BELIEFS OF SOUTH AFRICANS REGARDING FOOD AND CARDIOVASCULAR HEALTH

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AFRIKAANSE TITEL

Oortuigings van Suid-Afrikaners aangaande voedsel en kardiovaskulêre gesondheid.

OPSOMMING

Motivering

Kardiovaskulêre siekte (KVS) is een van die belangrikste oorsake van mortaliteit en morbiditeit in Suid-Afrika. Die hoof risiko faktore kom voor in sowel ontwikkelde en ontwikkelende lande, onder alle sosio-ekonomiese klasse, en is ewe belangrik vir publieke gesondheid in alle lande, ongeag die vlak van ontwikkeling. Hierdie is 'n aanduiding dat daar nog baie geleenthede is om die mortaliteit as gevolg van koronêre hartvatsiektes in ontwikkelde lande te verlaag, sowel as om die verhoging van die epidemie van koronêre hartvatsiektes in arm lande te voorkom. Hierdie studie beoog om die oortuigings van die Suid Afrikaanse volwasse populasie aangaande voedsel en kardiovaskulêre gesondheid te identifiseer en daardeur teikengroepe vir opvoedingsprogramme te identifiseer.

Doelwitte

Om die oortuigings van Suid Afrikaanse volwassenes aangaande die belangrikheid van die verband tussen voedsel en kardiovaskulêre gesondheid te ondersoek. Daar is veral gekonsentreer op die verskil tussen veskillende rasse, lewensstandaarde, ouderdoms- en geslagsgroepe. Daar is verder bepaal of hierdie populasie vir die Hart Stigting simbool op voedsel produkte kyk, asook hoe belangrik die verband tussen voedsel en hartvatsiekte geag word in vergelyking met ander algemene siektetoestande.

Metodes

Die studie het 'n ewekansige dwars-snit ontwerp gehad. Opgeleide veldwerkers het persoonlike onderhoude met die verbruikers in die taal van hulle keuse gevoer. Die verbruikers het bestaan uit twee duisend Suid-Afrikaanse individue (16 jaar en ouer), wat ewekansig gekies is uit die metroplitaanse gebiede van Suid Afrika. Die data is geweeg om verteenwoordigend te wees van die totale Suid Afrikaanse metropolitaanse verbruikers populasie, gebaseer op geslag, ouderdom en rasse groep verspreiding (n = 10 695 000). Die totale populasie was verteenwoordigend van albei geslagte (5 423 000 mans en 5 272 000 vrouens), en die hoof rasse groepe (2 615 000 blankes, 6 252 000 swartes, 1 255 000 bruin mense en 573 000 Indiërs) van verskillende ouderdomme en lewens standaards groepe (LSM). Die marknavorsingsmaatskappy, MARKINOR, was gekontrakteer om die data in te samel. Kwantitiewe data is statisties ontleed om die relevante beskrywende statistiek, oorkruis-tabellering en statistiese toetse te verkry.

Resultate

Die meederheid van die populasie het die verband tussen voedsel en kardiovaskulêre gesondheid as belangrik beskou, veral die hoër LSM groepe van die verskillende rasse groepe. Die verband tussen voedsel en gewigsverlies was die minste belangrik geag in vergelyking met die ander risiko faktore (cholesterol, bloeddruk, diabetes, gesonde bloedvate). Slegs 35%, waarvan die meederheid in die hoër LSM groepe was, het saamgestem dat hulle na die Hart Stigting se simbool soek. Terwyl 46% nie saamgestem het nie dat hulle na die Hart Stigting simbool soek. Die neiging om na die Hart Stigting se simbool te soek, was meer in die hoër LSM groep as in die laer LSM groep. In hierdie populasie is hartvatsiektes as belangrik beskou, tot dieselfde mate of belangriker as HIV/VIGS en kanker.

Gevolgtrekkings

Hierdie studie bewys dat die metropolitaanse Suid-Afrikaanse volwasse populasie bewus is van die belangrikheid van die effek van voedsel op koronêre hartvatsiektes. Voeding onderrig moet gemik word op altwee geslagte en alle ouderdomsgroepe van laer sosio-ekonomiese groepe van Suid-Afrika. Die redes waarom so 'n groot persentasie van die Suid Afrikaanse metropolitaanse volwasse populasie nie vir die Hart Stigting simbool kyk nie of besluiteloos is daaroor, moet ondersoek en aangespreek word. Voorkomingsprogramme wat 'n gesonde lewensstyl aanbeveel, en wat die risiko faktore verbonde aan koronêre hartvatsiektes aanspreek, behoort dus met 'n positiewe gesindheid aanvaar te word.

Sleutelterme: Oortuigings, kardiovaskulêre siekte, koronêre hartvatsiektes, voedsel, Hart Stigting simbool.

SUMMARY

Motivation

Cardiovascular disease (CVD) is one of the most important causes of mortality and morbidity in South Africa. The major risk factors are prevalent in both the developed and developing areas of the world, among all social classes, and are of similar public health significance in all countries regardless of their level of development. This indicates that much scope remains for further reducing coronary heart disease (CHD) death rates in developed countries and for preventing the emerging CHD epidemic in poorer nations. This study aims at identifying the beliefs of the South African adult population regarding food and cardiovascular health and to therefore identify target groups for education programs.

Objectives

To investigate the beliefs of South African adults towards the importance of the link between food and cardiovascular health, especially between the different races, living standards, age and gender groups. Also to determine whether this population looks for the Heart Foundation symbol on food products, as well as where the link between food and heart disease ranks in terms of importance compared to other highly prevalent diseases.

Method

The design of the study was a randomized cross-sectional study. Trained field workers administrated questionnaires by conducting face-to-face interviews with consumers in the language of their choice. Two thousand South African individuals (16 years and older) were randomly selected from metropolitan areas in South Africa. The data was weighted to be representative of the total South African metropolitan consumer population, based on gender, age and race distribution (n=10 695 000). The total population was representative of both genders (5 423 000 men and 5 272 000 women) and major race groups (2 615

000 whites, 6 252 000 blacks, 1 255 000 coloureds and 573 000 Indians), from different age and living standards groups. The market research group, MARKINOR, was contracted to collect the data. Quantitive data was statistically analysed in order to generate the relevant descriptive statistics, cross tabulations and statistical tests.

Results

The majority of the population found the link between food and cardiovascular risk related health issues to be important, especially the higher LSM groups within the different race groups. The link between food and weight loss was considered the least important compared to other cardiovascular risk factors (cholesterol, blood pressure, diabetes, healthy blood vessels). Only 35% of the study population agreed with the statement that they look for the Heart Foundation symbol, while 46% disagreed with the statement. There was a greater tendency for the higher LSM groups to look for the Heart Foundation symbol than the lower LSM groups. Heart disease was considered just as important and in some cases more important when compared with HIV/AIDS and cancer.

Conclusions

This study shows that the metropolitan South African adult population is aware of the importance of food on CVD. Nutritional education needs to be aimed at both genders and all ages of the lower socio-economic groups of South Africa.
The reasons why such a large percentage of the South African metropolitan adults do not look for the Heart Foundation symbol, or are undecided about it, needs to be investigated and addressed. Prevention programs promoting a healthy lifestyle, which would address the risk factors associated with CVD, should be received with a positive attitude.

Key words: Beliefs, cardiovascular disease, coronary heart disease, food, Heart Foundation symbol

LIST OF ABBREVIATIONS

ADSA	Association of Dietetics of South Africa
AHA	American Heart Association
BMI	Body Mass Index
BP	Blood pressure
BRISK	Risk factors for CHD in a black population of the Cape Peninsula
CAD	Coronary artery disease
CHD	Coronary heart disease
CORIS	Coronary risk factor intervention study
CRISIC	Coronary risk factors in a coloured population of the Cape Peninsula
CRP	C-reactive protein
CVD	Cardio vascular disease
DASH	Dietary Approaches to Stop Hypertension
DHA	Docosahexaenoic acid
DM	Diabetes mellitus
E	Energy
%E	Percentage of total energy intake
EPA	Eicosapentanoic acid
FBDG	Food based dietary guidelines
FH	Familial hypercholesterolaemia
GI	Glycaemic index
HDL-C	High density lipoprotein cholesterol
IBW	Ideal body weight
IDDM	Insulin-dependant diabetes mellitus
IHD	Ischaemic heart disease
IS	Insulin sensitivity
LASSA	Lipid and atherosclerosis society of Southern Africa
LDL-C	Low density lipoprotein cholesterol
Lp(a)	Lipoprotein a
LSM	Living standard measure
MI	Myocardial infarction
MTHFR	Methylene tetrahydrofolate reductase
MUFA	Monounsaturated fatty acids
NCEP	National Cholesterol Education Program
NHANES III	Third National Health & Nutrition Examination Survey
NIDDM	Non-insulin dependant diabetes mellitus
NSSA	Nutrition Society of South Africa
PUFA	Polyunsaturated fatty acids
SAARF	South African Advertising Research Foundation
SAMA	South African Medical Association

SD	Standard deviations
SFA	Saturated fatty acids
TC	Total cholesterol
TG	Triglycerides
tHcy	Total homocysteine
THUSA	Transition in health during urbanization of South Africans
WC	Waist circumference
WHO	World Health Organisation

CHAPTER 1

PREFACE

CHAPTER 1:

PREFACE

1. OBJECTIVES OF THE STUDY

The overall objective of this research project was to investigate the beliefs of South African consumers regarding food and cardiovascular health by using a randomised crossover study design.

The objectives were:

- To investigate the beliefs of South African adults living in metropolitan areas of the South Africa towards the importance of the link between food and cardiovascular health.
- To investigate the differences in beliefs of South African adults towards food and cardiovascular health between different race, living standards, age and gender groups
- To investigate the differences in beliefs in the living standards, gender and age groups within the different ethnic groups of South African adults towards food and cardiovascular health
- To compare the awareness of different South African ethnic groups regarding the Heart Foundation symbol.
- To determine where coronary heart disease ranks in terms of importance compared to other highly prevalent diseases in South Africa.

The variables used were race, gender, age group and living standard measure (LSM). These were subdivided into groups as depicted in Table 1.

Table 1: Variables and their subgroups used in this study

VARIABLE	SUBGROUPS								
GENDER	Men					Women			
LSM	2	3	4	5	6	7	8	9	10
RACE	White		Black		Coloured		Indian		
AGE	< 45 years				≥ 45 years				

2. STRUCTURE OF THIS DISSERTATION

This dissertation is presented in article format. Following this preface chapter is chapter 2, which consists of a literature review entitled "Risk factors for and prevention of cardiovascular disease in the South African population". This review looks at the prevalence of CHD and its risk factors in the various ethnic groups of South Africa, as well as the role of diet in the prevention and treatment thereof. Chapter 3 consists of a manuscript on the beliefs of South Africans regarding food and cardiovascular health (prepared for submission to the Public Health Nutrition journal). The demographic questionnaire used in this study is presented in Addendum B, and the questionnaire in Addendum C at the end of this dissertation. The relevant references for chapter 2 and 3 are provided at the end of each chapter according to the authors' instructions for the specific journal to which the manuscript is being submitted.

3. AUTHORS' CONTRIBUTIONS

The contribution of each of the researchers involved in this study is given in the following table:

NAME	ROLE IN THE STUDY
RC Dolman Hons. B.Sc Dietetics (Dietician)	Responsible for literature searches, processing of data, statistical analysis, interpretation of results and writing of manuscript.
Prof. W. Oosthuizen PhD (Nutritionist/Dietician)	Supervisor. Supervised the writing of the manuscript.
Hilda van 't Riet	Co-supervisor. Supervised the statistical analysis
Jane Badham (Dietician)	Responsible for the designing of questionnaires in co-operation with business partners and liaising with the market research company, MARKINOR.
Prof. JC Jerling PhD (Nutritionist)	Co-supervisor. Supervised the statistical analysis.

The following is a statement from the co-authors confirming their individual role in the study and giving their permission that the article may form part of this dissertation.

I declare that I have approved the above-mentioned article, that my role in the study, as indicated above, is representative of my actual contribution and that I hereby give my consent that it may be published as part of the M.Sc dissertation of Robin Dolman.

Prof. W Oosthuizen

H. van 't Riet

Ms. J. Badham

Prof. JC Jerling

CHAPTER 2

LITERATURE REVIEW

RISK FACTORS FOR AND PREVENTION OF CARDIOVASCULAR DISEASE IN THE SOUTH AFRICAN POPULATION

1. INTRODUCTION

Cardiovascular disease (CVD) is one of the most important causes of mortality and morbidity in South Africa (Seftal *et al.*, 1993). In this literature review, the major risk factors and their prevalence in the various South African population groups will be discussed. In a commentary, Paul Magnus states that the major risk factors are prevalent in both the developed and developing areas of the world, among all social classes, and are of similar public health significance in all countries regardless of their level of development. This statement indicates that much scope remains for further reducing coronary heart disease (CHD) death rates in developed countries and for preventing the emerging CHD epidemic in poorer nations (Magnus, 2001). Primary and secondary prevention of CHD will also be reviewed in this review, as well as current programs for prevention of CHD in South Africa.

