SOUTH AFRICAN METROPOLITAN CONSUMERS' RESPONSE TO HEALTH-RELATED MESSAGES REGARDING FRESH VEGETABLES

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ABSTRACT

The high prevalence of nutrition-related conditions and diseases in South Africa and scientific evidence regarding the health benefits offered by vegetables, guided this nationally representative study among South African metropolitan consumers. Vegetables have become a symbol of health for consumers, as they are exposed to health-related messages about vegetables by means of consumer socialisation and marketing. This study aimed to describe consumers‟ opinions on health-related messages about vegetables, their frequency of consumption of different vegetables and the preparation practices employed by consumers for different vegetables. This descriptive study employed stratified sampling for the recruitment of respondents (N=1997) from metropolitan areas in South Africa. Field workers collected data by means of interviewer-administered questionnaires. Results showed positive consumer opinions on health-related messages about vegetables. Most respondents, however, failed to include a sufficient variety of vegetables that are needed for health maintenance in their diets since they indicated that there were certain vegetables they never ate. Less healthy practices, such as adding fat and sugar to many vegetables, were also common among respondents. Health messages concerning vegetables should emphasise the incorporation of a variety of vegetables in consumers‟ diets. Interventions to equip consumers to employ healthy preparation practices are also recommended.

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ARTICLE INFO

Article history
Received 01 August 2016
Revision received 24 October 2016

Keywords
consumer, health, opinions, message response, preparation practices, vegetables, vegetable consumption

INTRODUCTION

The high prevalence of non-communicable diseases (NCDs) in South Africa is widely recognised as a burden with social, health-system and economic implications. Not only are NCDs in South Africa increasing, but cardiovascular disease (CVD) was also the second largest cause of all South African deaths in 2010 (Msemburi et al., 2014). Several nutrition-related risks and diseases contribute to the acknowledged burden of NCDs in South Africa, and are of utmost concern among the adult population (Bradshaw et al, 2007; Nojilana et al, 2007; Norman et al, 2007a; Norman et al, 2007b; Norman et al, 2007c), which emphasises the important impact that food intake may have on consumer health.

The World Health Organisation (WHO) documents the importance of managing one‟s diet in maintaining and optimising health (WHO, 2006). Amidst the concern about consumer health in South Africa, it is noteworthy that research has found that the global increase in consumers‟ awareness of and concerns about the role of diet as a risk reduction strategy for chronic diseases (Grunert & Wills, 2007), has spilled over to South African consumers. Dolman et al. (2007) showed that more than 80% of SA metropolitan consumers recognise the importance of managing cholesterol levels, blood pressure and diabetes by means of food consumption patterns. In this regard the role of fresh vegetable intake in the context of a balanced diet cannot be disregarded.

Scientific evidence points to a reduction in the risk of the nutrition-related diseases in response to increased vegetable intake in adults and children alike. In adults, a reduction in the risk of disease, such as certain cancers (e.g. lung, gastrointestinal) and CVDs (e.g. coronary heart disease, ischaemic heart disease and stroke) was reported (Schneider et al, 2007; Boeing et al, 2012), while an average 4% reduction in CVD-attributed mortality rates with the inclusion of each additional serving of vegetables in the diet, was also affirmed (Wang et al, 2014). Similarly, increasing the vegetable and fruit intake of children was proven to be invaluable for decreasing the risk of micronutrient deficiencies, adiposity (Naude, 2013) and obesity (Kremer-Sadlik et al, 2015). Research specific to South Africa shows that 3.2% of deaths in South Africa in 2000 were attributed to low vegetable and fruit intake, and that the suboptimal intake of vegetables and fruit resulted in more deaths from heart disease (more than 50%), stroke (25% on average) and certain cancers (5-10%) (Schneider et al, 2007). Vegetables offer a source of high nutrient density, accompanied by low energy content, at an affordable price (Darmon et al, 2005); even though vegetable prices are currently relatively high in South Africa.

Due to the importance of vegetables in consumer health, The South African Food-Based Dietary Guidelines (FBDG) for adults, which in essence includes short, scientific messages aimed at changing the eating behaviour of South Africans in general, emphasises the daily eating of plenty of vegetables and fruit as one of its key principles (Vorster et al, 2013). Vegetables are portrayed to consumers as a symbol of health, due to their proven importance for maintaining health and preventing disease. These symbols are communicated verbally (Schiffman & Kanuk, 2010) from an early age by parents when they stress the importance of vegetable intake to their young children, messages in the media (e.g. magazines, television), as well as health professionals‟ recommendations regarding vegetables. Marketers may also use non-verbal ways (Schiffman & Kanuk, 2010) to symbolise vegetables as a source of health, by using attractive in-store presentations to entice consumers into purchasing. Still, according to the work of Naude (2013) and Schneider et al (2007), vegetable and fruit consumption among South Africans is well below recommended standards.

The current study is motivated by the discrepancy between consumers‟ actual consumption of vegetables in relation to the positive health messages associated with vegetable consumption. The study views opinions about vegetables and health from a consumer perspective. Most previous research focused on the clinical role of vegetable intake in health and on vegetable consumption levels among consumers, whereas our study looked beyond the health messages regarding vegetables. Our study focused on consumer practices amidst exposure to these health messages, and dealt with their opinions on fresh vegetables and health, as well as their frequency of consuming fresh vegetables and their preparation practices. We argue that a positive opinion of vegetables and the frequent consumption of vegetables may in fact be of little value if healthy preparation practices are not employed.

This study is based on the following principal research question: Do South African metropolitan consumers respond positively to health messages regarding fresh vegetables in their opinions about these messages, the frequent consumption of fresh vegetables and employing healthy preparation practices for vegetables? The specific objectives were to:

- describe consumers‟ opinions about health-related messages concerning fresh vegetables;
- determine consumers‟ frequency of consumption of different fresh vegetables in cooked format;
- determine cooking methods used by consumers and additions made by consumers during preparing fresh vegetables;

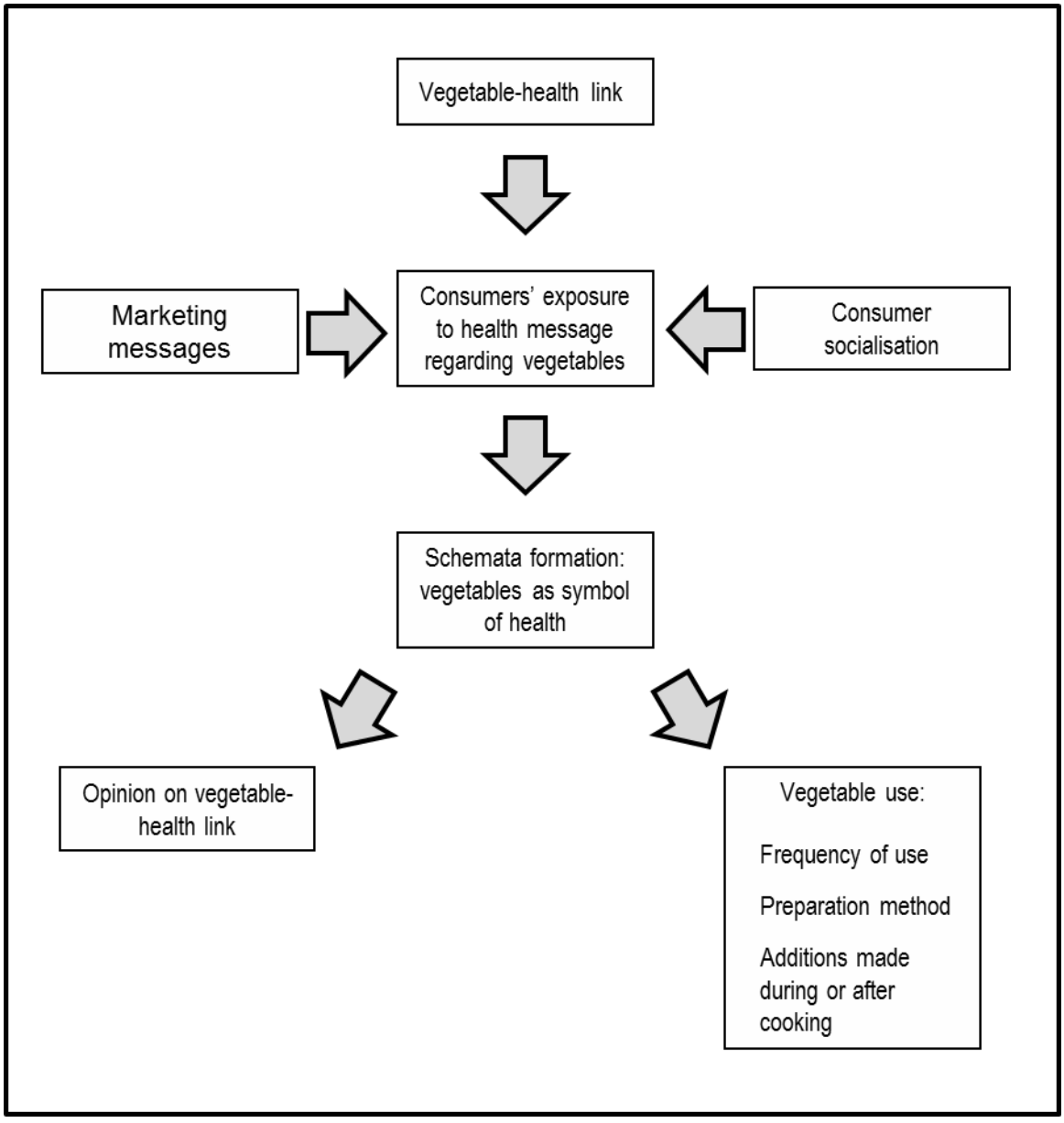

FIGURE 1: THEORETICAL FRAMEWORK OF CONSUMERS' RESPONSE TO HEALTH-RELATED MESSAGE REGARDING FRESH VEGETABLES

- describe the differences between consumers" opinions and consumption of fresh vegetables according to different demographic subgroups.

