the obese group, compared with the $\leq 0,5$ cut-off point for health.

Findings indicated a significant correlation between the BMI and WtHR at $p < 0,01$ level (2-tailed) ($r = 0,837$) ($p \leq 0,000$). Likewise, a significant correlation ($r = 0,151$) was found between BMI and income ($p = 0,036$), showing a link between a higher BMI and higher income. A strong relationship was also found between the level of education and income ($r = 0,214$) ($p = 0,003$).

Although the few respondents with a higher education (2,7%) showed a higher household income, the situation could also be interpreted as one in which the lower the education, the lower the income. As seen from the results in Table 1,

TABLE 9: TOP TWENTY FOODS CONSUMED IN HIGHEST QUANTITIES

	Food item	Intake/capita/day (g) (Mean \pm SD)	Frequency (n)	% (n=383)
1	Maize meal, stiff	241 \pm 158	336	88
2	Tea, brewed	283 \pm 149	192	50
3	Bread, brown and white	211 \pm 227	164	43
4	Maize meal, soft	219 \pm 167	108	28
5	Chicken, cooked	123 \pm 80	116	30
6	Milk, fresh full cream	129 \pm 109	108	28
7	Spinach, cooked	100 \pm 76	106	28
8	Water	506 \pm 473	16	4
9	Rice, cooked	137 \pm 103	46	12
10	Dried beans, tinned and cooked	114 \pm 91	55	14
11	Fruit juice	212 \pm 136	29	8
12	Maas/sour milk	183 \pm 112	31	8
13	Sugar, brown and white	23 \pm 22	229	60
14	Cabbage, cooked	78 \pm 40	66	17
15	Tomato and onion gravy	65 \pm 46	79	21
16	Potato, cooked	72 \pm 40	68	18
17	Scone	158 \pm 61	23	6
18	Cold drink, squash & carbonated	278 \pm 60	13	3
18	Coffee	242 \pm 98	13	3
20	Potato fries	87 \pm 66	36	9

TABLE 10: DAILY MEAN INTAKES AND NUTRITIONAL ADEQUACY (n=383)

Nutrient, unit of measure	Intake/capita (mean±SD)	Frequency <100% EAR	EAR*	% total energy intake
Energy (kJ)	4 548±2866	92,7	8928 ∞	
Total protein (g)	41±28	64,5	46	14,4
Total plant protein (g)	19±17			
Total animal protein (g)	23±22			
Total fat (g)	31±26			26
Cholesterol (mg)	112,8±132,2			
Carbohydrates (g)	146±106	38,1	100	58,1
Total dietary fibre (g)	11,3±9,7	94,5	25#	
Calcium (mg)	222,0±203,0	99,2	1000#	
Iron (mg)	6,9±4,5	73,6	8,1	
Magnesium (mg)	173,9 ± 107,6	88,0	265	
Zinc (mg)	5,3±3,3	73,9	6,8	
Copper (mg)	0,6±0,7			
Chromium (mcg)	31,5±62,8	70,1	25#	
Selenium (mcg)	31,0±49,6	81,5	45	
Iodine (mcg)	16,3±18,2	98,7	95	
Vitamin A (RE) (mcg)	443,7±1239,1	78,3	500	
Thiamine (mg)	0,7±0,5	78,3	0,9	
Riboflavin (mg)	0,6±0,7	84,3	0,9	
Niacin (mg)	10,9±9,5	61,4	11	
Vitamin B6 (mg)	0,8±0,6	79,1	1,1	
Folate (mcg)	213,5±190,3	82,2	320	
Vitamin B12 (mcg)	1,2±5,6	78,9	2,0	
Pantothenate (mg)	3,6±4,0	73,1	5#	
Biotin (mcg)	14,3±12,2	93,4	30#	
Vitamin C (mg)	28,1±44,0	89,6	60	
Vitamin D (mcg)	1,4±2,3	93,2	5#	
Vitamin E (mg)	4,2±4,5	92,4	12	

* Estimated Average Requirement for females aged 31-50 years, as the mean age of the sample was 42 years