2. PREVALENCE OF CORONARY HEART DISEASE IN SOUTH AFRICA

The World Health Organisation (WHO) attributed one-third of all global deaths (15.3 million) to CHD (Joint WHO/FAO 2003). In 1990 it was shown that cerebrovascular events and ischaemic heart disease (IHD) were the third and fifth leading causes of death in South Africa, accounting for seven percent and five percent of total deaths in that year (Bradshaw *et al.*, 1995). A more recent study, looking at the burden of disease in South Africa showed stroke and IHD as the eighth and ninth leading causes of premature death at 2.7% and 2.4%. The leading cause of premature death in South Africa was HIV/AIDS at 39% (Bradshaw *et al.*, 2003). It is generally accepted that the increase in morbidity and mortality from chronic diseases in developing populations is, in addition to changes in population age structure, a result of changes in lifestyle during industrialisation and economic development, including increased smoking habits, sedentary occupations, adoption of high fat, high animal protein, low fibre diets and increased exposure to stressful situations. All these factors are known to increase the risk of CVD and specifically IHD because they lead to obesity, hypertension, diabetes mellitus (DM) and hyperlipidaemia, the major IHD risk factors (Vorster *et al.*, 2003).

According to the 2001 census, the South African population consisted of over 44 million people, of whom 79% were blacks, 8.9% coloured, 2.5% Indian or Asian and 9.6% were white (Census, 2001). CHD is one of the most common causes of death in white and

Indian South Africans, and an important cause of mortality in urban coloureds. It is very rare among rural blacks, although the prevalence may have increased among urban blacks (Seftal *et al.*, 1993). In 1989, mortality rates for males were – whites 139, Indians 226, and coloureds 110 per 100 000 world population (Walker *et al.*, 1993). In the urban black South Africans of Soweto, the prevalence of IHD was 10 per 100 000 of the population (Mollentze *et al.*, 1995). Myocardial infarction (MI) has reached epidemic proportions in South African Indian descendants (Ranjith *et al.*, 2002).

Ethnic variation in CHD prevalence possibly relates to differences in exposure to both genetic and environmental risk factors. In South Africa, the inter-ethnic difference in prevalence and incidence of IHD is probably related to differences in patterns of dyslipidaemia. Early studies of the South African population groups showed the black population to have lower total cholesterol (TC) levels, and higher high density lipoprotein cholesterol (HDL-C) levels than the white population (Seftal *et al.*, 1995). However, numerous studies have shown that hypercholesterolaemia, obesity, hypertension, tobacco smoking and DM are rapidly increasing in black South Africans and that the emergence of IHD is already apparent (Gill *et al.*, 1996 & Mollentze *et al.*, 1995 & Oosthuizen *et al.*, 2002).

It is thus evident that CVD may be an important public health problem in South Africa. Several of the risk factors prevalent in the South African population will subsequently be discussed.

3. RISK FACTORS FOR CORONARY HEART DISEASE

Various studies have shown that the risk for CHD is determined by a number of risk factors and their interactions. These risk factors are summarised in Table 1. The major established risk factors include age, gender, smoking, blood pressure, cholesterol and DM (De Visser *et al.*, 2003). These risk factors explain about 75% of the occurrence of CHD within populations (Magnus, 2001).

Various tools have been and are being developed to assess or estimate absolute risk of CHD. The most common tools being used are the Framingham Risk Score and the Copenhagen Risk Score. When using a scoring system, it is important that clinicians

always remember that there are still variations occurring amongst the different populations as far as risk factor distribution, incidence and impact are concerned (De Visser *et al.*, 2003).

Table 1: Categories of risk factors for CHD (SAMA & LASSA, 2000 & Oosthuizen, 1999).

RISK FACTOR CATEGORY	RISK FACTORS
Biological	Risk increases with age and is highest in males and postmenopausal women.
Clinical	• Clinically manifest CHD or atherosclerotic vascular disease such as classic and other forms of angina pectoris, previous coronary artery surgery, MI, or peripheral and carotid vascular disease. • A family history of the above has to be assessed individually. • DM imparts an increased risk of CHD in both sexes, especially in women. • Hypertension increases risk with degree of BP elevation. • Obesity, especially abdominal.
Behavioural	• Cigarette smoking - stopping leads to a rapid decline in risk. • Atherogenic diet. • Lack of physical exercise. • Social and psychological factors. • Excess alcohol consumption.
Genetic or familial	FH and other major gene defects are clearly linked to a high family risk, whereas in other families the cause of the increased incidence of CHD is not readily ascertainable.
Physiological and metabolic	Lipid and lipoprotein: • Elevated total cholesterol • Elevated triglycerides • Elevated LDL-C • Hyperglycaemia (DM) • Low HDL-C

RISK FACTOR CATEGORY	RISK FACTORS
Physiological and metabolic cont.	• Elevated Apolipoprotein B • Decreased Apolipoprotein A • High plasma concentrations of lipoprotein (a) • Elevated chylomicron remnants Haemostatic: • Hyperfibrinogenaemia • Elevated factor VII coagulant activity • Low fibrinolytic activity • Elevated plasminogen activator inhibitor 1 Other: • Hyperhomocysteinaemia • Hyperinsulinaemia

CHD: Coronary heart disease; MI: Myocardial Infarction; DM: Diabetes Mellitus; BP: Blood pressure, FH: Familial hypercholesterolaemia; LDL-C: Low density lipoprotein cholesterol; HDL-C: High density lipoprotein cholesterol

Some of the risk factors will now be discussed further, with special reference to ethnic differences within the South African population.

3.1. DYSLIPIDAEMIA

Pathologists at the end of last century observed that in human atherosclerotic lesions, there were large amounts of cholesterol deposits. These pathologists fed rabbits with human food including cholesterol, and observed lesions somewhat similar to human atherosclerosis. This was the start of the diet-heart hypothesis (reviewed by Renaud & Lanzmann-Petithory, 2001).

High cholesterol concentrations are estimated to cause 18% of global cerebrovascular disease (mostly non-fatal events) and 56% of global IHD (WHO/FAO, 2003). Dyslipidaemia is defined as a clinically significant alteration in the circulating lipids and lipoproteins predisposing to CHD and related disorders. The most common, as well as

most important dyslipidaemia, is hypercholesterolaemia (SAMA & LASSA, 2000). Table 2 lists the normal values for a lipid profile.

Table 2: Desirable lipid profile (SAMA & LASSA, 2000 & Bersot *et al.*, 2003).

Total cholesterol:	≤ 5.0 mmol/l
Triglycerides:	≤ 1.5 mmol/l
LDL-C:	≤ 3.0 mmol/l
HDL-C:	≥ 1.2 mmol/l
LDL-C/HDL-C ratio:	< 3.0
TC/HDL-C ratio:	< 5.5

LDL: Low density lipoprotein cholesterol; HDL: High density lipoprotein cholesterol; TC: Total cholesterol

There is overwhelming evidence that an elevated low-density lipoprotein cholesterol (LDL-C) concentration in the plasma is atherogenic, whereas the HDL-C level is cardioprotective. According to the National Cholesterol Education Program (NCEP) guidelines, LDL-C concentration should be considered the primary therapeutic target, whereas HDL-C levels may be critical in the assessment of CHD risk (NCEP Expert panel 2001). Due to this the LDL-C/HDL-C is often calculated to estimate CHD risk. Results of some prospective studies have suggested that a LDL-C/HDL-C ratio combined with hypertriglyceridaemia is associated with the highest CHD risk. In the Quebec Cardiovascular study it was found that the total TC/HDL-C ratio was a useful and simple index of IHD risk in men (Lemieux *et al.*, 2001).

It is proposed that this is explained by the fact that it is a relevant cumulative marker of the cluster of metabolic abnormalities found in individuals with high triglyceride -low-HDL-C dyslipidaemia. This condition has been shown to be the consequence of abdominal obesity and insulin resistance and is commonly associated with an increased concentration of small, dense LDL particles. Because little variation is found in plasma LDL-C levels in overweight hyperinsulinaemic men compared with normolipidaemic individuals, it is proposed that calculation of the LDL-C/HDL-C ratio may underestimate IHD risk in some patients compared with the quality of estimation achieved with the simple use of the TC/HDL-C ratio (Lemieux *et al.*, 2001).

A recent report by NCEP has re-emphasised the importance of targeting LDL-C as the main indicator CVD risk. The report includes recommendations from recent clinical trials, which all confirm that therapeutic lifestyle changes remain an essential part in clinical management of dyslipidaemia, as well as the benefit of cholesterol lowering therapy in high risk patients with the goal of lowering LDL-C (Grundy *et al.*, 2004).

Studies have been done on the South African population to determine the tendencies in lipid levels in the various population groups. The mean cholesterol level in urban black South Africans in the Orange Free State was found to be 5.0 mmol/L (Mollentze *et al.*, 1995). In the risk factors for CHD in the black population of the Cape Peninsula (BRISK) study, subjects where found to have low TC, LDL-C and favourable HDL-C/TC ratios. These are all protective against CHD, which may partially explain the relatively low prevalence of CHD in this urban black population. There were, however, individuals who exceeded the recommended lipid cut-off levels for CHD risk. This combined with the fact that the population as a whole had a lipid profile showing signs of possible change towards that of a typical urban population, therefore indicated a transition from a rural towards an urban lipid profile (Oelofse *et al.*, 1996).

Wolmarans and Oosthuizen (2001) summarised the comparison of total fat intake and serum cholesterol levels from studies done in South Africa on the different population groups in Figure 1. The studies used were:

- BRISK study
- Study of Indian South Africans
- Coronary risk factors in the coloured population of the Cape Peninsula (CRISIC)
- Coronary Risk Factor Intervention Study (CORIS) of white South Africans

The studies showed that increased fat intake was associated with increased serum cholesterol levels.

In the South African Seven Schools study, evidence was provided that the groups of scholars at high risk for CHD also had a high prevalence and severity of known CHD risk factors. Namely, higher levels of TC, LDL-C, apolipoprotein B, apolipoprotein A-1, insulin and fibrinogen. Generally, all these levels were notably more unfavourable in Indians, whites and coloureds, than in blacks. The upper socio-economic groups of Indians tended to have a more adverse risk factor status (Chetty *et al.*, 1997).

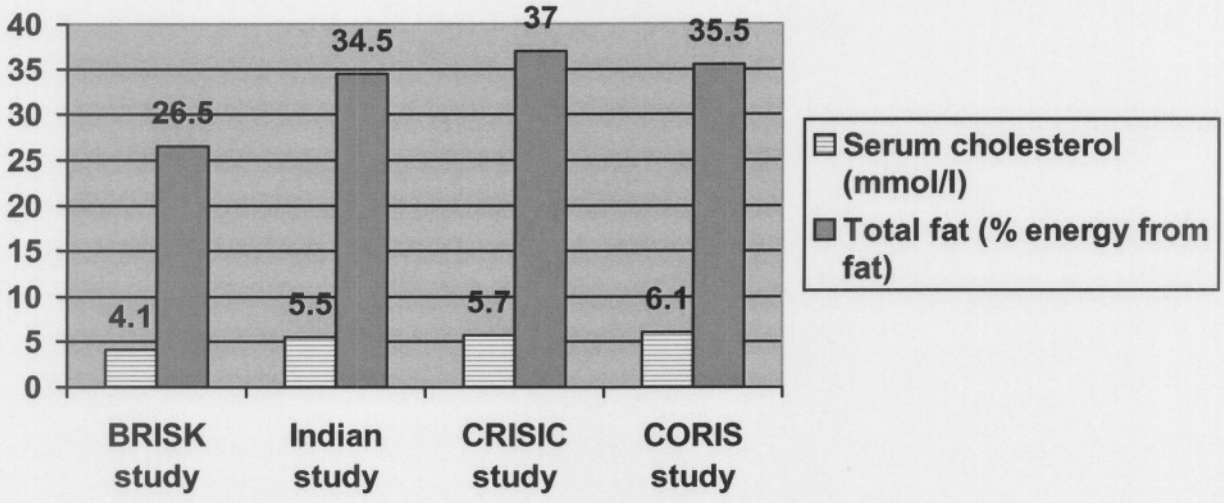

Figure 1: Mean fat intake and mean serum cholesterol levels of participants from four large epidemiological studies conducted in South Africa (Wolmarans & Oosthuizen, 2001).

A major observation in the Transition in Health during Urbanisation of South Africans (THUSA) study was that serum lipid levels increased with urbanisation in both black South African men and women in the Northwest province. The main factor responsible for these increases seemed to be increased body mass index (BMI), probably due to a decreased physical activity. The lipid levels in all strata of the population were, however, still within the normal recommended levels (Oosthuizen *et al.,* 2002).

The measurement of serum lipids and their associated apolipoproteins such as apolipoprotein B and A1, cannot identify all patients at risk for coronary artery disease (CAD). The majority of subjects who develop CAD do not have severe hyperlipidaemia. Approximately 50% of MI's occur in subjects with a TC of <6.5 mmol/L and 20% afflict those with desirable cholesterol levels of TC (<5.2mmol/L) (Castelli & Anderson 1986).

There is now accumulating evidence that many patients with CAD have postprandial abnormalities in lipid and glucose metabolism (Karpe, 1999). Patients with CAD tend to be insulin resistant and display delayed and higher peak plasma triglyceride levels after a fat load. Insulin resistance and postprandial lipemia may therefore be important risk factors for CAD (Joffe *et al.*, 1992).