CONCEPTUAL BACKGROUND

Figure 1 provides a theoretical framework for this study and will guide the discussion of the conceptual background of this study.

The scientific link between vegetables and health

According to Whitney and Rolfes (2008), fresh vegetables include vegetables available to consumers that have sustained little or no altering to their natural state and that have not undergone a canning or freezing process before being sold to the consumer. Whether in cooked or raw format, fresh vegetables are well-known for providing a valuable source of vitamins, minerals, fibre and phytochemicals to the diet. Frequent vegetable consumption plays an important nutritional role in consumer health on

various levels. Recently, a meta-analysis confirmed the increase of micronutrient, carbohydrate and fibre intake upon increased vegetable and fruit consumption levels, while energy intake levels seemed to remain unaltered (Fulton et al, 2016). A proven improvement in the vitamin A status of preschool children has also been confirmed once vegetable and fruit intake has been increased (Polidori et al, 2009). These nutrients that are associated with vegetable intake are vital for health maintenance, but also with respect to the management of nutritional deficiencies.

Non-nutritive components of plant foods have received considerable attention in research. The intake of cruciferous vegetables (e.g. cabbage, cauliflower, broccoli and Brussels sprouts) is associated with lower levels of certain circulating inflammatory markers (Jiang et al, 2014). Similarly, the hydrolysation products of the glucosinolates that are found in cruciferous vegetables, with particular reference to the isothiocyanates, may also play a significant role in human health (Wagner et al, 2013). Furthermore, increasing vegetable intake may offer additional cardiovascular benefits via increased levels of inorganic nitrates (Machha & Schechter, 2012). The polyphenols as a group and their respective subclasses as individual compounds have been the subject of intense study over the past 20 years. They have been linked to positive effects in a number of physiological systems and conditions, such as inflammatory bowel disease (Vezza et al, 2016), upper respiratory tract infection and immune function (Somerville et al, 2016), eye health (Patel et al, 2015), ovarian cancer (Hua et al, 2016), atherosclerosis (Cappello et al, 2016) and cognitive functioning (Grassi et al, 2016). The body of scientific support for the physiological health benefits that vegetable phytochemicals may offer is also rapidly growing, especially with regard to antioxidant characteristics that are known to diminish oxidants responsible for the development of disease (Kalt, 2005). An increase in vegetable intake was also shown to reduce the risks of some types of cancers and CVD (Naude, 2013). However, vegetable and fruit consumption is not only related to physiological well-being but also to psychological well-being. A longitudinal study in Canada found an increase of vegetable and fruit consumption to be associated with a reduction in depression and psychological distress (Kingsbury et al, 2016).

Consumers' exposure to health-related messages about vegetables

Based on the perception theory, exposure is interpreted as the extent to which a consumer notices a stimulus or message that comes within the vicinity of that consumer‟s senses (Cant et al, 2006; Solomon, 2011). Through the process of awareness, consumers learn of the existence of the particular stimulus or message upon exposure thereto (Boshoff, 2003). Thus, when consumers are exposed to a message about the health benefits of vegetables through verbal messages via the sound and sight senses, it is likely that they will become aware of these benefits. However, the message has to appeal to their senses in order for it to get noticed (Solomon, 2011). Kalt (2005) documents an example of the positive impact that consumers‟ exposure to health messages regarding vegetables can have on their behaviour. That study found that exposure to messages concerning the claimed health benefits of antioxidants in the diet, raised the demand for specific vegetables and fruit that are renowned for their superior or improved antioxidant value. Consumers can be exposed to messages in various ways; but for the purpose of health messages regarding vegetables, we will focus on consumer socialisation and marketing messages.

Consumer socialisation In the context of the present study, consumer socialisation can be described as a consumer process of obtaining the skills (e.g. skills to cook vegetables in a healthy manner), knowledge (e.g. knowledge about the importance of including vegetables in one‟s diet) and attitudes (e.g. attitudes regarding vegetables as healthy food source) that are necessary to engage in behaviours that allow efficient functioning as a consumer in a specific area (Hoyer & MacInnis, 2008; Schiffman & Kanuk, 2010; Solomon, 2011), for example during vegetable purchasing and preparation. These experiences are conveyed to consumers since childhood via socialisation agents such as parents, teachers, friends and the media, but continue throughout adulthood (Schiffman & Kanuk, 2010). Through successful consumer socialisation, consumers learn to function efficiently as consumers who engage in shopping (e.g. shopping for foods that support their health), conversations about products (e.g. health-related products) and in comparing purchasing criteria (e.g. selecting fresh vegetables instead of convenience food) (Rousseau, 2007b).

Mostly seen as the primary socialisation agent, parents subconsciously or intentionally imbed their own consumption values in their children‟s actions (Solomon, 2011), with a consequent influence on the acquisition of learning outcomes from the socialisation process (i.e. skills, knowledge and attitudes) (Lachance et al, 2000). Subconsciously, the types of foods to which children are frequently exposed in the household (e.g. frequent consumption of vegetables versus convenience foods), are likely to influence the food purchase and consumption patterns of child household members during adulthood (Lin & Yen, 2008). As such, many parents expose their children to messages conveying vegetables as a symbol of health and a basic principle of healthy eating from a young age. Children will also learn about vegetable consumption by watching and imitating the actions of role models, such as their parents, through observational learning (Schiffman & Kanuk, 2010; 24; Solomon, 2011). With regard to messages (e.g. health messages regarding vegetables), people or groups of people (Lachance et al, 2000), such as health care professionals; and the media (Solomon, 2011), such as health magazines, internet, television and social media, may also serve as important socialisation agents, especially to adult consumers.

Marketing messages In the context of consumer behaviour, a message resembles ideas communicated to consumers in verbal (spoken or written) or nonverbal (visual) ways (Schiffman & Kanuk, 2010) to instigate consumer needs and influence product decisions (Wright, 2006). Positively framed messages that specify the benefits of products, such as vegetable consumption (Schiffman & Kanuk, 2010), are often used in the media. Such messages that present vegetables as a symbol of health may be imposed upon consumers via the media, for instance by a picture of a consumer who is eating a carrot. Marketing messages pertaining to health may also be visually presented to consumers through a celebrity endorsing a product in an advertisement (e.g. fresh vegetables), so that consumers may act upon the message through social learning by buying the product (Jansson-Boyd, 2010).

Perhaps the most common visual marketing-related message pertaining to vegetables is the use of attractive in-store displays of vegetables to entice consumers into buying. The correct placement, colour and appeal of these displays may increase the chance that exposure to these displays will result in a positive perception (Rousseau, 2007a). However, consumers rarely receive positive visual and written messages presenting vegetables as a symbol of health in insolation, since all messages have to compete with an array of other messages to which consumers are exposed. In-store products (e.g. vegetable displays) are always displayed alongside an abundance of other products with equally attractive visual appeal, competing for the attention of consumers (Wright, 2006). In situations like these, the ultimate decision will be influenced by various internal and external factors, one of which may include knowledge obtained regarding vegetables and health during childhood socialisation.