∞ Estimated Energy Requirements (IoM, 2003) for low active women, aged 42 years, height =1,65 m

AI – Adequate Intake

Deficient intakes

the majority of the respondents (97,8%) have no (11,6%), or primary school (32,6%), or some secondary school (53,1%) education. Results reported in Table 7 indicate the household income for the majority of respondents (82,6%) as ≤ZAR1500 per month. When viewed in conjunction with the high prevalence of obesity (41,9%) in female caregivers in these low-income communities, the concurrence of these findings with earlier work indicating an association between high obesity rates, low income and low education levels among women, became apparent (Drewnowski & Specter, 2004).

Although the majority of the women were overweight (26%) and/or obese (41,9%) (Table 11), only 7,3% of the women consumed sufficient or higher levels of energy (kilojoules) when compared with the EAR (Table 10). The mean total dietary energy intake was very low, at 50,1% of EAR. In addition, a significant negative correlation ($r = -.230$)($p = 0,005$) was found between WtHR and the level of education, further confirming the previous findings.

It is known that hunger and obesity can exist within the same household, especially in low-income, food-insecure households such as exist

in this community (Harland & Haffner, 2008). The reason for this situation was not investigated as part of the current study.

CONCLUSIONS

The extent to which the household and individual food security of the households in the three rural communities was compromised is highlighted.

The bigger household size (5 members on average) allowed a smaller financial allocation to each household member. These amounts are substantially lower than the international poverty line indicator of USD1/ day (ZAR8.25) (IDA 14, 2004). The very low employment rate (24,3% of caregivers, 32,3% of spouses), has culminated in a situation where most households (82,6%) received a total income of \leq ZAR1500/month (\leq USD181.81/month) (of which 60,4% belonged to the \leq ZAR1000 (\leq USD121.21) category) to provide for all household needs. This income is descriptive of the most marginalised South African consumers, LSM 1 (\leq ZAR1351/month) (\leq USD163.76/month) and LSM 2 (\leq ZAR1575/month) (\leq USD190.91/month) (SAARF, 2011; BFAP, 2008:56), confirming the marginalised nature of household income in these communities.

The expenditure of cash on food by LSM 1 consumers in South Africa, as a share of total cash expenditure, amounts to 71% of their monthly household income (BFAP, 2008:56-57). When these findings are compared with the findings of the current study, which indicates that most households (56,1%) allocated 85,7% of total household income to food purchasing, comprising a maximum amount of ZAR200, the level of constraint experienced by these rural households in providing access to food through insufficient resources is placed in perspective. The resources for obtaining appropriate foods for a

nutritious diet were sadly lacking. These findings are indicative of a market segment highly vulnerable to changes in food price and income.

The choice of basic food items purchased was very limited, encompassing mainly maize meal (88%), sugar (60%), and brewed tea (50%). This trend of limited food choice in low-income budgets is confirmed by the literature (Kruger et al, 2008), as is the allocation of the greater portion of the budget to staple-type starch food products (ACNielsen, 2005). Such a diet is energy-dense and indicative of a decreased intake of complex carbohydrates and dietary fibre. Overall, the findings depicted the consumption of a monotonous diet consisting mainly of staple starches and very limited amounts of fruit and vegetables. These findings are consistent with the general situation in low-income households in SA (Labadarios et al, 1999). The picture derived indicates the highly compromised nature of food availability in these rural households, in quantities that were neither sufficient nor consistently available.

It comes as no surprise, therefore, that the dietary intake of most respondents was compromised for all/most nutrients. The findings correspond to South African and global findings indicating dietary intakes for iron, folate, vit B₁₂ and zinc as most compromised (Labadarios et al, 2008b:262-265), although the shortfalls reported for these rural communities are much more extensive and comprehensive.