3.2. OBESITY

Obesity is a well-established cause of DM, hypertension and lipid abnormalities (Manson *et al.*, 1992). It has long been recognized that BMI (in kg/m^2) is a predictor of mortality and morbidity that are due to numerous chronic diseases, including type two diabetes, CVD and stroke. It has also been established that abdominal obesity, assessed by waist circumference (WC), predicts obesity-related health risk and the weighted evidence indicates that WC coupled with BMI predicts health risk better than does BMI alone. In fact, Janssen *et al* (2004) discovered that WC and not BMI explains obesity-related health risk. Therefore, for a given WC value, overweight and obese persons and normal weight persons have comparable health risks. However, when WC is dichotomised as normal or high, BMI remains a significant predictor of health risk (Janssen *et al.*, 2004).

A BMI of greater than 19 kg/m^2 and less than 25 kg/m^2 is recommended for an adult (Hammond, 2000).

According to a WHO report, approximately 58% of DM globally, 21% of IHD and 42% of certain cancers were attributable to BMI above 21 kg/m^2 (WHO, 2002). In black South African women, obesity is an outstanding feature. The consequences of obesity and especially the metabolic consequences in South African blacks have not been adequately studied. A high prevalence of obesity particularly in black women has been shown to contribute to hypertension. A high degree of obesity may be the reason why HDL-C levels in black women are comparable to men. This is not the case in populations with less obesity in females (Steyn *et al.*, 1991). However, the association of obesity with CVD has been found mainly in a subgroup of obese persons, that is a subgroup with central or android obesity (Mollentze *et al.*, 1995; Oelofse *et al.*, 1996).

In a review of published data on mortality from and risk factors of CVD in South Africans, Vorster *et al* (2002) found that the prevalence of obesity in black women was higher than in other groups of women. While white men showed the highest prevalence among the male groups. According to the Health Systems Trust in 1998, the statistics of obesity in the South African population are summarised in Table 3. The definition of obesity for this survey was BMI equal to or more than 30 kg/m^2. Android obesity was defined as ratio of waist to hip circumference ratio as greater than 1.0 (for men) and

greater than 0.85 (for women) (Health Systems Trust, 1998). The prevalence of obesity was much higher in South African women than men, with black women having the highest prevalence.

In black African culture, obesity in women is not regarded as unacceptable as in the white African woman. Accordingly, there is only limited incentive in obese black African women to reduce their weight, except among the urban black women who are better-educated and live in higher socio-economic circumstances (Walker *et al.*, 2001). Mvo *et al* (1999) explored these perceptions and found that although black women expressed the desire to loose some excess weight for practical reasons, there was no negative social pressure to motivate this.

Table 3: Summary of prevalence (%) of various CHD risk factors in South Africa (Health Systems Trust, 1998)

RISK FACTOR	BLACK	COLOURED	INDIAN	WHITE
SMOKING (2000)[a]	22.7	48.7	28.2	36.6
OBESITY – MEN	7.8	9.2	9.0	20.1
OBESITY – WOMEN	31.2	28.5	21.3	25.5
ANDROID OBESITY – MEN	6.5	5.2	11.2	14.7
ANDROID OBESITY – WOMEN	33.3	36.2	23.2	20.4
HYPERTENSION – MEN	10.3	12.4	9.9	15.2
HYPERTENSION – WOMEN	13.0	17.1	9.3	12.0

[a]Van Walbeek, 2002.

The estimated risk reduction of MI associated with maintaining an ideal body weight (IBW), as compared with being obese (≥ 20 % above desirable body weight), is 35 to 55% (Manson *et al.*, 1992).

3.3. DIABETES

The incidence of CHD in patients with DM is approximately three times that seen in non-diabetic patients of equivalent age (Turner *et al.*, 1998). Patients with type two DM but no overt evidence of CVD have the same risk of MI as a non-diabetic patient who has already had a MI (Haffner *et al.*, 1998).

Diabetes accelerates atherogenesis and increases the risk of MI, particularly in women. In population based studies, the age adjusted mortality rates for CHD were two to three

times higher among diabetic men, but three to seven times higher among diabetic women than among people without diabetes. The association between non-insulin dependant diabetes mellitus (NIDDM) and CHD is complex. Coronary risk factors such as hypertension and dyslipidaemia, as well as clinically manifested CVD, are present in excess at the time of diagnosis of NIDDM. Furthermore, an atherogenic risk profile and an increased frequency of coronary disease are also present in people with "borderline" diabetes, as well as those with a family history of diabetes. These interrelations suggest the presence of pre-existing genetic or metabolic factors (or both) in the causal pathway common to all those conditions. Hyperinsulinaemia has been suggested as one candidate (summarised by Manson *et al.*, 1992).

In South Africa, there is no accurate data of the frequency or incidence of insulin-dependent DM (IDDM). In the South African Indian population, the prevalence of NIDDM ranges from 11-13%; in the white population, it is estimated at 3.7%; the coloured population approximately 8.7%. In the black population, it is estimated to be between five and eight percent (Levitt & Mollentze, 1995).

3.4. FAMILY HISTORY & GENETICS

The critical role of genes is in the coding for structural proteins and enzymes which enable the cell, organ or organism to maintain homeostasis in the face of the environmental challenges experienced. Within a population, genetic variation will mean that individuals will have different ability to maintain homeostasis when faced with a specific environmental challenge. The clinical features of any disorder with a late stage onset can therefore be thought of as being caused by the failure of the individual to maintain homeostasis, and this is particularly true for the disorder of CAD. The current epidemic of CAD being seen in Westernised societies is mainly due to an inability, in some individuals, to maintain optimum levels of these risk factor components, in the light of the environment experienced as a result of 'affluent' life-style changes. These changes include dietary fat intake and the proportion of individuals smoking cigarettes (summarised by Humphries *et al.*, 2001).

As mentioned earlier, in the South African Indian population, a strong familial link has been observed not only for a history of CHD or MI, but also for hypertension and DM,

supporting a genetic basis for the development of premature CHD in this population (Ranjith *et al.*, 2002). When looking at young South African Indians with acute MI's, the most common phenotypic risk factors identified were smoking, dyslipidaemia and obesity (Ranjith *et al.*, 2003).

Familial hypercholesterolaemia (FH) is an autosomal dominant disease presenting with elevated LDL-C levels, planar and tendinous xanthomas, and premature CAD (Henderson *et al.*, 1989). The genetic abnormality is in the LDL receptor, resulting in the high plasma LDL-C concentrations. Heterozygous FH is especially prevalent in the Afrikaans speaking South African population with a prevalence of one in 72 (Steyn *et al.*, 1996), as well as in other South African groups including Asians, Jews and Lebanese. It is also known to occur in the coloured and black populations (SAMA & LASSA, 2000).

3.5. HYPERTENSION

Hypertension is defined as a systolic blood pressure of ≥140mmHg and/or diastolic blood pressure of ≥90mmHg. Hypertension is categorised by either systolic or diastolic gradation into one of three stages (mild, moderate and severe) (WHO, 1999). High-normal blood pressure (systolic pressure of 130-139 mmHg, diastolic pressure of 85 to 89 mmHg, or both) is associated with an increased risk of CVD (Vasan, *et al.*, 2001).

Hypertension is a frequent, chronic, age-related disorder, which often entails debilitating cardiovascular and renal complications. The cornerstones of blood pressure regulation are sodium and fluid balance as well as vasomotor tone. Both mechanisms are affected by numerous genetic and environmental factors, and are controlled by hormonal, nervous system, and intracellular feedback loops. The interaction between these factors change with age, and is the cause of the heterogeneous pattern of the haemodynamic alterations that sustain high blood pressure throughout life (Staessen *et al.*, 2003).

Blood pressure is usually noted in combination with other cardiovascular risk factors. Systolic blood pressure increases with age until about 80 years of age. By contrast, diastolic blood pressure rises only slightly until 50 years of age, after which it either becomes constant or even decreases slightly. In the Framingham Heart Study,

increasing age entailed a shift from diastolic pressure to systolic pressure and then to pulse pressure as the main predictor of cardiovascular risk. Below the age of 50 years, diastolic pressure was the strongest predictor of cardiovascular risk (Franklin *et al.*, 2001). The association between overweight and hypertension is well established. The role of body fat distribution also plays a role, as central body fat distribution is associated with increased blood pressure (Siani *et al.*, 2002).

Worldwide, high blood pressure is estimated to cause 7.1 million deaths, about 13% of the total. Since most blood pressure related deaths or non-fatal events occur in middle age or the elderly, the loss of life years comprises a smaller proportion of the global total, but is nonetheless substantial (WHO, 2003).

In South Africa, hypertension is clinically the single most prevalent CVD risk factor in rural as well urban adult black South Africans. The incidence rate for stroke in an urban black population was reported to be 1.01 per 1000 per year with a peak of 10.31 per 1000 per annum for men 65 – 74 years of age. In the same study hypertension was present in 69.8% of stroke patients (Mollentze *et al.*, 1995). Morar *et al.* (1998) found that young black people had higher blood pressure readings than young Indian participants in the absence of metabolic abnormalities and also had greater cardiac involvement. Borderline hypertension is not innocuous. Metabolic risk factors for CHD in Indian people are already apparent at an early age (Morar *et al.,* 1998). Vorster (2002) compiled a summary of prevalence of CVD risk factors in South Africans and found that coloured and black women and white men had the highest prevalence of hypertension. Table 3 gives a summary of the prevalence of hypertension in South Africa in 1998.

The effective treatment of hypertension reduces the risk of CHD by about 16% and cuts stroke incidence by more than double this. Benefits are even greater in people over 60 years of age (Staessen *et al.*, 2003). The estimated risk reduction of MI is two to three percent for each decline of one mm Hg in the diastolic blood pressure (Manson *et al.*, 1992).

3.6. HYPERHOMOCYSTEINEMIA

Homocysteine is a nonessential sulphur-containing amino acid produced during the catabolism of an essential amino acid methionine. Homocysteine can be metabolised via two major pathways. When methionine is in excess, homocysteine is directed to the transsulphuration pathway, where it is irreversibly sulfoconjugated to serine by cystathionine β-synthase in a process requiring vitamin B6 as a cofactor. However, under conditions of negative methionine balance, homocysteine is primarily metabolised through a methionine-conserving remethylation pathway. In most tissues, homocysteine is remethylated in a process that requires methionine synthase, vitamin B12 as a cofactor, and methyltetrahydrofolate as a cosubstrate. This pathway requires an adequate supply of folic acid and the enzyme methylene tetrahydrofolate reductase (MTHFR). Genetic and acquired abnormalities in the function of these enzymes or deficiencies in folic acid, vitamin B6 or vitamin B12 cofactors can lead to elevated homocysteine levels (Eikelboom *et al.*, 1999).

Epidemiological studies have shown an association between elevated total homocysteine concentration in the blood and cardiovascular risk. A meta-analysis of observational studies showed that lowering homocysteine concentrations by three μmol/l from current levels (achievable by increasing folic acid intake) is associated with reducing the risk of IHD by 16%, deep vein thrombosis by 25% and stroke by 24% (Wald *et al.*, 2002).

Several possible mechanisms that may underlie the positive association between homocysteine and risk for CHD include oxidation of LDL-C, toxic effects on endothelial cells, impaired platelet activity, and increased smooth muscle proliferation (Eikelboom *et al.*, 1999).

In the third National Health and Nutrition Examination Survey (NHANES III), done on the American population, it was found that gender, age, race-ethnicity, serum creatinine, systolic blood pressure, BMI, hard-liquor consumption, smoking, supplement use, serum folate, red blood cell folate and serum vitamin B12 were significant predictors of total homocysteine concentration (Ganji & Kafai, 2003). This complies with other

epidemiological studies that showed moderately elevated plasma total homocysteine levels are highly prevalent in the general population (Eikelboom *et al.*, 1999).

However, studies have shown that black South Africans generally have lower circulating plasma homocysteine concentrations and more effective homocysteine metabolism after oral methionine loading, which may partially explain their relative resistance against CHD despite a high prevalence of obesity, hypertension and smoking (Ubbink *et al.*, 1995).

The total homocysteine concentrations in white South Africans may be more characteristic of the CHD-prone populations. When compared with black South Africans, young adult white males showed methionine intolerance expressed as high plasma homocysteine concentrations after an oral methionine load test (Ubbink *et al.*, 1996).

3.7. SMOKING

Cigarette smoking is directly responsible for 21 % of all mortality from CHD. Most of the conclusive evidence supporting smoking's causal role in heart disease derives from observational case-control studies, which have shown that smoking more than doubles the incidence of coronary disease and increases mortality from coronary disease by 70%. Smoking also acts synergistically with other risk factors. For example, users of oral contraceptives have about 4 times the risk of infarction than non-users, but women who smoke heavily and use oral contraceptives have 39 times the risk of women who do neither. The increased risks associated with diabetes, hyperlipoproteinaemia and hypertension are also more additive. The relative risk of infarction in ex-smokers decreases rapidly, as has been well demonstrated in both case-control and cohort studies (summarised by Manson *et al.*, 1992).

In the Oslo Study Group study in 1981, it was found that in healthy middle-aged men at high risk of CHD, advice given to change dietary habits and stop smoking significantly reduced the incidence of the first event of MI and sudden death (Hjermann *et al.*, 1981). The number of years a person has smoked cigarettes ("smoking-years") has

been shown to be the clearest indicator of IHD risk due to cigarettes (Cook *et al.*, 1986).

The mechanism by which smoking promotes atherosclerotic disease may include inflammation and hyperhomocysteinemia (Bazzano *et al.*, 2003).

A year after stopping smoking, the excess risk of heart disease is halved. Beyond 10 years the risk approaches that of a non-smoker (Cook *et al.*, 1986).