Cognitive processing of messages

In light of the abundant scientific evidence regarding the benefits of vegetables for consumer health and the messages to which consumers are exposed in this regard, it becomes clear why vegetables may become a symbol of health in consumers‟ minds through the process of cognitive learning. Cognitive learning is the theory of how something is learnt and entails the mental processes that are involved when consumers use information from previous experiences as well as new information acquired during problem solving (Jansson-Boyd, 2010; Schiffman & Kanuk, 2010; Solomon, 2011). Upon exposure to the sensory input from the health-related messages that are discussed, information processing needs to take place, to allow the message (e.g. vegetables as a symbol of health) to ultimately progress from the sensory store to the long-term memory store, where it will either be forgotten or retrieved (Schiffman & Kanuk, 2010). Semantic memory from the long-term memory store entails the development of schemata, that allows acquired messages or experiences to be organised for later retrieval or application (Reed, 2000; Baron & Byrne, 2004), such as during vegetable purchases or preparation. From a social cognitive perspective, schemata may thus form in a consumer‟s memory from a young age upon exposure to childhood socialisation and to marketing messages, resulting in opinions about and knowledge pertaining to appropriate vegetable use. On the other hand, a lack of exposure to such messages or the interference of other messages upon reception of health-related vegetable message may entail the formation of schemata about alternative food

consumption messages, not necessarily of equal benefit to consumer health.

Consumer opinions and use of vegetables

From the discussion thus far, it can be gathered that schemata formed in consumers‟ memory upon exposure to health-related messages about vegetables amongst various other food-related messages, may affect their opinion and use of vegetables. Consumer opinion refers to the views or thoughts that consumers have about something (e.g. vegetables and health) which are subject to change and may guide their behaviour (Bareham, 1995; Hornby, 2005).

Previous research had shown positive opinions among South African consumers about the contribution that food can make to health maintenance and disease prevention (Bosman et al, 2014), but data pertaining to vegetables in particular is lacking. Therefore, it will be valuable to investigate whether similar positive opinions are shown for vegetable consumption in the present study.

Consumers are directed by various guidelines and messages pertaining to the consumption of an appropriate amount of vegetables to support their nutritional needs for optimum physiological and psychological health. The South African FBDG advises consumers to “Eat plenty of vegetables and fruit every day” (Vorster et al, 2013). Another guideline for vegetable and fruit intake internationally proposes that at least five portions of vegetables and fruit should be eaten per day, under the stewardship of the International Fruit and Vegetable Alliance and hosted in South Africa by The Five a Day for Better Health Trust (IFAVA, 2016). However, despite these guidelines, a review of dietary surveys in South Africa showed the average daily intake of vegetables and fruit in South Africa to be only half the recommended amount of 400 g/day (Mchiza et al, 2016). In the UK, the Food Standards Agency confirmed that even though awareness of the number of vegetables and fruit portions to be eaten daily has increased among consumers, over the past five years there has only been a 4% increase in consumers who adhere to these guidelines (Food Standards Agency, 2007).

Consumers often attribute their sub-optimal intake of vegetables to high price. Yet, the price may often be less than that of other energy-dense foods items, while vegetables and fruit contribute excellent value in terms of vitamins, minerals and key nutrients (Darmon et al, 2005; Kongsbak et al, 2016). However, the lower cost of some nutrient-dense foods such as grains may in fact allow consumers to afford the higher price of nutrient-dense vegetables and fruit (Maillot et al, 2007), while also offering affordable-cost nutrients (Darmon et al 2005).

Herbert et al (2010) point out that low intake of vegetables and fruit may also be ascribed to the misinterpretation of health messages, such as portion size and what constitutes a portion in the 5-a-day message. Furthermore, the lack of the appropriate skills to prepare and cook vegetable also hinders the optimal intake of vegetables, and therefore health messages regarding vegetables and the optimal intake of these foods should also emphasise appropriate preparation practices which young consumers should attain. Pe´neau et al (2009) furthermore recommend that offering vegetables and fruit with enhanced flavour for extended seasons and at affordable prices may increase the consumption of these healthy foods.

METHODOLOGY

Research design and sampling

This quantitative study employed a cross-sectional survey design, to allow description of the selected population at one point in time (Babbie, 2008). Fieldworkers recruited metropolitan respondents (N=1 997) between April and May 2002 by means of stratified randomised sampling, to increase the representativeness of the sample from a population with evident strata (Welman et al, 2006). The metropolitan areas of South Africa (Gauteng, Durban, Pietermaritzburg, Port Elizabeth, East London, Bloemfontein and Cape Town) served as strata, and respondents in these strata were randomly selected by means of systematic sampling to proportionally represent the four main ethnic groups of South Africa (black, white, coloured and Indian) and to represent different age groups, while disproportionately including both genders on a 50/50 split basis. From the randomly selected starting point in each stratum, an adult respondent from every third household was selected for the interview, until a cluster of 5 was completed. No pertinent inclusion and exclusion criteria were required. Before data analysis, the sample was weighted to represent the adult population of metropolitan consumers (n=10,695,000) in South Africa with respect to age, gender and ethnicity. Data from the 2000

South African census by Statistics South Africa were used to ensure that the results were representative and could be extrapolated (SAARF, 2004).

Despite our study being based on data from 2002, there are currently no more recent data of similar scope available in South Africa. All available evidence suggests that the consumption of vegetables plays an important role in mitigating the rise in NCDs and that South Africans have less than optimum vegetable consumption. With the recent demise of the Five-a-Day for Better Health campaign South Africa have lost the strongest advocate for increasing vegetable (and fruit) consumption. All indications are that consumption will deteriorate and all these factors underline the importance of publishing the present data. We are confident that these results from 2002 still give valuable insight into this research question within a South African context.

The most similar dataset is that of the SANHANES survey (Shisana et al, 2014), but it does not deal with consumer issues or the frequency of consumption as in the present study. Furthermore, SANHANES attempts to quantify vegetable and fruit consumption, whereas the present study partially focused on more detailed frequencies of consumption. The sampling procedure used by the SANHANES is similar to that used in the present study.

Commonly used diet assessment methodologies assess frequency of consumption either with the 24h recall method or habitual intake. These methods have their strengths and weaknesses but none of the published data in South Africa give the level of detail that the present study provides. Our data are important in terms of understanding vegetable consumption patterns against the declining health situation in South Africa.

Measurement instrument design and data collection

This study formed part of a larger project on SA consumers‟ opinions concerning food- and health-related matters. A research team of experts from multiple health, research and market-related disciplines designed the questionnaire for the larger project, with inputs from literature, personal expertise and issues relevant to the food industry, such as food fortification, food processing and health claims. Questions pertaining to consumers‟ health-related opinions regarding fresh vegetables and consumers‟ use of fresh vegetables were selected for the current study and comprised the following sections:

1) Demographic data (age, gender, ethnicity)
2) Respondents‟ opinions regarding health-related messages about vegetables as rated on a five-point Likert scale, where 1= Strongly disagree, and 5 = Strongly agree.
3) Respondents‟ frequency of consumption of different fresh vegetables mostly consumed in cooked format (e.g. potato, carrots, mixed vegetables, baby marrows, broccoli, Brussels sprouts, cabbage, cauliflower, green beans, peas, pumpkin, spinach, sweet potato) was assessed by choosing between the frequency options: every day, more than once a week, once a week, every second week, seldom and never.
4) Respondents‟ preparation practices used for different vegetables, including cooking method: raw or uncooked, water-based (boiled, steamed and microwaved) and fat-based (stir fried and fried), as well as (sugar, fat, sugar and fat, salt and sauce).

The trained fieldworkers obtained informed consent from prospective respondents and collected data via the interviewer-administered questionnaires at the respondents‟ homes. This method was deemed most suitable to provide quality data of respondents from fully completed questionnaires which allowed the fieldworker to clarify uncertainties and misinterpretations. The non-sensitive nature of the research topic also made this method a feasible choice (Welman et al, 2005). The questionnaire was accompanied by show cards to assist respondents to understand the scale (e.g. Likert) pertaining to each question.

The larger research project, from which this study stems, was conducted in accordance with prescribed ethical principles for research with humans according to the Declaration of Helsinki and the ethical guidelines of the National Health Research Ethics Council and was approved by the Ethics Committee of the Faculty of Health Sciences of the North-West University. Respondents‟ privacy and confidentiality were protected, they were at all times treated with respect and they provided informed consent before voluntary participation.

Validity and reliability

Face and content validity was primarily insured by experts in health, food, nutrition and

consumer sciences inspecting the questionnaire and providing input on the content and format of the final questionnaire with respect to their fields of expertise. The final questionnaire was tested for clarity and face validity by conducting ten cognitive interviews before commencing with data collection (Boeije & Willis, 2013).

Reliability of data collection procedures was improved by careful selection of fieldworkers for the project and by only involving those with at least a Grade 12 qualification. Appointed fieldworkers from the contracted company were thoroughly trained in the sampling and data collection procedures. Each fieldworker had to be proficient in the language/(s) predominantly used in the area of data collection, to allow interviews to be conducted in the language of preference of the respondent. The original questionnaire was developed in English and translated into Afrikaans, isiXhosa, isiZulu, Setswana, Sesotho, Tsonga, Venda, Swazi and Ndebele by translators proficient in these languages. Questionnaires were then translated back into English by translators with English as a native language. A team supervisor conducted back-checks on at least 20% of each fieldworker‟s interviews by means of personal visits to respondents or telephone calls, as an additional means to raise the level of reliability for the data.