The deficient intake of essential micronutrients, due to limited diversity in the diet and/or the consumption of deficient quantities, is indicative of 'hidden hunger', which often culminates in health costs over time. As the consumption of fruits and vegetables represents the major difference between food-secure and food-insecure groups (Scheier, 2005), the fact that this problem was apparently neither prevented nor alleviated to a larger extent by the existing vegetable gardens cultivated by these communities, re-

TABLE 11: NUTRITIONAL STATUS OF WOMEN (n = 207)

Nutritional status parameter	Total group	WtHR	BMI (kg/m ²)	Weight (kg)	Height (m)
BMI cut-off points	%	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
Underweight (<18,5)	0,9	-	-	-	-
Normal weight (≥18,5≤24,9)	31,2	0,48±0,57	22,8±2,5	58,1±8,0	1,6±0,7
Overweight (≥25,0≤29,9)	26,0	0,56±0,49	27,8±1,4	70,4±6,2	1,6±0,1
Obese (≥30)	41,9	0,64±0,67	36,7±9,5	91,9±14,9	1,6±0,1
Total	100				

quires scrutiny. The choice, extent and utilisation of self-production should receive attention.

Although basic nutrition knowledge was not measured as part of this study, it seems that the principles of nutrition were not applied by most respondents to guide food use regarding choice or quantities consumed. This is clear from the prevalence of overweight (26%) and obesity (41,9%) reported for these communities. The association between higher obesity rates and low-income levels among women is a known phenomenon (Drewnowski & Specter, 2004). This tendency could possibly be ascribed to the lack of dietary variety, as a mainly carbohydrate-based diet was consumed. The literature confirms the co-existence of food insecurity and obesity in the same people at the same time for low-income households (Townsend et al, 2006).

It is evident that poverty is prevalent in these rural communities, coupled with signs of extensive household and individual food insecurity. The food security of the marginalised households in the broader Qwa-Qwa region is threatened by their diminished ability to meet food needs, and the situation is indicative of an extensive problem, including vulnerability to health risks.

REFERENCES

- ABSA INDICES. 2012, July 31.
- ACNIELSEN. 2005. A country divided: consumer spending trends in a dual economy. *Food Review* (April). Available on line. URL: http://www.foodreview.co.za/index.php?option=3&id=9&com_task=2&x=110. Accessed 15 May 2007.
- BONGAARTS J. 2001. Household size and composition in the developing world in the 1990s. *Population Studies* 55: 263-279.
- BUREAU FOR FOOD AND AGRICULTURAL POLICY (BFAP). 2008. The South African agricultural baseline: consumer trends and analysis. Available on line. URL: <http://www.bfap.co.za/reports/BFAP%20Baseline%20%20-Consumer%20Economics%20June%202008%20part%202.pdf>. Accessed 27 June 2008.
- DAS, SK & ROBERTS, B. 2001. Energy metabolism. In Bowman, BA & Russell, RM. 2001. *Present knowledge in nutrition*. 8th ed. Washington DC. ILSI.
- DEPARTMENT OF AGRICULTURE AND LAND AFFAIRS. 2002. *The integrated food security strategy for South Africa*. Pretoria. Department of Agriculture and Land Affairs
- DREWNOWSKI, A & SPECTER, SE. 2004. Poverty and obesity: The role of energy density and energy costs. *American Journal of Clinical Nutrition* 79:6-16.
- DUVENAGE, SS, SCHÖNFELDT, HC & KRUGER, R. 2010. Food product attributes guiding purchasing choice of maize meal by low-income South African consumers. *Development Southern Africa* 27(3):309-331.
- EUROPEAN FOOD INFORMATION COUNCIL. 2005. *The determinants of food choice*. EUFIC REVIEW 2005/04.