In Table 3, it can be seen that the prevalence of smoking among South Africans in the year 2000 was the highest in the coloured population and the lowest in the black population.

3.8. OTHER

Epidemiological studies have shown that C-reactive protein (CRP) is a risk factor for CHD. A nested case-control epidemiological study (the Rotterdam study) determined if routine measurement of CRP has a role in the prediction of future coronary disease in everyday practice. It was found that measurement of CRP in elderly people had no additional value in coronary disease risk prediction when traditional risk factors were known (Van der Meer *et al.*, 2003).

Arterial elasticity (stiffness of the large arteries) has also been identified as a risk factor. Atherosclerosis and several major risk factors for CHD can influence the elasticity of the large arteries. The clinical significance of this reduced elasticity in the aorta includes increased risk of systolic hypertension, increased left ventricular workload leading to hypertrophy, and possibly underperfusion of the myocardium through diminished diastolic coronary flow. Arterial elasticity is said to decrease in proportion to the number of other cardiovascular risk factors present. Increasing age and hypertension consistently impair arterial elasticity (Ashton *et al.*, 2000).

Haemostasis means the ability to prevent or arrest the blood flow from an injured vessel. The efficiency of this process depends on a complex interaction between the vessel wall, platelet aggregation, the coagulation system and the fibrinolytic system.

Failure of any one of these four components can result in either haemorrhagic or thrombotic tendency (summarised by Oosthuizen, 1999).

Most ischaemic cardiovascular events are triggered by thrombosis due to a disrupted plaque. Many of the factors that play a role in the haemostatic process have been implicated in epidemiological studies to be risk factors for CHD. In a meta-analysis the following conclusions were made regarding these various factors: elevated fibrinogen, CRP and D-dimer levels, as well as increased plasma viscosity emerged as strong predictors for total primary events. For fatal primary cardiovascular events, the best markers were fibrinopeptide A, increased ATIII, platelet counts and fibrinogen. Factor VIIc was a better predictor of cardiovascular mortality than of total events (Vorster *et al.*, 2000).

For secondary events, tPA antigen emerged as a strong predictor of stroke, and platelet aggregation, plasma viscosity, decreased protein C, D-dimer, platelet volume, fibrinogen, tPA antigen and von Willebrand factor in this order, a predictor of total secondary events. For primary plus secondary cardiovascular events, fibrinogen, D-dimer, platelet aggregation and plasma viscosity were good markers. Albumin was the strongest predictor of total, all-cause mortality (Vorster *et al.*, 2000). Fibrinogen levels were found to be elevated in a study of "apparently healthy" black South Africans in the North West province. This was associated with significant increases in serum lipids (James *et al.*, 2000).

Physical inactivity increases the risk by a factor of two; there is evidence that physical activity is useful in preventing CHD. The estimated risk reduction for MI with the maintenance of an active, as compared with a sedentary, lifestyle is 35-55% (Manson *et al.*, 1992).

3.9. SUMMARY

In summary, important modifiable risk factors for CHD that need to be addressed in the South African population for the prevention of CVD include smoking, dyslipidaemia, physical inactivity, obesity, DM and hypertension. Addressing these risk factors may

have important public health implications. Possible guidelines for the prevention of CVD in the South African population are summarized in Table 4.

Other emerging risk factors such as increased homocysteine, fibrinogen and CRP concentrations may also be important but it is probably still too early to make recommendations on a national level regarding the prevention and treatment of these risk factors.

Table 4: Summary of possible guidelines for prevention of CHD

Cessation of smoking
Achieve and maintain a desirable lipid profile
Achieve and maintain a normal blood pressure
Maintenance of a physical active lifestyle
Achieve and maintain a healthy body weight
Prevention of DM by maintenance of normal glucose tolerance and insulin concentration
Achieve and maintain a normal homocysteine level

4. PREVENTION OF CORONARY HEART DISEASE – ROLE OF DIET

To prevent CHD effectively, two strategies are necessary. The first is the patient-based strategy, where individuals who are at high risk are identified and treated. The second is the population-based strategy, which involves the facilitation of life-style changes, such as diet, to lower blood cholesterol levels and other risk factors and therefore reduce the prevalence of CHD. Primary prevention involves clinical management, which includes diet, exercise and other life-style changes that will lower the risk of CHD in patients who have no evidence of CHD, but who do have risk factors. Secondary prevention is the treatment of risk factors in patients who already have CHD (Krummel, 2000).

The prevention and treatment of CHD is often focused on the management of LDL-C. The reason for this is probably because increased LDL-C is the most extensively

examined risk factor for which a cause and effect relationship has been reported. A meta-analysis of primary prevention trials showed that treatment with a statin that reduced serum TC by 20%, LDL-C by 28% and triglycerides by 13%, and increased HDL-C by 5% reduced the risk of developing CHD by 34%. The benefits were seen for both men and women up to the age of 75 years (data beyond this age not available) (La Rosa *et al.*, 1999). It has also been shown that a one percent reduction in serum TC level yielded a two to three percent reduction in the risk of coronary disease (Manson *et al.*, 1992). The benefits of decreasing LDL-C on morbidity, especially in the older age group, is often under appreciated. Prevention of morbid events results in lower prevalence of congestive heart failure, angina, significant arrythmia and debilitating strokes. This is likely to affect quality of life and cost of care in the older patients (La Rosa *et al.*, 1999). For most of the other risk factors; cause and effect relationships have not been determined. One can, however, not ignore these other risk factors, since strong evidence of their relationship with CVD exists, as discussed earlier. CVD is a multifactorial disease and the risk increases markedly with the addition of each risk factor. It is, therefore, important that primary prevention and treatment of CVD involves the assessment and management of these risk factors (SAMA & LASSA, 2000).

Managing the diet is the key to treating all common lipid disorders. Studies have shown that intensive dietary intervention can decrease serum TC and LDL-C by approximately 30% (Anderson *et al.*, 1980). More recent trials have demonstrated that intensive dietary therapy may be just as effective in reducing cholesterol levels as starting dosages of statin drugs (Jenkins *et al.*, 2003). A study comparing benefits of diet and exercise in treatment of dyslipidaemia showed that intensive lifestyle interventions might be effective at improving blood lipids, other risk factors and quality of life (Lalonde *et al.*, 2002).

It has been argued that it is easier to prescribe drugs than to change dietary habits of patients, a task often considered being too difficult, and unfortunately, after some attempts, many physicians do give up. The Lyon Diet Heart Study showed that, several years after randomisation, most experimental patients were still closely following the Mediterranean diet recommended to them. This suggests, in contrast to the current opinion, that the adoption of and compliance with new dietary habits is not so difficult, provided that the instruction to patients and surveillance are properly (professionally) conducted. The new dietary habits must of course be financially affordable and

tolerable and practical for patients who often have to adapt to a difficult working environment and the stressful urban way of life (de Logeril *et al.*, 1999).

Information on existing food consumption patterns, their change over time, and associated sociodemographic and lifestyle factors can be useful for public health efforts to improve diet. Interventions may become more effective if they are targeted at specific sociodemographic subgroups. The study by van Dam *et al.* (2003) on the Dutch population found that unfavourable food consumption patterns were associated with low educational level, less physical activity and cigarette smoking, which they found to be consistent with results from other studies (van Dam *et al.*, 2003).

Early results from the Women's Health Initiative study showed that women in the dietary change intervention group made substantial changes in food choices, to lower fat options. These results can facilitate future low-fat interventions, and also offer clinical applications, by identifying foods that may be refractory to change (Patterson *et al.*, 2003). This shows that intervention, educational programs can be successful.

In 1995, de Lorgeril *et al.* (as summarised by Renaud & Lanzmann-Petithory) showed that a Mediterranean-type diet resulted in decreased non-fatal MI and cardiac death by more than 70% compared to controls consuming a prudent diet (Renaud & Lanzmann-Petithory, 2001).

The results from the Dietary Approaches to Stop Hypertension (DASH) trial and the Lyon Diet Heart study indicate that interventions to change dietary patterns can be highly effective in reducing CVD risk. In the DASH trial, a diet rich in fruit and vegetables, and low-fat diary products with a lower saturated fat content resulted in a systolic blood pressure that was 5.5 mmHg lower than before. Such a diet offers an additional approach to prevention as well treatment of hypertension (Appel *et al.*, 1997).

In the THUSA trial it was found that during urbanisation the diets of the black South Africans in the North West Province changed from a very low fat (approximately 23% energy as fat) traditional diet to a more western type of diet. However, the urban dwellers and professionals still followed an adequate diet with regard to higher intakes of fibre and micronutrients. This diet was relatively prudent and provided less than 30% of its energy as fat. If this trend of increasing fat consumption continues to increase, the

diet patterns of the urban South African black population will possibly no longer be prudent (Oosthuizen *et al.*, 2002).

4.1. ROLE OF SPECIFIC NUTRIENTS IN DIETARY PREVENTION AND TREATMENT OF CHD RISK FACTORS

For over 40 years, numerous epidemiological studies, experimental studies and clinical trials have been and are still being conducted, to show that numerous dietary factors affect risk factors for CHD, atherogenesis and CHD (Krummel, 2000).

Table 5 gives a summary of the effects certain foods and nutrients have on risk factors for CHD.

4.2. DIETARY GUIDELINES

4.2.1. HISTORY OF RECOMMENDATIONS FOR PREVENTION OF CORONARY HEART DISEASE

Several papers published in the early 1950's stimulated real interest in dietary fat and its effects, particularly with regard to its role in CVD. The first dietary guidelines were published in 1957. Table 6 and 7 gives a summary of the history of the American Heart Association (AHA) guidelines aimed at primary prevention of CHD. From this summary, it is evident how the scientific evidence for dietary factors that affect CHD has evolved over the decades.

Table 5: Summary of some dietary factors that affect risk factors for CHD (Adapted from Wolmarans 2000; Riccardi *et al.*, 2003 & Van Horn & Ernst, 2001).

NUTRIENTS OR FOODS	FOOD SOURCES	EFFECT ON CHD AND RISK FACTORS FOR CHD
SATURATED FATTY ACIDS[a]	Animal products (beef, lamb, pork, chicken and dairy products), plant oils (coconut oil, palm oil and palm kernel oil).	↑ TC, LDL-C, postprandial TG, ↓IS, ↑ risk of CHD
OMEGA-6 POLYUNSATURATED FATTY ACIDS	Plant oils (sunflower, soybean & corn oil), seeds, nuts & grains.	↓ TC, LDL-C, fasting TG Amount >10%E may ↓ HDL-C, ↓ risk of CHD
OMEGA-3 POLYUNSATURATED FATTY ACIDS[bc]	Fatty fish e.g. mackerel, salmon, sardines, kipper and herring.	No effect on TC ↑ LDL-C (temporarily) ↓ fasting and postprandial TG ↓ risk of CHD
MONOUNSATURATED FATTY ACIDS	Olive oil, canola oil/ margarine, peanut oil, nuts, avocados, olives	↓/↔ TC, LDL-C, fasting TG ↑/↔ HDL-C, ↓ risk of CHD
TRANS FATS	Some margarines, shortenings, baked goods containing these fats, animal products (meat and dairy products).	↑ LDL-C, TG, Lp(a) ↓ HDL-C, ↑ risk of CHD
DIETARY CHOLESTEROL	Egg yolks, organ meats, etc.	↑ TC , LDL-C ↑/↔ HDL-C, ↑ risk of CHD
TOTAL FAT		Very high amounts (>35%E) could modify metabolism in ways that could promote obesity. Very high carbohydrate (>60%) low fat diets could aggravate some lipid and non-lipid factors in metabolic syndrome (↑TG, ↑small dense LDL-particles, ↓HDL-C).
FIBRE (soluble)	Pectins, gums, mucilages, etc. in oats, fruits, etc.	Dietary intake of 2-3g/day ↓ TC and LDL-C by 3-5%. Also possibly lowers fasting TG, ↑IS, improve glucose control.
ALCOHOL	In excess (more than 1-2 drinks per day)	↑ fasting and postprandial TG, HDL-C, BP, ↔ on LDL-C Moderate intakes in middle-aged and older adults may ↓ risk for CHD.

ANTIOXIDANTS[d]		↓ Oxidative stress and LDL-C oxidation Epidemiological studies suggest a reduction in CVD, but randomised trials do not support this.
SODIUM, POTASSIUM AND CALCIUM		Lower salt intake ↓BP or prevents its rise. Effects of low salt diet to ↓BP are possibly enhanced by a diet rich in fruit and vegetables and relatively low in fat, low-fat dairy products.
SUGAR		Can ↑ TG
PLANT STEROLS[e]		Dietary intakes of 2-3g/day will ↓ TC and LDL-C by 6 – 15%
SOYA PROTEIN[f]		Lowers serum-tHcy Lowers TC, LDL-C Antioxidant actions, antithrombotic, anti-platelet aggregating effects and anti-inflammatory actions all promote vascular health.
CARBOHYDRATE		When carbohydrate is substituted for SFA, LDL-C ↓. See effects under total fat.
LOW GLYCAEMIC INDEX[gh]		↓ TC, LDL-C, ↔ HDL-C, TG, improve glucose control, ↑IS
FOLATE		↓ tHcy
NUTS[i]		Walnuts (as part of a heart-healthy diet) ↓ TC, LDL-C. An inverse association between relative risk of CHD with a frequent daily consumption of a small amount of nuts.