We determined construct validity for the two opinion scales (food-health link; vegetable-health link) (reported under results) with exploratory factor analysis (EFA) using principal component analysis as an extraction method and Oblimin rotation with Kaiser normalisation. Internal reliability for the extracted factors in each scale was determined with Chronbach‟s alpha value. Mean factor scores for the reliable factors that were extracted, were determined as the average of all items contributing to a factor.

Statistical analysis

Statistical analysis was undertaken using SPSS Version 23 by means of the weighted data, to represent the South African metropolitan consumer population. Descriptive statistics included frequency analysis and means. For frequency analysis the categories for the five-point opinion Likert scales were combined to present a three-point agreement scale for easier interpretation of differences. Cohen‟s d-values effect sizes were determined for the differences between the percentage of respondents respectively disagreeing and agreeing with the different items in the opinion scales, where according to Steyn (2000), d=0.2 represented small effect sizes (not practically significant), d=0.5 represented medium effect sizes (tendency) and d=0.8 represented large effect sizes (practically significant). For our study, only medium and large effect sizes are reported. Spearman‟s rank order correlations were determined between the different extracted factors, where r=0.1 (small), r=0.3 (medium) and r=0.5 (large) serve as effect sizes. Only r≥0.23 are reported, representing medium (tendencies) and large (practically significant) correlations.

One-way ANOVA with Cohen‟s effect sizes was used to determine differences between demographics (gender, age and ethnicity) for the extracted opinion factors. We determined differences between demographics and respondents‟ use (frequency of use, cooking method and added ingredients) of the different vegetables, using cross-tabulations, where Cramer‟s V was indicative of medium (r≥0.23) or large (r≥0.45) effect sizes. Statistical significance of differences (p-values) was calculated where applicable, but due to the large sample size it was not reported. Instead, effect sizes were reported as described.

RESULTS AND DISCUSSION

Demographics

The sample consisted of a near-equal gender distribution (male=51%; female=49%) and mostly of younger consumers (<45 years=72%; ≥45 years=28%). The distribution of the main ethnic groups was: black=58%; white=24%; coloured=12% and Indian=5%. The weighted sample distribution represented the true SA metropolitan population according to SAARF (2004).

Opinions on health-related messages regarding food and vegetables

Chronbach‟s alpha values below 0.7 are acceptable for diverse psychological constructs. Table 1 depicts the factor loadings for EFA for the scale of respondents‟ opinion on health-related messages regarding vegetables. Two factors were extracted according to the scree plot that explained 42% of the variation, which is acceptable with an adequate KMO value of 0.83 (KMO>0.5). Bartlett‟s test for sphericity for correlation between items was an acceptable value of 0.000 (Field, 2009). Construct validity was therefore confirmed by the EFA; and EFA

TABLE 1: SUMMARY OF EXPLORATORY FACTOR ANALYSIS OF OPINIONS ABOUT HEALTH-RELATED MESSAGES REGARDING FRESH VEGETABLES

Item in scale	Factor loadings*	
	Healthy and nutritious	Fresh vegeta-ble preference
Vegetables keep me healthy	0.74	
Vegetables prevent me from getting ill	0.73	
Vegetables are good for me, depending on how fresh they are	0.57	0.21
Vegetables are a good source of vitamins and minerals	0.55	0.25
I can recall from a young age being told that vegetables are good for me	0.54	
Vegetables are good for me depending on how long they have been cooked	0.52	
Recently I have heard and read more about the health benefits of vegetables	0.48	
All vegetables are good for me	0.46	
Fresh vegetables are the healthiest choice		0.80
I always prefer fresh vegetables		0.71
Fresh vegetables are the healthiest choice, depending on how long they have been on the shelf		0.66
Inter-item correlations	0.25	0.32
Cronbach alpha coefficient	0.70	0.58
Mean factor score	4.17	4.37
±Standard Deviation	±(0.49)	±(0.60)

*Factor loadings from principal components analysis

successfully reduced the amount of data. With regard to internal consistency, Kline (1999) states that even though Chronbach"s alpha values above 0.8 and 0.7 are reasonable for intelligence and ability tests respectively, values below 0.7 are probable for diverse psychological constructs (such as opinion). Our lower value of 0.58 (≈0.6) is therefore interpreted as being acceptable, as supported Malhotra and Birks"s (2007) threshold value of 0.6 for acceptable internal consistency. Mean inter-item correlation values were also within the acceptable range of 0.15 and 0.55, as recommended by Clark and Watson (1995). The factors therefore theoretically made sense.

The first extracted factor pertaining to the healthiness, goodness and nutritional benefits of fresh vegetables was labelled "Healthy and nutritious" while the second, relating to respondents" preference for fresh vegetables and their consideration of these vegetables as a healthy choice, was labelled "Fresh vegetable preference". The mean factor scores for respondents" opinions regarding these two factors on the five-point agreement scale reflected that they agreed with both these factors (Table 1), where values ≥3.5 are interpreted as "agree". They agreed to a somewhat greater extent with the "Fresh vegetable" factor. Respondents therefore had positive opinions on health-related messages about vegetables. Thus, vegetables were one of the food categories which they considered as nutritious and as contributing to their health, with a special focus on fresh vegetables as an important component of a healthy diet.

Table 2 depicts the percentage of respondents who respectively disagreed and agreed with the different statements in the factors of the opinion scale. Their agreement as indicated by the mean factor scores of the different opinion factors was confirmed by Cohen"s d-values, which show that practically significantly more respondents agreed with all the different scale items than those who disagreed, except for one statement, where only a tendency towards greater agreement was found. More respondents doubted whether to agree with the statement "Recently I have heard and read more about the health benefits of vegetables". This may be interpreted in two possible ways: firstly, it may confirm the notion that vegetables are seen as symbol of health and that respondents had been socialised since childhood with regard to the health benefits of vegetables. Childhood exposure to such messages was indeed confirmed by 90% of respondents who agreed with the statement "I can recall from a young age being told that vegetables are good for me" (Table 2). Furthermore, more than 90% of the respondents agreed that vegetables keep them healthy, prevent them from getting ill and are a source of vitamins and minerals, which are typical messages communicated by parents to

TABLE 2: FREQUENCY TABLE FOR THE DIFFERENT STATEMENTS PERTAINING TO HEALTH-RELATED MESSAGES ABOUT VEGETABLES OF THE TOTAL POPULATION (N=10 695 000)

Opinion factors and statements	N	Disagree (%)	Neither agree nor disagree (%)	Agree (%)	*d**
Healthy and nutritious					
Vegetables keep me healthy	10 540	1.6	5.7	92.1	1.81**
Vegetables prevent me from getting ill	10 475	4.0	13.7	81.0	1.54**
Vegetables are good for me, depending on how fresh they are	10 552	2.5	8.2	88.7	1.72**
Vegetables are a good source of vitamins and minerals	10 495	1.1	6.2	91.6	1.81**
I can recall from a young age being told that vegetables are good for me	10 460	3.1	6.8	88.6	1.71**
Vegetables are good for me depending on how long they have been cooked	10 483	7.1	12.7	79.0	1.44**
Recently I have heard and read more about the health benefits of vegetables	10 440	23.3	18.5	56.6	0.67*
All vegetables are good for me	10 577	6.8	6.6	86.3	1.59**
Fresh vegetable preference					
Fresh vegetables are the healthiest choice	10 544	2.9	8.3	88.2	1.71**
I always prefer fresh vegetables	10 595	1.9	5.9	92.0	1.80**
Fresh vegetables are the healthiest choice depending on how long they have been on the shelf	10 467	5.5	10.0	83.2	1.55**

Effect size (Cohen's d): 0.2 = small; 0.5 = medium*; 0.8 = large**

children from a young age, as well as by media messages regarding vegetables. A second possible interpretation for the medium effect size for the difference between the agreement and disagreement concerning this statement, may be that the health benefits of vegetables are not always sufficiently promoted in current health messages and in the popular media to which consumers are exposed, or that these messages do not reach consumers as effectively as other messages to which they are exposed. However, their strong agreement with most of the statements with the factor "Healthy and nutritious" points to a strong awareness of the health and nutritional value of fresh vegetables. This confirms that exposure to health-related information about vegetables does take place or has taken place in the past. The fact that 92% of respondents agreed with "I always prefer fresh vegetables", shows that these respondents place a high premium on fresh, as opposed to frozen and canned vegetables that are also available in the marketplace.

The two extracted factors correlated with Spearman"s correlations with medium effect sizes. Respondents who agreed that fresh vegetables are "Healthy and nutritious" also tended to agree that they had a "Fresh vegetable preference" (r=0.41). Positive opinions on the health and nutritional value of vegetables therefore tended to be linked to positive opinions on the behaviour or action of actually preferring fresh vegetables.