- FOOD INSECURITY AND VULNERABILITY MAPPING SYSTEMS. 2004. What is meant by food insecurity and vulnerability? Available on line. URL: <http://www.fivims.net/static.jsp?lang=en&page=overview>. Accessed 14 January 2005.
- GALUSKA, DA & KHAN, LK. 2001. Obesity: A public health perspective. In Bowman, BA & Russell, RM. *Present knowledge in nutrition*. 8th ed. Washington DC. ILSI.
- HARLAND, JI & HAFFNER, TA. 2008. Systematic review, meta-analysis and regression of randomised controlled trials reporting an association between an intake of circa 25g soya protein per day and blood cholesterol. *Atherosclerosis* 200(1):13-27.
- HERSEY, J, ANLIKER, J, MILLER, C, MULLIS, RM, DAUGHERTY, S, DAS, S, BRAY, CR, DENNEE, P, SIGMAN-GRANT, M & THOMAS, HO. 2003. Food shopping practices are associated with dietary quality in low-income households. *Journal of Nutrition Education* 33 (Supplement 1):S16-S25.
- HSIEH, SD, MUTO, T, YOSHINAGA, H, TSUJI, H, ARIMOTO, S, MIYAGAWA, M, HOSHIHARA, Y & HARA, S. 2006. Waist-to-height ratio, a simple and effective predictor for metabolic risk in Japanese men and women. *International Congress Series* 1294:186-189.
- INSTITUTE OF MEDICINE (IOM). 2003. *Dietary Reference Intakes*. Food and Nutrition Board. Washington DC. National Academic.
- INTERNATIONAL DEVELOPMENT ASSOCIATION. 2004. *Proportion of the population below USD1/day poverty line*. Global monitoring system. The World Bank Group. Available on line. URL: http://ddp-ext.worldbank.org/ext/GMIS/gdmis.do?siteId=1&contentId=Content_2&menuId=LNAV01HOME2. Accessed 8 November 2007.
- KENDALL, A, OLSON, CM & FRONGILLO, EA. 1995. Validation of the Radimer/ Cornell measures of hunger and food insecurity. *Journal of Nutrition* 125:2793-2801.
- KENDALL A, OLSON CM & FRONGILLO EA (Jr). 1996. Relationship of hunger and food insecurity to food availability and consumption. *Journal of the American Dietetic Association* 96:1019-1024.
- KOCH, J. 2011. *The food security policy context in South Africa*. International Policy Centre for Inclusive Growth. United Nations Development Programme. Available on line. URL: <http://www.ipc-undp.org>. Accessed 7 December 2011.
- KRUGER, R, SCHÖNFELDT, HC & OWEN, JH. 2008. Food-coping strategy index applied to a community of farm-worker households in South Africa. *Food and Nutrition Bulletin* 29(1): 3-14.
- KUZWAYO, P. 2008. Food and nutrition security. In Steyn, NP & Temple, N. 2008. *Community nutrition textbook for South Africa: A rights-based approach*. Cape Town. South African Medical Research Council.
- LABADARIOS, D, DHANSAY, A & HENDRICKS, M. 2008a. The nutrition situation in South Africa: Demographic, socioeconomic, and health indicators. In Steyn, NP & Temple, N. 2008. *Community nutrition textbook for South Africa: A rights-based approach*. Cape Town. South African Medical Research Council.
- LABADARIOS D, STEYN N, MAUNDER E, MACINTYRE U, SWART R, GERICKE G, HUSKISSON J, DANNHAUSER A, VORSTER HH, NESAMVUNI E. 1999. *National Food Consumption Survey: Children aged 1-9 years in South Africa*. Available on line. URL: <http://www.sahhealthinfo.org/nutrition/foodconsumption.htm>. Accessed 22 August 2008.
- LABADARIOS, D, STEYN, NP & NEL, J. 2011. How diverse is the diet of adult South Africans? *Nutrition Journal* 10:33. Available on line. URL: http://www.hrsc.ac.za/Research_Publication-22138.phtml. Accessed 2 August 2012.
- LABADARIOS D, SWART R, MAUNDER EMW, KRUGER HS, GERICKE GJ, KUZWAYO PMM, NTSIE PR, STEYN NP, SCHLOSS I, DHANSAY MA, JOOSTE PL, DANNHAUSER A, NEL JH, MOLEFE D, KOTZE YJVV. 2008b. National Food Consumption Survey Fortification Baseline South Africa 2005: executive summary (NFCS-FB-1). *South African Journal of Clinical Nutrition*