TC: total cholesterol; LDL-C: low density lipoprotein cholesterol; HDL-C: high density lipoprotein cholesterol; IS: insulin sensitivity; CHD: coronary heart disease; TG: triglycerides; Lp(a): lipoprotein a; E: energy; BP: blood pressure; tHcy: total homocysteine

[a]Hauner, 2002; [b]Harris, 1996; [c]Kris-Etherton *et al.*, 2003; [d]Vivekananthan et *al.*, 2003; [e]Law, 2000; [f]Anderson & Major, 2002; [g]Leeds, 2002; [h]Opperman *et al.*, 2004; [i]Feldman, 2002.

Table 6: Summary of American Heart Association (AHA) guidelines (Kritchevsky 1998)

American Heart Association (AHA) guidelines 1957 1. Diet may play an important role in the pathogenesis of atherosclerosis. 2. The fat content & total calories in the diet are probably important factors. 3. The ratio between saturated and unsaturated fat may be the basic determinant. 4. A wide variety of other factors besides fat, both dietary & non-dietary may be important.
American Heart Association (AHA) guidelines 1961 1. Maintain a correct body weight. 2. Engage in moderate exercise, e.g. walking to aid in weight reduction. 3. Reduce intake of total fat, saturated fat, & cholesterol. Increase intake of polyunsaturated fat. 4. Men with a strong family history of atherosclerosis should pay particular attention to diet modification. 5. Dietary changes should be carried out under medical supervision.
Dietary goals for the United States 1977 1. Increase carbohydrate consumption to account for approximately 55 – 60% of energy intake. 2. Reduce overall fat consumption from 40 to 30% of energy intake 3. Reduce saturated fat consumption to account for about 10% of total energy intake; and balance that with polyunsaturated & monounsaturated fat, which should account for 10% of energy intake each. 4. Reduce cholesterol consumption to about 300mg/day 5. Reduce sugar consumption by about 40% to account for about 15% of total energy intake. 6. Reduce salt consumption by about 50 – 85% to about three grams per day
Dietary guidelines for Americans 1990 1. Eat a variety of foods. 2. Maintain a healthy weight. 3. Choose a diet low in fat, saturated fat and cholesterol. 4. Choose a diet with plenty of vegetables, fruits and grain products. 5. Use sugars only in moderation.

6. Use salt and sodium only in moderation.
7. If you drink alcoholic beverages, do so in moderation.

Dietary guidelines for Americans 1995

1. Balance the food you eat with physical activity – maintain or improve your weight.
2. Choose a diet with plenty of grain products, vegetables, and fruits.
3. Choose a diet low in fat, saturated fat and cholesterol.
4. Eat a variety of foods.
5. Choose a diet moderate in salt and sodium.
6. Choose a diet moderate in sugar.
7. If you drink alcoholic beverages, do so in moderation.

Table 7: American Heart Association dietary guidelines for 2000 (Lauber & Sheard, 2001)

1. Consume a varied diet that includes foods from each of the major food groups with an emphasis on fruits, vegetables, whole grains, low fat or non-fat dairy products, fish, legumes, poultry and lean meats.
2. Monitor portion size and number to ensure adequate, not excess, intake.
3. Match energy intake to energy needs.
4. When weight loss is desirable, make appropriate changes to energy intake and expenditure (physical activity).
5. Limit foods with a high sugar content, and those with a high caloric density.
6. Limit foods high in saturated fat, trans fat and cholesterol.
7. Substitute unsaturated fat from vegetables, fish, legumes and nuts.
8. Maintain a healthy body weight.
9. Limit sodium intake.
10. Limit alcohol intake.

4.2.2. DIFFERENT STRATEGIES FOR PREVENTION OF CORONARY HEART DISEASE

Earlier dietary guidelines in South Africa were either nutrient-based or aimed at a population eating a typical Western diet. In 1997, the Nutrition Society of South Africa (NSSA) formed a focus or working group that started the process of developing food-based dietary guidelines (FBDG) for South Africa. The FBDG, that were recently published, are positive, practical, affordable, sustainable and culturally sensitive. They are to help South Africans over the age of 5 years to opt for an adequate but prudent diet. These guidelines are based on the existing consumption of locally available foods and aim to address identified nutrition-related public health issues such as CHD. The FBDGs consist of 11 short, clear and simple messages that have been tested for comprehension, appropriateness and applicability in consumer groups of different ethnic backgrounds in both rural and urban areas. These guidelines can be adapted for groups with special dietary needs (Vorster *et al.*, 2001). Table 8 refers to the FBDGs for South Africa.

Table 8: Food based dietary guidelines for South Africa (Vorster *et al.*, 2001)

1. Enjoy a variety of foods.
2. Be active.
3. Make starchy foods the basis of most meals.
4. Eat plenty of fruit and vegetables.
5. Eat dry beans, peas, lentils and soya regularly.
6. Meat, fish, chicken, milk and eggs could be eaten everyday.
7. Eat fats sparingly.
8. Use food and drinks containing sugar sparingly and not between meals.*
9. Use salt sparingly.
10. Drink lots of clean, safe water.
11. If you drink alcohol, drink sensibly.

*The guideline regarding sugar was added after the guidelines were published

Another program in South Africa is the Heart Foundation of Southern Africa, which was established in 1981. The Heart Foundation is a Section 21 (not-for-profit) company charged with reducing the incidence of CVD through education and supporting research. The Heart Foundation has three key focus areas:

- Health promotion to encourage prevention of heart disease
- Support for people living with a heart condition
- Fundraising (as there is no government funding) (Heart foundation of South Africa, 2003)

Since its inception, the heart foundation has undertaken many national programmes, including a cholesterol education programme to the public and the medical profession, labelling of low fat food stuffs with the "heart mark", and numerous media activities aimed at improving risk factor knowledge and behaviour (Steyn *et al.*, 1997).

The Heart Foundation Symbol (see figure 2) is an incentive for shoppers to instantly identify healthy products on the shelf. The products with the Heart mark are low in cholesterol, low in saturated fat, low in salt and high in fibre (where applicable) (Heart Foundation of South Africa, 2003).

Figure 2: Heart Foundation Symbol

Table 9 summarises the dietary guidelines for prevention of cardiovascular disease of various international countries and organisations.

Table 9: Summary of dietary guidelines for primary prevention of CHD

NUTRIENT/ FOOD	BRITISH [a]	AMERICAN HEART ASSOCIATION [b]	AUSTRALIAN[c]	EUROPEAN[d]	WHO/FAO GUIDELINES [e]
Total fat	< 35%E	< 30%E		< 30% of energy	15-30%E
Unsaturated fatty acids	An increased use of MUFA and PUFA (particularly ω-3 fatty acids)		PUFA:SFA ratio of > 1. ω-3 fatty acids: 1-2g/day ω-6 fatty acids: 10%E Diet rich in α-linolenic acid	PUFA: No goal ω-6 fatty acids: 4-8%E ω-3 fatty acids: 2g/ day linolenic acid 200mg/day of very long chain fatty acids	PUFA: 6-10% ω-6 fatty acids: 5-8%E ω-3 fatty acids: 1-2%
Saturated fat	< ⅓ of total fat	≤ 10%E	<8%E	< 10%E	<7%E
Trans fatty acids		Reduce intake		< 2%E	< 1%E
Cholesterol	< 300mg	< 300mg		No goal	< 300mg
Complex carbohydrates	50%E			> 55%E	55-75%E
Dietary fibre	Increased use of fresh fruit and vegetables	≥ 25g		> 25g(or3g/MJ) per day	No goal 400-500g fresh fruit and vegetables
Folate				> 400µg/day from food	No goal
Sugar				≤4 occasions per day of sugary foods	< 10%E
Salt	< 6g/day	< 6g/day		< 6g/day	< 5g/day
Alcohol	< 3 units per day	♂≤ 2 drinks per day ♀ ≤1 drink per day			No general recommendation

[a]Wood *et al.,* 1998; [b]Pearson *et al.*, 2002; [c]National heart foundation of Australia, 1999; [d]EHN 2002; [e] Joint WHO/FAO Expert Consultation, 2003

%E: Percentage of total energy intake; MUFA: mono-unsaturated fatty acids; PUFA: polyunsaturated fatty acids; SFA: saturated fatty acids

4.2.3. DIETARY TREATMENT OF DYSLIPIDAEMIA

Table 10 summarizes the recommendations for the dietary treatment of dyslipidaemia, while table 11 gives the AHA guidelines (Lauber & Sheard, 2001).

Table 10: Summary of recommendations for dietary treatment of dyslipidaemia

NUTRIENT	RECOMMENDATION	REFERENCE
ENERGY	Balance energy intake and expenditure to maintain a desirable body weight/prevent weight gain	NCEP, 2001
TOTAL FAT	25-35%E	NCEP, 2001
SATURATED FAT	< 7%E	NCEP, 2001
TRANS FATTY ACIDS	Should be kept low	NCEP, 2001
MONOUNSATURATED FAT	Up to 20%E	NCEP, 2001
POLYUNSATURATED FATTY ACIDS	Up to 10%E EPA + DHA combined: 500mg/day Omega 6:omega 3 ratio ranges from 4:1 to 10:1	NCEP, 2001 ISSFAL, 2004 Bucher, *et al.*, 2002
DIETARY CHOLESTEROL	<200mg/day	NCEP, 2001
CARBOHYDRATES	50-60%E Low GI diet	NCEP, 2001 Leeds, 2002
DIETARY FIBRE	20-30g/day 3 to 6g/day of soluble fibre	NCEP, 2001 Brown, *et al.*, 1999
PROTEIN	Approximately 15%E Regular intake of pulses	NCEP, 2001 Anderson & Major, 2002
ALCOHOL	Moderate consumption 30g alcohol per day may be beneficial	Rimm, *et al.*, 1999
ANTIOXIDANTS	Supplement is not recommended, as more research is needed. A food-based approach is recommended i.e. 5 portions of fruit and vegetables (including a dark green or yellow and a vitamin C rich portion) are recommended per day to provide the necessary antioxidants.	Wolmarans, 2000
VITAMIN B SUPPLEMENTS	May be necessary to treat hyperhomo-cysteinaemia. Consumption of foods rich in these vitamins should also be encouraged.	Wolmarans, 2000
SODIUM	≤ 3g sodium (5g sodium chloride/ 5g salt) per day. Foods high in salt and those containing flavoured salts should be limited.	Wolmarans, 2000
PLANT STEROLS	2g per day	Law, 2000

%E: Percentage of total energy intake EPA: eicosapentanoic acid

DHA: docosahexaenoic acid GI: glycaemic index

Table 11: AHA Dietary guidelines for people with dyslipidaemia (AHA Specific dietary recommendations) (Lauber & Sheard, 2001)

FOR GENERAL POPULATION

- Restrict total fat to ≤ 30%E.
- Restrict saturated fat to ≤ 10%E.
- Limit the total intake of cholesterol-raising fatty acids (saturated and trans) to ≤ 10%E.
- Limit cholesterol intake to < 300mg/day.
- Replace cholesterol-raising fatty acids with whole grains and unsaturated fatty acids from fish, vegetables, legumes and nuts.
- Limit sodium intake to ≤ 2400 mg/day (≤ 6g/day of salt).
- If alcohol is consumed, limit intake to two drinks per day for men, one drink per day for women.
- Eat at least two servings of fish per week.
- Eat five or more servings of vegetables and fruit per day.
- Eat six or more servings of grain products per day.
- Emphasize daily intake of low-fat or non-fat dairy products.

ELEVATED LDL-C OR PRE-EXISTING CARDIOVASCULAR DISEASE

- Restrict saturated fat to < 7%E
- Limit cholesterol intake to < 200mg/day
- Weight loss when appropriate
- Include soy proteins with isoflavones

DYSLIPIDAEMIA CHARACTERIZED BY LOW HDL-C, ELEVATED TRIGLYCERIDES, & SMALL DENSE LDL

- Replace saturated fat calories with unsaturated fat
- Limit carbohydrate intake, especially sugars and refined carbohydrates
- Weight loss when appropriate
- Increased physical activity

DIABETES AND INSULIN RESISTANCE

- Restrict saturated fat to < 7%E
- Limit cholesterol intake to < 200mg/day
- When selecting carbohydrates, chose those with high fibre content

%E: Percentage of total energy intake

5. CONCLUSION

CHD is one of the leading causes of morbidity and mortality in South Africa (Bradshaw *et al.*, 1995). The proven risk factors for CHD are present in all population groups in South Africa, but to varying degrees. The way in which risk factors affect or do not affect various ethnic groups is still unclear and more research is needed in this area. It is also evident from this study that intervention programs to prevent the development of CHD are effective and of extreme importance. These programs, however, need to be aimed at the specific population groups and the problems they experience, to be effective in South Africa.

6. REFERENCES

ANDERSON, J.W., CHEN, W.J. & SIELING, B. 1980. Hypolipidemic effects of high-carbohydrate, high-fibre diets. *Metabolism*, 29:551-558.

ANDERSON, J.W. & MAJOR, A.W. 2002. Pulses and lipaemia, short- and long-term effect: Potential in the prevention of cardiovascular disease. *British journal of nutrition*, 88, suppl.3: S263 – S271.

APPEL, L.J., MOORE, T.J., OBARZANEK, E., VOLLMER, W.M., SVETKEY, L.P., SACKS, F.M., BRAY, G.A., VOGT, T.M., CUTLER, J.A., WINDHAUSER, M.M., LIN, P. & KARANJA, N. 1997. A clinical trial of the effects of dietary patterns on blood pressure. DASH collaborative research group. *The New England journal of medicine*, 336:1117-1124, Apr. 17.