Frequency of consumption of different fresh vegetables

Table 3 depicts the frequency of respondents who claimed to consume the different fresh vegetables mostly in a cooked format. Potatoes were evidently the most frequently consumed vegetables and were to a large extent eaten on a daily basis. Respondents who did not eat it on a daily basis, mostly indicated that they ate potatoes at least once a week. The popularity of potatoes over the other vegetables can be attributed to it being consumed as a starch, instead of a vegetable (Herbert et al, 2010), and often as a staple. Health professionals also regard potatoes as a starch and do not include it in the group of vegetables that are considered for the purpose of 5-a-day consumption of vegetables and fruits (Herbert et al, 2010). Therefore the consumption of potatoes should

TABLE 3: RESPONDENTS' FREQUENCY OF USE OF DIFFERENT FRESH VEGETABLES

Vegetable	Frequency of vegetable intake (% respondents)					
	Every day	More than once a week	Once a week	Every second week	Seldom	Never
Potatoes	**44.9**	**12.4**	38.1	2.6	1.4	**0.7**
Pumpkin[1]	4.1	4.8	66.0	7.9	12.1	5.1
Carrots[1]	11.8	10.6	59.6	6.4	9.4	2.2
Cabbage[1]	5.9	10.1	51.0	10.9	15.0	7.1
Green beans[1]	3.9	3.5	49.8	9.2	21.3	12.4
Mixed vegetables	8.1	4.2	45.2	7.4	18.8	16.3
Peas	3.2	2.2	39.7	7.2	25.1	22.5
Spinach	3.9	3.8	38.4	11.0	26.3	16.6
Cauliflower	1.8	2.3	26.7	7.8	21.0	40.4
Sweet potatoes	1.1	1.9	25.0	9.3	40.2	22.5
Sweetcorn	1.1	1.1	15.5	6.1	32.6	43.7
Broccoli[2]	1.0	1.4	13.7	5.1	16.2	62.6
Baby marrow[2]	0.6	1.0	11.1	5.0	16.3	66.0
Brussels sprouts[2]	0.3	0.4	5.1	2.9	11.6	79.6

[1] most frequently consumed
[2] least frequently consumed

be viewed on its own rather than in comparison with other vegetables.

Pumpkin, carrots, cabbage and green beans were the most frequently consumed vegetables among the remaining vegetables, and were consumed by 50% and more of respondents on a weekly basis (Table 3). On the other hand, more than 60% of the respondents never consumed Brussels sprouts, baby marrow or broccoli. Although the frequent intake of pumpkin and carrots contributes to consumers‟ vitamin A needs (Whitney & Rolfes, 2008), these consumption patterns may be a cause of concern, since only green beans are considered a good source of dark green vegetables among the most frequently consumed group. Furthermore, broccoli is an excellent source of phytochemicals (Vasanthi et al, 2009; Cartea et al, 2011) but it was rarely consumed. A total of 43% of the respondents never ate Brussels sprouts, and seldom or never ate spinach; yet, both fall among the group of vegetables containing the highest antioxidant levels (Halvorsen et al., 2002). Both broccoli and Brussels sprouts, which are lacking in the diets of many of the respondents, also belong to the cruciferous family of vegetables that are associated with lower levels of inflammatory markers (Jiang et al, 2014), as pointed out before; and both contain hydrolysation products of the glucosinolates that are essential for human health (Wagner et al, 2013). Among this important group of vegetables, only cabbage was frequently consumed by respondents.

The frequency of intake of the different types of vegetables is a possible cause for concern, as it points towards the limiting or exclusion of certain vegetables from respondents‟ diets. In doing so, respondents may be restricting their intake of important health benefits that are found only in particular vegetables. As mentioned before, literature indicates that the price of vegetables prevents some consumers from consuming vegetables (Darmon et al, 2005). According to Kongsbak et al (2016) this problem should be addressed by means of strategies to improve the affordability of vegetables and to allow lower socioeconomic groups access to vegetable consumption.

Preparation practices for different fresh vegetables

More than 74% of respondents prepared all vegetables by means of water-based cooking, except for cabbage, which is prepared by means of fat-based methods by more respondents than the other vegetables (Table 4). A quarter of the respondents also used fat-based cooking for potatoes. The large proportion of respondents who use fat-based cooking for potatoes and cabbage is of concern, as these vegetables are among the most frequently eaten vegetables, and this preparation method may contribute an

TABLE 3: RESPONDENTS' FREQUENCY OF USE OF DIFFERENT FRESH VEGETABLES

Type of vegetable	Cooking method (%)			Additions (%)				
	Raw	Water-based	Fat-base	With sugar	With fat	With fat & sugar	With salt	With sauce
Potatoes	0.2	74.7	25.1	0.1	52.7	1.3	78.7	6.3
Pumpkin[1]	0.3	91.2	8.5	32.4	34.5	40.6	22.9	0.7
Carrots[1]	13.9	74.2	11.9	16.8	30.1	16.0	48.8	2.3
Cabbage[1]	2.9	62.3	34.8	0.4	51.9	1.1	78.9	3.7
Green beans[1]	0.8	86.1	13.1	0.7	35.8	1.1	69.4	1.5
Mixed vegetables	1.6	82.5	16.0	0.8	36.3	1.4	69.3	6.1
Peas	4.0	87.7	8.3	7.1	35.5	4.9	60.3	1.7
Spinach	0.3	80.9	18.8	0.4	44.0	1.6	69.6	8.5
Cauliflower	0.5	87.2	12.3	0.6	26.1	0.8	72.5	32.1
Sweet potatoes	0.6	93.7	5.7	26.9	25.2	24.9	24.5	0.9
Sweet corn	3.4	91.9	4.7	6.7	23.9	3.1	59.8	1.3
Broccoli[2]	1.2	95.7	3.1	0.9	18.8	1.2	72.7	30.4
Baby marrow[2]	2.2	85.4	12.3	4.7	27.0	4.2	68.6	8.6
Brussels sprouts[2]	1.2	95.2	3.7	0.3	18.6	0.1	78.6	20.0

[1] most frequently consumed
[2] least frequently consumed

unhealthy amount of additional fat to the diet. Water-based cooking of vegetables is recommended as the healthiest way of preparing vegetables, taking into account the amount of water used, the time of cooking and immediate serving upon preparation.

During preparation or upon serving vegetables, a considerable number of respondents added sugar to vegetables that are traditionally served as sweet vegetables, such as pumpkin, sweet potatoes and carrots (Table 4). The over-consumption of sugar is of great concern according to health professionals worldwide. In South Africa “sugar tax” legislation on sugar-containing carbonated beverages is being introduced in an effort to curb excessive sugar consumption. A South African systematic review raised concerns about the high intake of sugar among South African children and adults, with respect to dental caries development, the diluting effect of sugar on micronutrients and the development of obesity and type 2 diabetes (Steyn & Temple, 2012). Both pumpkin and carrots fall amongst the most frequently consumed vegetables, and these preparation methods may result in overconsumption of sugar. Furthermore, a high percentage of respondents also added a combination of both fat and sugar to pumpkin and sweet potato (Table 4). Fortunately, fewer respondents added salt to pumpkin, sweet potatoes and carrots, compared to more than 60% who add salt to the other vegetables under consideration.

A total of 20% to 53% of respondents added fat to all the vegetables in this study, except for broccoli and Brussels sprouts (Table 4). This practice would result in an increase in the total fat content of the diet. In accordance with the South African FBDG, fat should be used sparingly in order to prevent NCD (Vorster et al, 2013). Unfortunately the advantage that broccoli and Brussel sprouts have when no fat is added during their preparation, is limited because so few respondents consume these vegetables. More than 50% of respondents added fat to potatoes and cabbage, which are more frequently cooked with fat-based methods than other vegetables. These practices are of great concern because potatoes and cabbage are consumed most frequently.

A larger percentage of respondents added sauce to cauliflower, broccoli and Brussels sprouts than to the other vegetables (Table 4), probably to enhance the taste of these vegetables to be more acceptable, since these vegetables were among the less popular, with broccoli and Brussels sprouts never eaten by most respondents (Table 3). Depending on the type of sauce, this addition may be a less healthy practice and may in some instances contribute more fat or salt to the diet. However, the addition of a sauce could also be considered from a positive stance, since it may make these less frequently consumed vegetables more acceptable, especially considering that all cruciferous vegetables, except cabbage, were never eaten by a large number of respondents.

Previous research indicated that a lack of skills to prepare vegetables appropriately may impede vegetable intake (Herbert et al, 2010). In the context of this study we cannot exclude the possibility that a lack of knowledge could also play a role. Our research identifies tendencies towards less healthy practices among a large number of respondents, which may to a certain extent counteract the health benefits afforded by regular vegetable consumption.