- 21(3):245-300, Supplement 2.
- LEE, K, SONG, YM & SUNG, J. 2008. Which obesity indicators are better predictors of metabolic risk? Healthy twin study. *Obesity* 16(4):834-840.
- MAFFEIS, C, BANZATO, C & TALAMINI, G. 2008. Waist-to-height ratio, a useful index to identify high metabolic risk in overweight children. *Journal of Paediatrics* 152(2):207-213.
- MAHAN, LK. 2004. Nutrition care. In Mahan, LK & Escott-Stump, S. 2004. *Krause's food, nutrition & diet therapy*. 11th ed. Philadelphia, PA. Saunders.
- MARKETS AND ECONOMIC RESEARCH CENTRE. 2008. *The South African Food Cost Review*. Pretoria. National Agricultural Marketing Council & Department of Agriculture.
- MEDICAL RESEARCH COUNCIL. 1993. *Guidelines on ethics for medical research: general principles*. Cape Town. South African Medical Research Council.
- NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY 111. *Body measurements: Anthropometry*. 1988. Rockville, MD. Westat.
- OLDEWAGE-THERON, WH. 2001. *Evaluation of the fortification of sugar with vitamin A*. PhD thesis. Potchefstroom. Potchefstroom University for Christian Higher Education.
- OLDEWAGE-THERON, WH, DICKS, EG, NAPIER, CE & RUTENGWE, R. 2005. Situation analysis of an informal settlement in the Vaal Triangle. *Development Southern Africa* 22(1):13-26.
- OLDEWAGE-THERON, WH & EGAL, AA. 2010. Nutrition knowledge and nutritional status of primary school children in Qwa-Qwa. *South African Journal of Clinical Nutrition* 23(3):149-154.
- OLDEWAGE-THERON, WH & SLABBERT, TJ. 2008. Impact of food and nutrition interventions on poverty in an informal settlement in the Vaal Region of South Africa. *Proceedings of the Nutrition Society* 67:91-97.
- PELLETIER, DL, OLSON, CM & FRONGILLO, EA (Jr). 2001. Food insecurity, hunger, and undernutrition. In Bowman, BA & Russell, RM. 2001. *Present knowledge in nutrition*. 8th ed. Washington DC. ILSI.
- PINSTRUP-ANDERSEN, P. 2009. Food security: Definition and measurement. *Food Security* 1:5-7.
- PUNT, C, PAUW, K, VAN SCHOOR, M, NYHODO, B, McDONALD, S, CHANT, L & VALENTE, C. 2005. *PROVIDE project: A profile of the Free State province demographics, poverty, inequality and unemployment*. Background paper 2005:1(4). Available on line. URL: www.elsenberg.com/provide. Accessed 31 May 2011.
- PUOANE, T, STEYN, K, BRADSHAW, D, LAUBSCHER, R, FOURIE, H, LAMBERT, V & MBANANGA, N. 2002. Obesity in South Africa: The South African demography and health survey. *Obesity Research* 10:1038-1048.
- RADIMER, KL, OLSON, CM, GREENE, JC, CAMPBELL, CC & HABICHT, JP. 1992. Understanding hunger and developing indicators to assess it in women and children. *Journal of Nutrition Education* 24:36S-45S.
- REGMI, A. 2001. *Changing structure of global food consumption and trade*. Agriculture and Trade Report No. WRS-01-1. Economic Research Service. USDA.
- ROSE, D & CHARLTON, KE. 2002. Prevalence of household food poverty in South Africa: Results from a large nationally representative survey. *Public Health Nutrition* 5(3):383-389.
- SADLER, MJ. 2004. Meat alternatives: Market developments and health benefits. *Trends in Food Science and Technology* 15:250-260.
- SCHEIER, LM. 2005. What is the hunger-obesity paradox? *Journal of the American Dietetic Association* 105(6):883-886.
- SOUTH AFRICAN ADVERTISING RESEARCH FOUNDATION. 2006. *SAARF segmentation handbook based on AMPS 2005 and AMPS 2006*. Johannesburg. SAARF.
- SOUTH AFRICAN ADVERTISING RESEARCH FOUNDATION. 2010. *SAARF trends 2005 to 2009 based on data from SAARF AMPS*. Johannesburg. SAARF.