ASHTON, E.L., POMEROY, S., FOSTER, J.E., KAYE, R.S., NESTEL, P.J. & BALL, M. 2000. Diet high in monounsaturated fat does not have a different effect on arterial elasticity than a low-fat, high carbohydrate diet. *Journal of the American Dietetic Association*, 100:537-542.

BAZZANO, L.A., JIANG, H., MUNTER, P., VUPPUTURI, S. & WHELTON, P.K. 2003. Relationship between cigarette smoking and novel risk factors for cardiovascular disease in the United States. *Annals of internal medicine*, 138(11): 891-899.

BERSOT, T.P., PĒPIN, G.M. & MAHLEY, R.W. 2003. Risk determination of dyslipidaemia in populations characterised by low levels of high-density lipoprotein cholesterol. *American heart journal*, 146:1052-1060.

BRADSHAW, D., BOURNE, D., SCHNEIDER, M. & SAYED, R. 1995. Mortality patterns of chronic diseases of lifestyle in South Africa. In: Fourie, J. & STEYN, K. EDS. Chronic diseases of lifestyle in South Africa. MRC Technical report. Cape Town: Medical research council. 1-32.

BRADSHAW, D., GROENEWALD, P., LAUBSCHER, R., NANNAN, N., NOJILANA, B., NORMAN, R., PIETERSE, D., SCHNEIDER, M., BOURNE, D.E., DORRINGTON, R. & JOHNSON, L. 2003. Initial burden of disease estimates for South Africa, 2000. *South African medical journal*, 93(9): 682-688, Sep.

BROWN. L., ROSNER, B., WILLETT, W.W. & SACKS, F.M. 1999. Cholesterol-lowering effects of dietary fiber: a meta-analysis. *American journal of clinical nutrition*, 69: 30-42.

BUCHER, H.C., HENGSTLER, P., SCHINDLER, C. & MEIER, G. 2002. n-3 Polyunsaturated fatty acids in coronary heart disease: A meta-analysis of randomised controlled studies. *American journal of medicine*, 112: 298-304.

CASTELLI, W.P. & ANDERSON, K. 1986. A population at risk: Prevalence of high cholesterol levels in patients in the Framingham study. *American journal of medicine*, 80(suppl 2A): 23-32, Feb.14.

CENSUS, 2001. www.statssa.gov.za [Date of access: 9 Sept. 2004].

CHETTY, N., NARAN, N.H., WALKER, A.R.P., SEFTAL, H.C., JOFFE, B.I. & RAAL, F.J. 1997. Plasma fatty acid levels in South African interethnic male high school pupils at different ultimate risks of coronary heart disease. *Clinica Chimica Acta*, 258: 31-46.

COOK, G., POCOCK, S.J., SHAPER, A.G. & KUSSICK, S.J. 1986. Giving up smoking and the risk of heart attacks. A report from the British regional heart study. *The Lancet*, 2: 1376-1380, Dec. 13.

DE LOGERIL, M., SALEN, P., MARTIN, J.L., MONJAUD, I., DELAYE, J. & MAMELLE, N. 1999. Mediterranean diet, traditional risk factors, and the rate of cardiovascular complications after myocardial infarction. *Circulation*, 99: 779-785.

DE VISSER, C.L., BILO, H.J.G., THOMSEN, T.F., GROENIER, K.H. & MEYBOOM-DE JONG, B. 2003. Prediction of coronary heart disease: a comparison between the Copenhagen risk score and the Framingham risk score applied to a Dutch population. *Journal of internal medicine*, 253: 553-526.

EIKELBOOM, J.W., LONN, E., GENEST, J., HANKEY, G. & YUSUF, S. 1999. Homocyst(e)ine and cardiovascular disease: A critical review of epidemiological evidence. *Annals of internal medicine,* 131(5): 363-375, Sept. 7.

EUROPEAN HEART NETWORK (EHN). 2002. Food, nutrition and cardiovascular disease prevention in the European region: Challenges for the new millennium. Summary of core findings and recommendations. Brussels: European Heart Network. 22p.

FELDMAN, E. 2002. The scientific evidence for a beneficial health relationship between walnuts and coronary heart disease. *Journal of nutrition*, 132: 1062S-1101S.

FRANKLIN, S.S., LARSON, M.G., KHAN, S.A., WONG, S.A., LEIP, E.P., KANNEL, W.B. & LEVY, D. 2001. Does the relation of blood pressure to coronary heart disease change with aging? The Framingham heart study. *Circulation*, 103: 1245-1249.

GANJI, V. & KAFAI, M.R. 2003. Demographic, health, lifestyle, and blood vitamin determinants of serum total homocysteine concentrations in the third National Health and Nutrition Examination Survey, 1988-1994. *American journal of clinical nutrition*, 77: 826-833.

GILL, G.V., ROLFE, M., MACFARLANE, I.A. & HUDDLE, K.R. 1996. Smoking habits of black South African patients with diabetes mellitus. *Diabetic medicine*, 13: 996-999.

GRUNDY, S.M., CLEEMAN, J.I., MERZ, B., BREWER, B., CLARK, L.T., HUNNINGHAKE, D.B., PASTERNAK, R.C., SMITH, S.C. & STONE, N.J. 2004. Implications of recent clinical trials for the National Cholesterol Education Program

Adult Treatment Panel III guidelines. *Circulation*, 110: 227-239.

HAFFNER, S.M., LEHTO, S. & RONNEMAA, T. 1998. Mortality from coronary heart disease in subjects with type 2 diabetes and in non-diabetic subjects with and without prior myocardial infarction. *The New England journal of medicine*, 339: 229-234.

HAMMOND, K.A. 2000. Dietary and clinical assessment. (*In* Mahan, L.K. & Escott-Stump, S., *eds*. Krause's food, nutrition and diet therapy. Philadelphia:W.B. Saunders Company. P. 353-379.)

HARRIS, W.S. 1996. Dietary fish oil and blood lipids. *Current opinion in lipidology*, 7(1): 3-7, Feb.

HAUNER, H. 2002. Insulin resistance and the metabolic syndrome – a challenge of the new millennium. *European journal of clinical nutrition,* 56(Suppl.1): S25-S29.

HEALTH SYSTEMS TRUST. 1998. Health Statisitics. [Web:] http://www.hst.org.za/healthstats/46/data/eth [Date of access: 9 Sept. 2004].

HEART FOUNDATION OF SOUTH AFRICA. 2003. The Heart Mark. [Web:] http://www.heartfoundation.co.za/hmark.php [Date of access: 12 July 2004].

HENDERSON, H.E., KOTZE, M.J. & BERGER, G.M.B. 1989. Multiple mutations underlying familial hypercholesterolemia in the South African population. *Human genetics*, 83: 67 – 70.

HJERMANN, I., VELVE BYRE, K., HOLME, I. & LEREN, P. 1981. Effect of diet and smoking intervention on the incidence of coronary heart disease. *The Lancet*, 1303-1310, Dec. 12.

HUMPHRIES, S.E., MONTGOMERY, H.E. & TALMUD, P.J. 2001. Predisposing genes, high-risk environments and coronary artery disease: LPL and fibrinogen as examples. (*In* Simopoulos, A.P. & Pavlou, K.N., *eds*. Nutrition and fitness: Diet,

genes, physical activity and health. World review of nutrition and dietetics.

ISSFAL. 2004. PUFA Intakes. [Web:] http://www.issfal.org.uk/PUFA%20intakes.htm [Date of access: 27 Oct. 2004].

JAMES, S., VORSTER, H.H., VENTER, C.S., KRUGER, H.S., NELL, T.A., VELDMAN, F.J. & UBBINK, J.B. 2000. Nutritional status influences plasma fibrinogen concentration: evidence from the THUSA survey. *Thrombosis research*, 98(5): 383-394. June, 1.

JANSSEN, I., KATZMARZYK, P.T. & ROSS, R. 2004. Waist circumference and not body mass index explains obesity-related health risk. *American journal of clinical nutrition*, 79: 379-384.

JENKINS, D.J., KENDALL, C.W., MARCHIE, A., FAULKNER, D.A., WONG, J.M., DE SOUZA, R., EMAM, A., PARKER, T.L., VIDGEN, E., LAPSLEY, K.G., TRAUTWEIN, E.A., JOSSE, R.G., LEITER, L.A. & CONNELLY, P.W. 2003. Effects of a dietary portfolio vs lovostatin on serum lipids and C-reactive protein. *Journal of the American Medical Association,* 290: 502-510, July, 23.

JOFFE, B.I., PANZ, V.R., WING, J.R., RAAL, F.J. & SEFTAL, H.C. 1992. Relationship between plasma insulin and blood pressure in South African black women in Johannesburg. *Diabetes care*, 15: 556-558, Apr.

KARPE, F. 1999. Postprandial lipoprotein metabolism and atherosclerosis. *Journal of internal medicine*, 246: 341-355.

KRIS-ETHERTON, P.M., HARRIS, W.S. & APPEL, L.J. 2003. Fish consumption, fish oil, omega-3 fatty acids and cardiovascular disease. *Arteriosclerosis, thrombosis and vascular biology*, 23: e20-e31.

KRITCHEVSKY, D. 1998. History of recommendations to the public about dietary fat. *Journal of nutrition*, 128: 449s-452s.

KRUMMEL, D. 2000. Nutrition in cardiovascular disease. (*In* Mahan, L.K. & Escott-Stump, S., eds. Krause's food, nutrition and diet therapy. Philadelphia:W.B. Saunders Company. P. 558-593.)

LA ROSA, J.C., HE, J. & VAPPUTURI, S. 1999. Effect of statins on risk of coronary heart disease. A meta-analysis of controlled trials. *Journal of the American Medical Association*, 82:2340-2346, Dec.

LALONDE, L., GRAY-DONALD, K., LOWENSTEYN, I., MARCHAND, S., DORAIS, M., MICHAELS, G., LLEWELLYN-THOMAS, H.A., O'CONNER, A., GROVER, A., & The Canadian Collaborative Cardiac Assessment Group. 2002. Comparing the benefits of diet and exercise in the treatment of dyslipidaemia. *Preventative medicine,* 35: 16-24.

LAUBER, R.P. & SHEARD, N.F. 2001. The American Heart Association dietary guidelines for 2000: A summary report. *Nutrition reviews*, 59(9): 298-306.

LAW, M. 2000. Plant sterol and stanol margarines and health. *British medical journal*, 320:861-864, Mar. 25.

LEEDS, A.R. 2002. Glycaemic index and heart disease. *American journal of clinical nutrition*, 76:286S-289S.

LEMIEUX, I., LAMARCHE, B., COUILLARD, C., PASCOT, A., CANTIN, B., BERGERON, J., DAGENAIS, G.R. & DESPRÉS, J.P. 2001. Total cholesterol/HDL cholesterol ratio vs LDL cholesterol/HDL cholesterol ratio as indices of ischaemic heart disease risk in men. *Archives of internal medicine*, 161:2685-2692, Dec.

LEVITT, N.S. & MOLLENTZE, W.F. 1995. Diabetes mellitus and impaired glucose tolerance. A review of South African Studies. In: Fourie, J. & STEYN, K. EDS. Chronic diseases of lifestyle in South Africa. MRC Technical report. Cape Town:Medical research council. 99-109.

MAGNUS, P. 2001. The real contribution of the major risk factors to the coronary epidemics. *Archives of internal medicine*, 161:2657-2660, Dec.

MANSON, J.E., TOSTESON, H., RIDKER, P.M., SATTERFIELD, S., HEBERT, P., O'CONNER, G.T., BURING, J.E. & HENNEKENS, C.H. 1992. The primary prevention of myocardial infarction. *The New England journal of medicine*, 326(21): 1406-1413, May. 21.

MOLLENTZE, W.F., MOORE, A.J., STEYN, A.F., JOUBERT, G., STEYN, K., OOSTHUIZEN, G.M. & WEICH, D.J.V. 1995. Coronary heart disease risk factors in a rural and urban Orange Free State black population. *South African medical journal*, 85: 90-96, Feb.

MORAR, N., SEEDAT, Y.K., NAIDOO, D.P. & DESAI, D.K. 1998. Ambulatory blood pressure and risk factors for coronary heart disease in black and Indian medical students. *Journal of cardiovascular risk*, 5(5-6): 313-318, Oct.

MVO, Z., DICK, J. & STEYN, K. 1999. Perceptions of overweight African women about acceptable body size of woman and children. *Curationis*, 22(2): 27-31, June.

NATIONAL HEART FOUNDATION OF AUSTRALIA. 1999. A review of the relationship between dietary fat and cardiovascular disease. *Australian journal of nutrition and dietetics*, 56(4 suppl): S5-S22.

NCEP. 2001. Executive summary of the third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). *Journal of the American Medical Association*, 285(19): 2486-2497, May.

OELOFSE, A., JOOSTE, P.L., STEYN, K., BADENHORST, C.J., LOMBARD, C., BOURNE, L. & FOURIE, J. 1996. The lipid and lipoprotein profile of the urban black South African population of the Cape Peninsula – the BRISK study. *South African*

medical journal, 86(2): 162-166, Feb.

OOSTHUIZEN, W. 1999. The effect of nutrition on risk factors for coronary heart disease. Potchefstroom: North-West University. (Thesis*PhD) p. 42-46.