Differences between demographic subgroups

One-way ANOVA indicated no differences between age, gender and ethnic groups with regard to the two vegetable opinion factors (d<0.45). Respondents therefore on average had similar opinions, irrespective of age, gender and ethnicity. Cross-tabulations also revealed no differences between different age and gender groups with respect to their frequency of vegetable use, the cooking method applied and additions made during or after preparation (Cramer"s V<0.25). However, cross-tabulations mostly indicated tendencies towards differences between the various ethnic groups with regard to the frequency of use, cooking methods and additions made (Cramer"s V≥0.25).

Most of the differences (tendencies) between the ethnic groups pertained to the consumption of the least frequently consumed vegetables, namely Brussels sprouts, baby marrows, broccoli and sweetcorn (results not shown in a table). More black (95.7%; 87.0% respectively), coloured (69.5%; 61.1% respectively) and Indian (84.7%; 56.8% respectively) respondents tended to never eat Brussels sprouts (Cramer"s V= 0.32) and baby marrows (Cramer"s V=0.35), compared to white respondents (44.3%; 19.2% respectively). However, concerning broccoli (Cramer"s V=0.36) and sweetcorn (Cramer"s V=0.27), almost a third of both white (34.5%; 29.4% respectively) and coloured respondents (22.0%; 30.5% respectively) tended to eat these mostly once a week, in contrast with black (61.5%; 40.5% respectively) and Indian (34.5%; 29.4% respectively) respondents, who tended to never eat these. Black respondents also tended to differ with regard to their consumption of cauliflower (Cramer"s V=0.36) and spinach (Cramer"s V=0.27), in that they were more inclined to never eat cauliflower, compared to the other ethnic groups (black=61.5%; others=9.4-12.9%), while they more frequently consumed spinach once a week than the other ethnic groups (black=48.0%; others=15.6-29.9%). More than half the black (59.0%) and coloured (53.4%) respondents also tended to eat cabbage once a week, compared to about a third of both Indian (35.4%) and white (35.0%) respondents (Cramer"s V=0.27).

According to the greater tendencies that some ethnic groups showed to never eat some vegetables in comparison to other ethnic groups, it is evident that some groups might lack a sufficient variety of certain types of vegetables in their diets. A general pattern is observed among black and Indian respondents, who tend to exclude similar types of vegetables from their diets.

More white (80.9%-96.1%), black (55.4%-94.1%) and coloured (81.8%-98.1) respondents tended to use water-based cooking methods for preparing cabbage, green beans, peas, cauliflower and sweetcorn than the fat-based methods used by more Indian respondents (36.2-80.0%) (Cramer"s V=0.26-0.40). In addition, more Indian respondents (64.5%; 62.2% respectively) also added fat to cauliflower and green beans. More Indian (39.9%-72.7%) and black (32.5%-62.8%) respondents also tended to add fat to broccoli, potatoes and spinach than white (10.4-33.7%) and coloured (18.7%-40.9%) respondents (Cramer"s V=0.26-0.37). Fewer white respondents (16.8%) tended to add fat to cabbage than the other ethnic groups (51.6%-72.7%; Cramer"s V=0.38). Both Indian and black respondents thus have a greater tendency to add fat to many vegetables – a practice not frequently applied by white and coloured respondents. This fat addition is of concern, for many Indian respondents are more likely to apply fat-based cooking methods, while more of these respondents (62.2%) also tended to add salt to pumpkin, compared to other ethnic groups (12.8%-36.5%; Cramer"s V=0.32). It is, however, noteworthy that most Indian respondents (76.7%) ate carrots uncooked, compared to the other ethnic groups who mostly made use of water-based cooking (72.3%-90.2%; Cramer"s V=0.34). The fat-adding habit among black respondents should also be noted, in the context where CVDs are becoming more prevalent among black South Africans as a result of dietary changes associated with urbanisation (Vorster et al, 2005). Although fewer white respondents tended to add fat to vegetables (white=19.4%; others=0.0%-12.1%), more of them tended to add sugar (Cramer"s V=0.31) and to add a sugar-fat combination (white=14.5%; others=1.0%-3.4%; Cramer"s

V=0.26) to peas, compared to other ethnic groups. Practically significantly more white (56.5%) and coloured respondents (47.2%) also added a sauce to cauliflower than black (7.8%) and Indian (3.8%) respondents (Cramer‟s V=0.50). Similar tendencies of medium effect size were noted for adding sauce to broccoli (coloured=40.4%; white=36.9% vs. Indian=13.6%; black=12.0%; Cramer‟s V=0.25) and spinach (white=22.0%; coloured=13.1% vs. Indian=5.5%; black=3.7%; Cramer‟s V=0.27). Thus, fat addition to vegetables was more prominent among black and Indian respondents, whereas coloured and white respondents were more prone to add a sauce. Both groups probably employ these practices to enhance the taste of vegetables, even though from a nutritional point of view the additions may not necessarily be the best way to prepare the product.

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

This study was undertaken against the background of non-communicable diseases that are attributed to nutrition-related causes in South Africa and health messages regarding the benefits of vegetables in health promotion and disease prevention. The sampling strategy is however the strength of the survey, since it encompass a large, completely random, representative sample of the metropolitan population that is weighted to the 2000 Census data.

South African metropolitan consumers had favourable opinions of health-related messages that were about vegetables proposed to them. Most respondents were agreed that vegetables could contribute to their health, they viewed it as healthy and nutritious, and they responded favourably to fresh vegetables. Our results therefore confirm that these metropolitan consumers responded positively to typical health messages regarding fresh vegetables to which they were exposed during consumer socialisation and in the marketplace.

This study revealed a rather limited array of fresh vegetables that were consumed frequently by respondents. More respondents consumed pumpkin and carrot (contributing vitamin A), green beans (fulfilling dark green vegetable needs) and cabbage (providing the benefits of the cruciferous family of vegetables) on a frequent basis. However, there is cause for concern about the large proportion of respondents who never ate Brussels sprouts (rich in antioxidants; benefits of cruciferous family), broccoli (rich in phytochemicals; dark green; benefits of cruciferous family) and spinach (rich in antioxidants; dark green leafy) and who are therefore deprived of the health benefits associated with these vegetables. In particular it was found that the majority of black and Indian respondents tended to never eat certain vegetables. Our findings therefore point to a possible lack of exposure to health messages concerning the need to consume of a variety of vegetables or the vegetables that they tend to avoid, or inadequate cognitive processing of these messages into positive behaviours in this regard. However, the high cost of some vegetables or the lack of skills to prepare them tastefully may also prevent messages from being successfully encoded into consumers‟ memory, so that may be converted into practice.

Although most respondents used water-based cooking methods, in line with health recommendations, a large proportion used fat-based methods for cooking cabbage, while most respondents also often added fat to these frequently consumed vegetables. More Indian consumers were inclined to use fat-related cooking methods and additions than other ethnic groups, probably owing to cultural practices of food preparation. The fat-related preparation practices are a cause for concern in light of the high prevalence of CVD in South Arica. Considering the burden of NCDs in South Africa, the large number of respondents who add additional sugar to some naturally sweet vegetables (i.e. pumpkin, sweet potatoes and carrots) is also a problematic practice. The addition of a sauce to the less popular broccoli and Brussels sprouts, especially by coloured and white respondents, could be interpreted in different ways, depending on the nature of the sauce added. A limitation of the questionnaire employed in our study is that it did not provide details of the sauce. Traditionally South Africans use a white or cheese sauce, which may add a considerable amount of fat and salt to the dish, but also protein and carbohydrates. The addition of healthy, tasty sauces to less popular vegetables may increase the intake of these vegetables, while contributing to the nutritional value of the product. The less healthy preparation practices that a considerable number of respondents employed may indicate that health messages regarding vegetables are not necessarily sufficiently focussed on both healthy and tasty ways to prepare vegetables.

Our study shows that health messages pertaining to vegetables have been positively integrated in respondents‟ opinions regarding vegetables, but that reported behaviour does not indicate that the messages were implemented in the frequent consumption of different types of vegetables, nor in healthy preparation practices. Barriers such as price, skills to prepare vegetables, adhering to some traditional/cultural preparation practices and taste preferences may hinder consumers‟ effort to adhere to health recommendations on vegetable intake. Health messages or programmes should assist consumers to make informed vegetable choices by incorporating information regarding affordable types of vegetables that provide the essential vitamins, minerals, phytochemicals and polyphenols that are only available through vegetable consumption.

We also recommend that healthy preparation practices should not only be incorporated in health-related messages by parents, health-care practitioners and in the media, but also by means of intervention research. In this regard current successful vegetable garden interventions could be supplemented with interventions in preparation practices if it is not already done. Short courses or training programmes to assist consumers to use quick, affordable ways to prepare vegetables may also be of assistance. It is recommended that future research should investigate include a greater variation of vegetables, the amount of water or fat and type of fat used for cooking, as well as the amount of additional ingredients added.