- SOUTH AFRICAN ADVERTISING RESEARCH FOUNDATION. 2011. *Segmentation handbook based on AMPS fieldwork period July 2009 to June 2010*. Johannesburg. SAARF.
- STATISTICS SOUTH AFRICA. 2000. Measuring poverty in South Africa. RDP (Reconstruction and Development Programme). *Development Monitor* 16(12):5-7, December. Available on line. URL: <http://statssa.gov.za>. Accessed 19 February 2008.
- STATISTICS SOUTH AFRICA. 2003. *Census 2001: Census in brief*. Report no. 03-02-03 (2001). Available on line. URL: <http://www.statssa.gov.za/census01/html/CInbrief/CIB2001.pdf>. Accessed 2 August 2012.
- STATISTICS SOUTH AFRICA. 2005. *Census survey 2001*. Available on line. URL: <http://www.statssa.gov.za>. Accessed 25 March 2008.
- STATISTICS SOUTH AFRICA. 2011. *Census 2011 products*. Fact sheet. Available on line. URL: <http://statssa.gov.za/Census2011/Products.asp>. Accessed 2 November 2012.
- STEYN, NP. 2006. Nutrition and chronic diseases of lifestyle in South Africa. In Steyn, K, Fourie, J & Temple, N. 2006. *Chronic diseases of lifestyle in South Africa: 1995-2005*. Cape Town. South African Medical Research Council.
- STEYN, NP, BRADSHAW, D, NORMAN, R, JOUBERT, JD, SCHNEIDER, M & STEYN, K. 2006. Dietary changes and the health transition in South Africa: Implications for health policy. In FAO. 2006. *The double burden of malnutrition: Case studies from six developing countries*. Rome. FAO.
- THE SURVEY SYSTEM. No date. Available on line. URL: <http://www.surveysystem.com/sample-size-formula.htm>. Accessed 29 May 2009.
- TOWNSEND, MS. 2006. Obesity in low-income communities: Prevalence, effects, a place to begin. *Journal of the American Dietetic Association* 106(1):34-37.
- WENHOLD, F, KRUGER, S & MUEHLHOFF, E. 2008. Nutrition for school-age children and adolescents. In Steyn, NP & Temple, N. 2008. *Community nutrition textbook for South Africa: A rights-based approach*. Cape Town. South African Medical Research Council.
- WIKIPEDIA. 2012a. Maas. Available on line. URL: <http://en.wikipedia.org/wiki/amasi>. Accessed 2 August 2012.
- WIKIPEDIA. 2012b. Spaza shop. Available on line. URL: http://en.wikipedia.org/wiki/Spaza_shop. Accessed 2 August 2012.
- WOLMARANS, P, DANSTER, N, DALTON, A, ROSSOUW, K & SCHÖNFELDT, H. 2010. *Condensed food composition tables for South Africa*. Medical Research Council. Cape Town. South African Medical Research Council.
- WORLD HEALTH ORGANIZATION. 1995. *Physical status: The use and interpretation of anthropometry*. Report of a WHO Expert Committee. Geneva. WHO.
- WORLD HEALTH ORGANIZATION. 2003. Global and regional food consumption patterns and trends. In WHO Technical Report Series 916. *Diet, nutrition and the prevention of chronic diseases*. Available on line. URL: http://www.who.int/nutrition/topics/3_foodconsumption/en/print.html. Accessed 19 January 2011.
- WORLD HEALTH ORGANIZATION. 2012. *Trade, foreign policy, diplomacy and health: Food security*. Available on line. URL: <http://www.who.int/trade/glossary/story028/en/>. Accessed 2 August 2012.
- WORLD MEDICAL ASSOCIATION. 2004. *Declaration of Helsinki. Regulations and ethical guidelines*. Office of Human Subjects Research. National Institutes of Health. Available on line. URL: <http://ohsr.od.nih.gov/guidelines/helsinki.html>. Accessed 19 January 2011.
-