OOSTHUIZEN, W., VORSTER, H.H., KRUGER, A., VENTER, C.S., KRUGER, H.S. & DE RIDDER, J.H. 2002. The impact of urbanisation on serum lipid profiles of Africans: The THUSA survey. *South African medical journal*, 92(9): 723 – 728, Sept.

OPPERMAN, A.M., VENTER, C.S., OOSTHUIZEN, W., THOMPSON, R.L. & VORSTER, H.H. 2004. Meta-analysis of the health effects of using the glycaemic index in meal-planning. *British journal of nutrition*, 92:367-381.

PATTERSON, R.E., KRISTAL, A., RODABOUGH, R., CAAN, B., LILLINGTON, L., MOSSAVAR-RAHMANI, Y., SIMON, M.S., SNETSELAAR, L. & VAN HORN, L. 2003. Changes in food sources of dietary fat in response to intensive low-fat dietary intervention: Early results from the Women's Health Initiative. *Journal of the American Dietetic Association*, 103:454-460.

PEARSON, T.A., BLAIR, S.N., DANIELS, S.R. et al. 2002. AHA Guidelines for primary prevention of cardiovascular disease and stroke: 2002 Update. Consensus panel guide to comprehensive risk reduction for adult patients without coronary or other atherosclerotic vascular diseases. *Circulation*, 106:388-391.

RANJITH, N., PEGORARO, R.J. & ROM, L. 2003. Risk factors and methylenetetrahydrofolate reductase gene polymorphisms in a young South African Indian-based population with acute myocardial infarction. *Cardiovascular journal of South Africa*, 14(3): 127-132, May.

RANJITH, N., VERHO, NK., VERHO, M. & WINKELMANN, B.R. 2002. Acute myocardial infarction in a young South African Indian-based population: patient characteristics on admission and gender-specific risk factor prevalence. *Current medical research opinion,* 18(4): 242-248.

RENAUD, S.C. & LANZMANN-PETITHORY, D. 2001. α-Linolenic acid in the prevention of cardiovascular diseases. (*In* Hamazaki, T. & Okuyama, H., *eds*. Fatty acids and lipids – New findings: World review of nutrition and dietetics. Basel:Karger. P. 79-85.)

RICCARDI, G., RIVELLESE, A. & WILLIAMS, C. 2003. The cardiovascular system. (In Gibney, M.J., Macdonald, I.A. & Roche, H.M., eds. Nutrition and Metabolism. Oxford: Blackwell Science. P 224-241.)

RIMM, E.B., WILLIAMS, P., FOSHER, K., CRIQUI, M. & STAMPFER, M.J. 1999. Moderate alcohol intake and lower risk of coronary heart disease: meta-analysis of effects on lipids and haemostasis factors. *British medical journal*, 319 (7224): 1523-1528, Dec.

SEFTAL, H.C., ASVAT, M.S., JOFFE, B.I., RAAL, F.J., PANZ, V.R., VERMAAK, W.J.H., LOOCK, M.E., RAJPUT, M.C., OMAR, M.A.K., JEENAH, M.S., STEYN, K. & BECKER, P.J. 1993. Selected risk factors for coronary heart disease in male scholars from the major South African population groups. *South African medical journal*, 83: 891-897, Dec.

SEFTAL, H.C., RAAL, F.J. & JOFFE, B.I. 1995. Dyslipidaemia in South Africa. In: Fourie, J. & STEYN, K. EDS. Chronic diseases of lifestyle in South Africa. MRC Technical report. Cape Town: Medical research council. 61-71.

SIANI, A., CAPPUCIO, F.P., BARBA, G., TREVISAN, M., FARINARO, E., IACONE, R., RUSSO, P., MANCINI, M. & STRAZZULLO, P. 2002. The relationship of waist circumference to blood pressure: The Olivetti heart study. *American journal of hypertension*, 15: 780-786.

SOUTH AFRICAN MEDICAL ASSOCIATION (SAMA) & LIPID AND ATHEROSCLEROSIS SOCIETY OF SOUTHERN AFRICA (LASSA) WORKING GROUP. 2000. Diagnosis, management and prevention of the common

dyslipidaemias in South Africa – clinical guideline 2000. *South African journal of medicine*, 90(2): 164-178, Feb.

STAESSEN, J.A., WANG, J., BIANCHI, G. & BIRKENHAGER, W.H. 2003. Essential hypertension. *The Lancet*, 361: 1629-1642, Oct. 5.

STEYN, K., GOLDBERG, Y.P., KOTZE, M.J., STEYN, M., SWANEPOEL, A.S.P., FOURIE, J.M., COETZEE, G.A. & VAN DER WESTHUYZEN, D.R. 1996. Estimation of the prevalence of familial hypercholesterolaemia in a rural Afrikaner community by direct screening for the three Afrikaner founder low density lipoprotein receptor gene mutations. *Human genetics*, 98:479-484.

STEYN, K., JOOSTE, P.L., BOURNE, L., FOURIE, J., BADENHORST, C.J., BOURNE, D.E., LANGENHOVEN, M.L., LOMBARD, C.J., TRUTER, H., KATZENELLENBOGEN, J., MARAIS, M. & OELOFSE, A. 1991. Risk factors for coronary heart disease in the black population of the Cape Peninsula. *South African journal of medicine*, 79: 480-485, Apr. 20.

STEYN, K., STEYN, M., SWANEPOEL, A.S.P., JORDAAN, P.C.J., JOOSTE, P.L. FOURIE, J.M. & ROSSOUW, J.E. 1997. Twelve year results of the Coronary Risk Factor Study (CORIS). *International journal of epidemiology,* 26(5): 964-917.

TURNER, R.C., MILLINS, H. & NEIL, H.A.W. 1998. Risk factors for coronary artery disease in non-insulin dependent diabetes mellitus: United Kingdom Prospective Diabetes Study (UKPDS: 23). *British medical journal*, 316: 823-828.

UBBINK, J.B., DELPORT, R. & VERMAAK, W.J.H. 1996. Plasma homocysteine concentrations in a population with a low coronary heart disease prevalence. *Journal of nutrition*, 126: 1254S-1257S.

UBBINK, J.B., VERMAAK, W.J.H., DELPORT, R., VAN DER MERWE, A., BECKER, P.J. & POTGIETER, H. 1995. Effective homocysteine metabolism may protect South African blacks against coronary heart disease. *American journal of clinical nutrition*,

62: 802-808.

VAN DAM, R.M., GRIEVINK, L., OCKÉ, M.C. & FESKENS, E.J.M. 2003. Patterns of food consumption and risk factors for cardiovascular disease in the general Dutch population. *American journal of clinical nutrition*, 77: 1156-1163.

VAN DER MEER, I.M., DE MAAT, M.P.M., KILIAAN, A.J. VAN DER KUIP, D.A.M., HOFMAN, A. & WITTEMAN, J.C.M. 2003. The Value of C-reactive protein in cardiovascular risk prediction: The Rotterdam study. *Archives of internal medicine*, 163(11): 1323 – 1329, Sep. 6.

VAN HORN, L. & ERNST, N. 2001. A summary of the science supporting the new National Cholesterol Education Program dietary recommendations: What dieticians should know. *Journal of the American Dietetics Association*, 101(10): 1148-1154, Oct.

VAN WALBEEK, C. 2002. Recent trends in smoking prevalence in South Africa – some evidence from AMPS data. *South African medical journal*, 92(6): 468-472, June.

VASAN, R.S., LARSON, M.G., LIEP, E.P., EVANS, J.C., O'DONNELL, C.J., KANNEL, W.B. & LEVY, D. 2001. Impact of high-normal blood pressure on the risk of cardiovascular disease. *The New England journal of medicine*, 345 (18): 1291-1297, Nov.

VIVEKANANTHAN, D.P., PENN, M.S., SAPP, S.K., HSU, A. & TOPOL, E.J. 2003. Use of antioxidant vitamins for the prevention of cardiovascular disease: meta-analysis of randomised trials. *The Lancet*, 361:2017-2012, June.

VORSTER, H.H. 2002. The emergence of cardiovascular disease during urbanisation of Africans. *Public health nutrition*, 5(1A): 239-43, Feb.

VORSTER, H.H., LOVE, P. & BROWNE, C. 2001. Development of food-based dietary guidelines for South Africa – the process. *South African journal of clinical*

nutrition, 14(3): s3-s6, Sept.

VORSTER, H.H., RAAL, F.J., UBBINK, J.B., MARAIS, A.D., RAJPUT, F.Y. & NTANIOS, F.Y. 2003. Functional foods with added plant sterols for treatment of hypercholesterolaemia and prevention of Ischaemic heart disease. *South African journal of clinical nutrition*, 16(2): 49-56, July.

VORSTER, H.H., VENTER, C.S., JERLING, J.C., OOSTHUIZEN, W.O., NELL, T.A. & VENTER, J.H. 2000. The predictive value of haemostatic variables for atherothrombotic cardiovascular events: a review and meta-analysis of the literature. Report to Unilever research Laboratorium Vlaardingen. March 2000.

WALD, D.S., LAW, M. & MORRIS, J.K. 2002. Homocysteine and cardiovascular disease: evidence on causality from a meta-analysis. *British medical journal*, 325: 1202-1206, Nov. 23.

WALKER, A.R.P., ADAM, A. & KŰSTNER, H.G.V. 1993. Changes in total death rate and in Ischaemic heart disease death rate in interethnic South African populations. *South African medical journal*, 83: 602-605.

WALKER, A.R.P., ADAM, F. & WALKER, B.F. 2001. World pandemic of obesity: the situation in Southern African populations. *Public health*, 115: 368-372.

WHO/FAO EXPERT CONSULTATION ON DIET, NUTRITION AND PREVENTION OF CHRONIC DISEASES (2002: GENEVA). 2003. Diet, nutrition and the prevention of chronic diseases. WHO Technical report series: 916. [Web:] http://www.who.int/hpr/NPH/docs/who.fao.expert.report [Date of access: 23 Sep. 2004].

WOLMARANS, P. 2000. Position Statement on the dietary management of people with dyslipidaemia (ADSA). *South African journal of clinical nutrition*, 13(1): 16-22.

WOLMARANS, P. & OOSTHUIZEN, W. 2001. Eat fats sparingly - implications for health and disease. *South African journal of clinical nutrition,* 14(3): S48-S55, Sept.

WOOD, D. 1998. Joint British recommendations on prevention of coronary heart disease in clinical practice. *Heart*, 80(supplement 2): S1-S29.

WORLD HEALTH ORGANISATION. 2002. The World health report 2002 – Reducing risks, promoting healthy life. www.who.int/whr/2002/chapter4/en/index4.html [Date of access: 23 Sep. 2004].

WORLD HEALTH ORGANISATION – INTERNATIONAL SOCIETY OF HYPERTENSION. 1999. Guidelines subcommittee: guidelines for the management of hypertension. *Journal of hypertension*, 17: 151-183.

CHAPTER 3

BELIEFS OF SOUTH AFRICANS REGARDING FOOD AND CARDIOVASCULAR HEALTH

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Running head: Beliefs regarding food and cardiovascular health

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Abstract

Objective: To investigate the beliefs of South African metropolitan adults towards the importance of the link between food and cardiovascular health and to compare beliefs between different race, living standards, age and gender groups. Also, to determine whether this population looks for the Heart Foundation symbol on food products, as well as where the link between food and heart disease ranks in terms of importance compared to other highly prevalent diseases.

Design: Randomized cross-sectional study. Trained field workers administrated questionnaires by conducting face-to-face interviews with consumers in the language of their choice.

Subjects: Two thousand South African individuals (16 years and older), were randomly selected from metropolitan areas in South Africa. The data was weighted to be representative of the total South African metropolitan population based on gender, age and race distribution (n=10 695 000).

Results: The majority of the population found the link between food and cardiovascular risk related health issues to be important especially the higher LSM groups within the different race groups. The link between food and weight loss was considered the least important compared to other cardiovascular risk factors (cholesterol, blood pressure, diabetes, healthy blood vessels). Only 35% of the study population agreed with the statement that they look for the Heart Foundation symbol, while 46% disagreed with the statement. There was a greater tendency for the higher LSM groups to look for the Heart Foundation symbol than the lower LSM groups. Heart disease was considered just as important and in some cases more important when compared with HIV/AIDS and cancer.

Conclusions and recommendations: This study shows that the metropolitan South African adult population considers the link between food and CVD to be important. Nutritional education needs to be aimed at both genders and all ages of the lower socio-economic groups of South Africa.

Introduction

The World Health Organisation (WHO) attributes one-third of all global deaths (15.3 million) to coronary heart disease (CHD)[1]. South Africa is a country with great diversity in race as well as economic status. This country has highly industrialised cities, which follow a predominantly urban Western culture as well as remote rural areas, where many South Africans still follow traditional African lifestyles[2]. This diverse country has a high overall prevalence of cardiovascular disease (CVD), although it differs slightly between the various ethnic groups. CVD is the second leading cause of death (due to disease) in South Africa, at 16.6%[3]. CHD is one of the most common causes of death in white and Indian South Africans, and an important cause of mortality in urban coloureds. It is still rare among rural blacks, although the prevalence may be on the rise among urban blacks[4]. Stroke is the most important non-communicable disease in females and ischaemic heart disease (IHD) in males. Hypertensive heart disease is also a major cause of premature death in females[3]. When looking at age groups it is seen that in South African males and females, deaths from non-communicable diseases starts increasing from the age of 45 years[3].