A limitation of this study is that the data were collected in 2002 and conclusions should be viewed against that background. We recognise that Metropolitan areas in SA may have undergone changes over time. The Consumer Price Index (CPI) for food has been quite variable since 2008 (when some of the key definitions were changed). Poor households still spend proportionally more on food than non-poor households. The year 2016 reveals the only real increase (above the all item CPI) in the CPI for food as a category due to the severe drought (Statistics South Africa, 2016). However, the CPI is and has always been variable and it is difficult to speculate on its impact on consumers‟ opinion about health messages related to vegetables. On average, a decrease in real terms of 6% was spent on food and non-alcoholic beverages by non-poor households, which is in contrast with the average poor household‟s expenditure increase of 1% in real terms (Statistics South Africa 2014). Despite this limitation, it is hoped that this paper will stimulate thought, research and innovation in this area since it is of critical importance to increase vegetable consumption in South Africa. The closed-ended nature of the questionnaire limited the quality of information that could be gathered but also meant that information on some vegetables were not collected.

This study contributes to existing knowledge regarding vegetable intake in South Africa, by providing representative data of SA metropolitan consumers‟ opinions regarding and use of vegetables. It also uniquely approaches the problem of consumer vegetable intake from a consumer behaviour perspective. There is no similar source of this kind of information available in South Africa and we believe it to be important to have it in the public domain to serve as a reference point but also to stimulate thought and debate on the issue amongst consumer scientists and health professionals alike.

ACKNOWLEDGEMENT

The authors acknowledge the intellectual contribution of JM Badham, and the Department of Trade and Industry (dti) and the National Research Foundation (NRF) for funding of the larger study via The Technology and Human Resources for Industry Programme (THRIP). Disclaimer: „Any findings included in this material are the opinion of the authors and therefore the NRF does not accept any liability in regard thereto.‟

REFERENCES

BABBIE, E. 2008. The basics of social research. 4th ed. Belmont, CA. Thomson Wadsworth.

BAREHAM, J. 1995. Consumer behaviour in the food industry: An European perspective, London, Butterworth-Heinemann.

BARON, RA & BYRNE, D. 2004. Social psychology. 10th ed. New York: Pearson Prentice Hall.

BOEIJE, H & WILLIS, G. 2013. The Cognitive Interviewing Reporting Framework (CIRF): towards the harmonization of cognitive testing reports. European journal of research methods for the behavioural and social sciences 9(3):87-95.

BOEING, H, BECHTHOLD, A, BUB, A, ELLINGER, S, HALLER, D, KROKE, A LESCHIK-BONNET, E, MÜLLER, MJ,

OBERRITTER, H, SCHULZE, M, STEHLE, P & WATZL, B. 2012. Critical review. Vegetables and fruit in the prevention of chronic diseases. European Journal of Nutrition 51(6):637–663.

BOSHOFF, C. 2003. Services marketing decision-making. In Du Plessis PJ & Rousseau, GG. 2003. Buyers behaviour: A multi-cultural approach. 3rd ed. Cape Town. Oxford University Press.

BOSMAN, MJC, VAN DER MERWE, D, ELLIS, S, JERLING, JC & BADHAM, J. 2014. South African adult metropolitan consumers" opinions and use of health information on food labels. British Food Journal, 116(1):30-43.

BRADSHAW, D, NORMAN, R, PIETERSE, D & LEVITT, S. for the South African Comparative Risk Assessment Collaborating. 2007. Estimating the burden of disease attributable to diabetes in South Africa in 2000. South African Medical Journal, 97: 700-706.

CANT, M, BRINK, A & BRIJBALL, S. 2006. Consumer behaviour. Pretoria. Juta.

CAPPELLO, AR, DOLCE, V, IACOPETTA, D, MARTELLO, M, FIORILLO, M, CURCIO, R, MUTO, L & DHANYALAYAM, D. 2016. Bergamot (Citrus bergamia Risso) flavonoids and their potential benefits in human hyperlipidemia and atherosclerosis: An overview. Mini Reviews in Medicinal Chemistry, 16(8):619-629.

CARTEA, ME, FRANCISCO, M, SOENGAS, P & VELASCO, P. 2011. Phenolic compounds in Brassica vegetables. Molecules, 16(1): 251-280.

CLARK, LA & WATSON, D. 1995. Constructing validity: Basic issues in objective scale development. Psychological Assessment, 7 (3):309-319.

DARMON, N, DARMON, M, MAILLOT, M & DREWNOWSKI, A. 2005. A nutrient density standard for vegetables and fruits: Nutrients per calorie and nutrients per unit cost. Journal of the American Dietetic Association, 105:1881-1887.

DOLMAN, RC, STONEHOUSE, W, VAN"T RIET, H, BADHAM, J & JERLING, JC. 2007. Beliefs of South Africans regarding food and cardiovascular health. Public Health Nutrition, 11:946–954.

FIELD, A. 2009. Discovering statistics using SPSS. 3rd ed. Sage, London.

FOOD STANDARDS AGENCY. 2007. Consumer attitudes to food standards: Wave 7 UK report. London. Food Standards Agency.

FULTON SL, MCKINLEY MC, YOUNG IS, CARDWELL CR & WOODSIDE JV. 2016. The effect of increasing fruit and vegetable consumption on overall diet: a systematic review and meta-analysis. Critical Reviews in Food Science and Nutrition, 56(5):802-816.

GRASSI, D, FERRI, C & DESIDERI, G. 2016. Brain protection and cognitive function: Cocoa flavonoids as nutraceuticals. Current Pharmaceutical Design, 22(2):145-151.

GRUNERT, KG & WILLS, JM. 2007. A review of European research on consumer response to nutrition information on food labels. Journal of Public Health, 15:385-399.

HALVORSEN, BL, HOLTE, K, MYHRSTAD, MCW, BARIKMO, I, HVATTUM, E, REMBERG, SF, WOLD, A, HAFFNER, K, BAUGERØD, H, ANDERSEN, LF, MOSKAUG, JØ, JACOBS, DR JR & BLOMHOFF, R. 2002. Systematic Screening of Total Antioxidants in Dietary Plants. The Journal of Nutrition, 132(3):461-471.

HERBERT, G, BUTLER, L, KENNEDY, O & LOBB, A. 2010. Young UK adults and the 5 A DAY campaign: Perceived benefits and barriers of eating more fruits and vegetables. International Journal of Consumer Studies, 34:657–664.

HORNBY, A.S. 2005. Oxford advanced learners dictionary. 7th ed. Oxford. Oxford University Press.

HOYER, WD & MACINNIS, DJ. 2008. Consumer behavior. 5th ed. Mason, OH. South-Western Cengage learning.

HUA, X, YU, L, YOU, R, YANG, Y, LIAO, J, CHEN D & YU, L. 2016. Association among dietary flavonoids, flavonoid subclasses and ovarian cancer risk: A meta-analysis. PLoS ONE, 11(3):1-15.

IFAVA (International Fruit and Vegetable Alliance). 2016. Programs and interventions. Available on line. http://www.ifava.org/programs-and-interventions/ Accessed 1 Augustus 2016.

JANSSON-BOYD, CV. 2010. Consumer psychology. New York. McGraw-Hill Open University Press.

JIANG, Y, WU, SH, SHU, XO, XIANG, YB, JI, BT, MILNE, GL, CAI, Q, ZHANG, X, GAO, YT, ZHENG, W & YANG G. 2014. Cruciferous vegetable intake is inversely correlated with circulating levels of proinflammatory markers in women. Journal of the Academy of Nutrition and Dietetics, 114(5): 700-8.e2.

KALT, W. 2005. Effects of production and processing factors on major fruit and vegetable antioxidants. Journal of Food Science, 70 (1):R11-R12.

KINGSBURY, M, DUPUIS, G, JACKA, F, ROY-GAGNON, MH, MCMARTIN, SE & COLMAN, I. 2016. Associations between fruit and vegetable consumption and depressive symptoms: Evidence from a national Canadian longitudinal survey. Journal of Epidemiology and Community Health, 70(2):155–161.

KLINE, P. 1999. The handbook of psychological testing. London. Routledge.

KONGSBAK, I, SKOV, LR, NIELSEN, BK, AHLMANN, FK, SCHALDEMOSE, H, ATKINSON, L, WICHMANN, M & PÉREZ-CUETO, FJA. 2016. Increasing fruit and vegetable intake among male university students in an ad libitum buffet setting: A choice architectural nudge intervention. Food Quality and Preference, 49:183–188.

KREMER-SADLIK, T, MORGENSTERN, A, PETERS, C, BEAUPOIL, P, CAËT, S, DEBRAS, C & LE MENÉ, M. 2015. Eating fruits and vegetables. An ethnographic study of American and French family dinners. Appetite, 89:84–92.

LACHANCE, MJ, LEGAULT, F & BUJOLD, N. 2000. Family structure, parent-child communication, and adolescent participation in family consumer tasks and decisions. Family and Consumer Sciences Research Journal, 29 (2):125-152.

LIN, B & YEN, ST. 2008. Consumer knowledge, food label use and grain consumption in the US. Applied Economics, 40:437-448.

MACHHA, A & SCHECHTER, AN. 2012. Inorganic nitrate: A major player in the cardiovascular health benefits of vegetables? Nutrition Reviews, 70(6):367-372.

MALHOTRA, NK & BIRKS, DF. 2007. Marketing research: An applied approach. 3rd ed. Essex: Prentice Hall.

MAILLOT, M, DARMON, DARMON, M, LAFAY, L & DREWNOWSKI, A. 2007. Nutrient-dense food groups have high energy costs: An econometric approach to nutrient profiling. The Journal of Nutrition, 1371815-1820.

MCHIZA, ZJ, STEYN, NP, HILL, J, KRUGER, A, SCHONFELDT, H, NEL J & WENTZEL-VILJOEN, E. 2015. A Review of Dietary Surveys in the Adult South African Population from 2000 to 2015. Nutrients, 7(9):8227-8250.

MSEMBURI, W, PILLAY-VAN WYK, V, DORRINGTON, RE, NEETHLING, I, NANNAN, N, GROENEWALD, P, LAUBSCHER, R, JOUBERT, J, MATZOPOULOS, R, NICOL, E, NOJILANA, B, PRINSLOO, M, SITHOLE, N, SOMDYALA, N & BRADSHAW, D. 2014. Second natonal burden of disease study for South Africa: Cause-of-death profile for South Africa, 1997–2010. Cape Town. Medical Research Council.

NAUDE, C. 2013. Would an increase in vegetable and fruit intake help to reduce the burden of nutrition-related disease in South Africa? An umbrella review of the evidence. South African Journal of Clinical Nutrition, 26 (3):104-114.

NOJILANA, B, NORMAN, R, DHANSAY, MA, LABADARIOS, D, VAN STUIJVENBERG, ME & BRADSHAW, D. for the South African Comparative Risk Assessment Collaborating 2007. Estimating the burden of disease attributable to iron deficiency anaemia in South Africa in 2000. South African Medical Journal, 97:741-746.

NORMAN, R, BRADSHAW, D, SCHNEIDER, M, JOUBERT, J, GROENEWALD, P, LEWIN, S, STEYN, K, VOS, T, LAUBSCHER, R, NANNAN, N, JOJILANA, B & PIETERSE, D. 2007a. A comparative risk assessment for South Africa in 2000: Towards promoting health and preventing disease. South African Medical Journal, 97:637-641.

NORMAN, R, D. BRADSHAW, D, STEYN, K & GAZIANO, T. South African Comparative Risk Assessment Collaborating (2007b) Estimating the burden of disease attributable to high cholesterol in South Africa in 2000. South African Medical Journal, 97:708-715.

NORMAN, R., GAZIANO, T, STEYN, K & BRADSHAW, D. South African Comparative Risk Assessment Collaborating (2007c) Estimating the burden of disease attributable to high blood pressure in South Africa in 2000. South African Medical Journal, 97:692-698

PATEL, S, MATHAN, JJ, VAGHEFI, E & BRAAKHUIS AJ. 2015. The effect of flavonoids on visual function in patients with glaucoma or ocular hypertension: A systematic review and meta-analysis. Graefe's Archive for Clinical and Experimental Ophthalmology, 253(11): 1841-1850.

PE´NEAU, S, LINKE, A, ESCHER, F, & NUESSLI, J. 2009. Freshness of fruits and vegetables: Consumer language and perception. British Food Journal, 111(3): 243-256.

POLIDORI, MC, CARRILLO, JC, VERDE, PE, SIES, H, SIEGRIST, J & STAHL, W. 2009. Plasma micronutrient status is improved after a 3-month dietary intervention with 5 daily portions of fruits and vegetables: implications for optimal antioxidant levels. Nutrition Journal, 8:10.

REED, SK. 2000. Cognition. 5th ed. Belmont, CA: Wadsworth.

ROUSSEAU, GG. 2007a. Buyer expectations and perceptions. In Du Plessis PJ & Rousseau, GG. 2007. Buyers behaviour: Understanding consumer psychology and marketing. 4th ed. Cape Town. Oxford University Press.

ROUSSEAU, GG. 2007b. Reference groups and family decision making. In Du Plessis PJ & Rousseau, GG. 2007. Buyers behaviour: Understanding consumer psychology and

marketing. 4th ed. Cape Town. Oxford University Press.
SAARF (South African Advertising Research Foundation) 2004. All media and products survey (AMPS) 2003b, (CD-ROM). Bryanston: SAARF.
SCHIFFMAN, LG. & KANUK, LL. 2010. Consumer behavior. Upper Saddle River. NJ. Prentice Hall.
SCHNEIDER, M, NORMAN, R, STEYN, N & BRADSHAW, D. for the South African Comparative Risk Assessment Collaboration. 2007. Estimating the burden of disease attributable to low fruit and vegetable intake in South Africa in 2000. South African Medical Journal, 97:717-723.
SHISANA, O, LABADARIOS, D, REHLE, T, SIMBAYI, L, ZUMA, K., DHANSAY, A, REDDY, P, PARKER, W, HOOSAIN, E, NAIDOO, P, HONGORO, C, MCHIZA, Z, STEYN, N.P, DWANE, N, MAKOAE, M, MALULEKE, T, RAMLAGAN, S, ZUNGU, N, EVANS, MG, JACOBS, L, FABER, M & SANHANES-1 Team. 2014. South African National Health and Nutrition Examination Survey. Cape Town. SANHANES-1.
SOLOMON, RM. 2011. Consumer behavior. Buying, having and being. 9th ed. Upper Saddle River, NJ. Pearson.
SOMERVILLE, VS, BRAAKHUIS, AJ & HOPKINS, WG. 2016. Effect of flavonoids on upper respiratory tract infections and immune function: A systematic review and meta-analysis. Advances in Nutrition, 7(3):488-497.
Statistics South Africa. 2014. Poverty trends in South Africa. An examination of absolute poverty between 2006 and 2011. Pretoria. Statistics South Africa.
Statistics South Africa. 2016. Time series CPI data from 2008. Available on line. http:// www.statssa.gov.za/?
page_id=1854&PPN=P0141. Accessed 17 Oct. 2016.
STEYN, NP & TEMPLE, NJ. 2012. Evidence to support a food-based dietary guideline on sugar consumption in South Africa. BMC Public Health, 12:502.
VASANTHI, HR, MUKHERJEE, S & DAS, DK. 2009. Potential health benefits of broccoli - a chemico-biological overview. Mini Reviews in Medicinal Chemistry, 9(6):749-759.
VEZZA, T, RODRÍGUEZ-NOGALES, A, ALGIERI, F, UTRILLA, MP, RODRIGUEZ-CABEZAS, ME & GALVEZ, L. 2016. Flavonoids in inflammatory bowel disease: A review. Nutrients, 8(4):211-222.
VORSTER, HH, BADHAM, JM & VENTER, CS. 2013. An introduction to the revised food-based dietary guidelines for South Africa. South African Journal of Clinical Nutrition, 26(3): 5-13.
VORSTER, HH, VENTER, CS, WISSING, MP & MARGETTS, BM. 2005. The nutrition and health transition in the North West Province of South Africa: A review of the THUSA (Transition and Health during Urbanisation of South Africans) study. Public Health Nutrition, 8 (5):480-490.
WAGNER, AE, TERSCHLUESEN, AM & RIMBACH, G. 2013. Health promoting effects of brassica-derived phytochemicals: from chemopreventive and anti-inflammatory activities to epigenetic regulation. Oxidative Medicine and Cellular Longevity, 2013:964539-964539.
WANG, X, OUYANG, Y, LIU, J, N, ZHU, M, ZHAO, G, BAO, W & HU, FB. 2014. Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. British Medical Journal, 349:g4490-g4490.
WELMAN, C, KRUGER, F & MITCHELL, B. 2005. Research methodology. 3rd ed. Cape Town. Oxford University Press Southern Africa.
WHITNEY, E & ROLFES, SR. 2008. Understanding Nutrition. 11th ed. Belmont. Thomson.
WHO (WORLD HEALTH ORGANIZATION). 2006. European charter on counteracting obesity. In llWHO European Ministerial conference on counteracting obesity, diet and physical activity for health. Istanbul, Turkey, 5-17 November 2006, Available on line. URL: www.euro.who.int/__data/assets/
pdf_file/0009/87462/E89567.pdf Accessed 1 August 2016.
WRIGHT, R. 2006. Consumer behaviour. London. Thomson.