Dietary interventions, together with other lifestyle changes form an essential part of the prevention and treatment of CVD and the treatment of CVD risk factors[5]. The first dietary guidelines published by the American Heart Association was in 1957. It was then already evident that diet played a role in the development of CVD, with fat and total calorie content considered as possible factors. By 1977, guidelines for the type of fat, sugar, salt and carbohydrate were included. In 1990, the importance of fruit and vegetables was also noted[6].

Since then numerous observational studies have suggested that nutrients such as potassium, anti-oxidants and folic acid are associated with lower incidence of and mortality from CVD[7]. Numerous large, randomised, controlled clinical trials have also proven the importance of diet in CVD[8].

South Africa has its own dietary guidelines for prevention and management of dyslipidaemia. The Association of Dietetics of South Africa (ADSA) released a

position statement on the dietary management of people with dyslipidaemia in 2000[9]. The Nutrition Society of South Africa (NSSA) initiated the process of compiling the South African Food Based Dietary Guidelines (FBDG), which are aimed at helping South Africans choose an adequate and prudent diet in a positive, practical, affordable, sustainable and culturally acceptable way[10]. The Heart Foundation of Southern Africa is a community based health organisation established to reduce the incidence of heart disease and stroke in the population of South Africa by providing education and supporting research. It was established in 1981, since which time they have undertaken numerous programmes to educate the South African public and medical professions, through programmes such as labelling low fat food products with the "Heart Mark"[11]. The Heart Foundation symbol is an incentive for consumers to easily identify healthy products, as these foods are low in cholesterol, low in saturated fat and low in salt[12].

Consumers' beliefs of the importance of the link between the foods they eat and CVD may influence their behavior and health practice. Factors such as race, age, gender and socio-economic status may, furthermore, influence the consumer's beliefs. According to Sargeant and West (2001), an attitude, in consumer behavior terms, is a lasting, general, evaluation of products and ideas. Attitudes are formed by personal usage or trust in the attitudes of other influential users, while beliefs may be formed without product experience[13]. A study of black South African University students showed that beliefs were more independent predictors of health behaviors than was risk awareness[14]. Studies have also shown that the perceived advantages of certain health behaviors are associated with actual practice of such behaviors[15]. For prevention programs to be effective, it is important for health promotion advice to be culturally sensitive and relevant for the target population[16]. It is therefore important that the beliefs of specific target groups for dietary intervention are taken into account when planning primary prevention programs.

This investigation, the first of its kind in South Africa, aims at investigating the beliefs of South African adults living in the metropolitan areas of the country towards the importance of the link between food and cardiovascular health. More specifically, differences in beliefs towards food and cardiovascular health between the different

races, living standards, age and gender groups will be investigated. Additionally, differences in living standards, gender and age will be investigated within different ethnic groups. It also aims to determine whether this population looks for the Heart Foundation symbol on food products or not. Lastly, it will be determined where the link between food and heart disease ranks in terms of importance compared to other highly prevalent diseases in South Africa such as HIV/AIDS, the main cause of death (30%) and cancer, the fourth major cause of death (7.5%)[3].

The results of this investigation may be valuable in identifying target groups where more education regarding the link between nutrition and CVD is necessary. The results may also be used in the planning of primary prevention programs or revision of current primary prevention programmes, taking into account the beliefs of South African metropolitan adults from different race, age, gender and living standards groups.

Methods

Subjects

Two thousand South African individuals (16 years and older), randomly selected from metropolitan areas in South Africa, participated in this survey. The metropolitan areas were described as Gauteng, Pretoria, Durban/Pietermaritzburg, Port Elizabeth/East London, Bloemfontein and Cape Town. It included squatters but excluded live-in domestic workers and hostel dwellers. Due to incomplete data, three respondents' data were excluded from the analysis resulting in a total number of 1997 respondents. The sample was weighted to the 2000 census data of Statistics South Africa[17], to reflect the adult metropolitan population based on gender, age and race distribution. This resulted in a total population of 10 695 000. The total population was representative of both genders (5 423 000 men and 5 272 000 women) and major race groups (2 615 000 whites, 6 252 000 blacks, 1 255 000 coloureds and 573 000 Indians) from different age and living standards groups.

Study design

A randomized cross-sectional study design was used. The market research company, MARKINOR (Randburg, South Africa) was contracted to do the random selection and collection of the data. The sample was stratified by province and within province, by community size, city, township and suburb. Within each stratum, sampling points were determined by systematic random selection, based on cumulative population figures per group. A starting point per sample point was randomly selected. A low integer point was randomly selected and the first interview took place at the house with the lowest number ending in the low integer. From this starting point every third household was chosen until a cluster of five was completed. When there was more than one household on a stand, one was randomly selected. Within a household all qualifying members were listed and the qualifying respondent determined by a random selection grid. All efforts were made to interview this person. If this proved impossible even after three calls, including weekend and evening calls or if the person refused to participate, someone of the same gender, age and working status living in the same street substituted the person.

Contracted trained field workers with a minimum matric education administered questionnaires by conducting face-to-face interviews in the homes, in the language of the consumer's choice (English, Afrikaans, Xhosa, Zulu, Tswana, North Sotho or South Sotho). The base language of the questionnaire was English. It was then translated from the base language by a translator whose native language was the one into which the questionnaire was being translated. Someone whose native language was the base language then retranslated this version back into the base language. In this way translation errors could be identified and corrected. A minimum of 20% back-check on each interviewers work, either by a personal visit or telephonic call, was made by the team supervisor to ensure reliability and validity of data.

The field workers were also issued with "show cards" to aid them in ensuring that the participants fully understood the question being asked. The show cards explained the scale for the way in which questions were to be answered, as well as complex or foreign terms. For example, the question about cholesterol levels was explained as "Preventing excess fat in the blood, which may clog the blood vessels". The question

about heart disease was explained on the show card as "Making sure that your heart is kept healthy and preventing heart attacks".

Questionnaires

A multidisciplinary team consisting of marketers, dietitians, nutritionists and research specialists designed the questionnaires. Seventeen food- and health related questionnaires (with a number of sub-sections) were developed. Demographic information such as race, gender, age, and information to determine the Living Standard Measure (LSM) were collected by using a questionnaire. The South African Advertising Research Foundations' (SAARF) classification to group people according to their living standards using criteria such as degree of urbanisation and ownership of cars and major appliances was used. The SAARF LSM divides the population into ten groups, from 1 at the bottom end, to 10 at the top end[18]. There were no people in LSM group 1 living in metropolitan areas, and therefore were not included in this study.

The statements (questions) that were selected from the original questionnaires for the purpose of this investigation are summarized in Table 1.

Table 1: Selected statements (questions) relating to food and certain disease conditions

If you could influence the following health issues by eating certain food types, indicate how important each health issue would be to you:
1. Heart disease (2-1)
2. Weight loss (2-5)
3. Cholesterol lowering (2-9)
4. Blood pressure (2-10)
5. Diabetes (2-16)
6. Stroke (2-26)
7. Healthy blood vessels (2-29)
8. Cancer (2-2)
9. HIV/AIDS (2-23)

The number in brackets refers to the number of the statement in the original questionnaire (See addendum C).

Respondents were asked to rate how important each health issue would be to them on a scale of 1 to 5, as illustrated in Table 2.

Table 2: Five-point likert response scale used to determine degree of importance

RESPONSE	SCALE
Don't know	6
Very important	5
Important	4
Neither important nor unimportant	3
Unimportant	2
Very unimportant	1

The following question was included to test whether respondents were aware of the South African Heart Foundation symbol.

Table 3: Statement used to determine whether subjects look for the Heart Foundation Symbol

Indicate to what extent you agree or disagree with the following statements:
I look for the heart foundation symbol (3-10)

Respondents were asked to rate the above statement on how strongly they agreed with it on a scale of 1 to 5, as illustrated in Table 4.

A possible limitation of the questionnaires was that they were not tested in focus group discussions for comprehensibility, ambiguity or to ensure that the question was testing the appropriate belief of the respondents.

Table 4: Five-point likert response scale used to determine how strongly respondents agreed/disagreed with statements

RESPONSE	SCALE
Don't know	6
Strongly agree	5
Agree	4
Neither agree nor disagree	3
Disagree	2
Strongly disagree	1

Statistical analysis

The data collected by the field workers was captured manually and transferred into a computer database using the computer software package QUANVERT® (SPSS Inc, Chicago, IL, USA). The quantitative data was stored as an ASCII flat file, that was then loaded into the computer software package Statistica® Release 6 (Statsoft Inc., Tulsa, OK, USA) which was used to perform the statistical analysis. The weighted data was used for all the statistical analysis to reflect the total metropolitan population. Subjects who answered, "don't know" to any of the statements were treated as missing values.

Cross tabulations were carried out for the individual statements to calculate the frequencies of responses of the total population and the following subgroups: race, gender, age (<45 and ≥45 years) and LSM groups. The specific age groups were used because according to Bradshaw *et al.*, deaths from non-communicable diseases start increasing from the age of 45 years[3]. Cross tabulations were also used to describe the study population's demographic profile. Means and standard deviations (SD) of selected statements were also calculated.

An item and factor analysis using principal components for factor extraction was done to test the reliability and validity, respectively, of grouping the statements 1 to 7 and using it as a scale for beliefs regarding food and CVD. As indicated by the Cronbach's alpha (0.81) and the % of variance explained by the scale (53.1%), the

scale was reliable and valid. All seven statements, except the one on weight loss, were included in the scale.

One-way analysis of variance (ANOVA) was performed to test for significant differences between mean responses of different race, gender, age and LSM groups. In addition, within each race group, significant differences between mean responses of different gender, age and LSM groups were determined. In cases where there were more than two categories (race and LSM groups), post hoc comparisons were done to determine which means differed statistically significantly from each other by using the HSD test for unequal N. A small p-value (<0.05) is usually considered as statistically significant. However, statistical significance does not necessarily imply that the result is important in practice, especially when very large data sets are used. Ellis and Steyn (2003) reported that statistical significant tests have a tendency to yield small p-values as the size of the data sets increase[19]. They state the effect size is independent of sample size and is a measure of practical significance. In other words, it is a large enough effect to be important in practice. It has been described for differences in means as well as for the relationship in two-way frequency tables. Because of this study's large sample size, randomly selected from the South African metropolitan population, only practical significance between means will be reported.

Practical significance was calculated by using the standardized difference between the two means divided by the estimate for standard deviation. An effect size (d-value) of <0.5 was considered as a small effect and a d-value of ≥0.5 as a practical significant effect.

Results

The demographic profile of the study population is summarized in Table 5.

Although all the statistical analysis were performed on the 5 point likert response scales, for practical reasons, the results will be reported as "important" and "unimportant", which were obtained by combining "very important" with "important" and "unimportant" with "very unimportant". The same for the second scale where results will be reported as "agree" and "disagree". These were obtained by combining

"strongly agree" with "agree" and "strongly disagree" with "disagree". As discussed in the methods section, only practical significant differences of statistically significant results will be reported.

Table 5: Characteristics of study population (N = 10 695 000)*

Total group			Gender		Race			
Variables	**Number**	**%**	**Men**	**Women**	**White**	**Black**	**Coloured**	**Indian**
Gender								
Men	5 423 000	50.7			1 295 000	3 261 000	588 000	279 000
Women	5 272 000	49.3			1 320 000	2 991 000	667 000	294 000
Age group								
< 45 years	7 718 000	72.2	3 985 000	3 733 000	1 482 000	4 915 000	938 000	383 000
≥ 45 years	2 977 000	27.8	1 438 000	1 539 000	1 133 000	1 337 000	317 000	190 000
Race								
White	2 615 000	24.5	1 295 000	1 320 000				
Black	6 252 000	58.5	3 261 000	2 991 000				
Coloured	1 255 000	11.7	588 000	667 000				
Indian	573 000	5.36	279 000	294 000				
LSM group								
LSM 2	408 000	3.81	177 000	231 000	0	408 000	0	0
LSM 3	671 000	6.27	364 000	307 000	4 000	661 000	6 000	0
LSM 4	1 346 000	12.6	649 000	697 000	0	1 328 000	14 000	4 000
LSM 5	2 336 000	21.8	1 230 000	1 106 000	20 000	2 084 000	200 000	32 000
LSM 6	1 967 000	18.4	1 129 000	838 000	112 000	1 314 000	431 000	110 000
LSM 7	849 000	7.94	360 000	489 000	214 000	317 000	174 000	144 000
LSM 8	799 000	7.47	387 000	412 000	316 000	123 000	244 000	116 000
LSM 9	994 000	9.29	487 000	507 000	762 000	17 000	130 000	85 000
LSM 10	1 325 000	12.4	640 000	685 000	1 187 000	0	56 000	82 000

LSM: Living standard measure; * weighted data

The beliefs of South Africans, stratified for gender, age, race and LSM group regarding the importance of food and cardiovascular health are summarized in Table 6. No practical significant differences (d value was less 0.5 for all statements) were seen between gender, race, age or LSM groups, except for healthy blood vessels where differences were found between white and coloured South Africans.

In general, the majority of the population found the link between food and cardiovascular risk related health issues to be either important or very important. The statement with the highest average response for importance was "Heart disease" (93.5%), the lowest being "Weight loss" (61.4%). The statements of most importance to the Indian population were "Heart disease" (98.4%) and "Blood pressure" (95.8%), with "Weight loss" (63.7%) being the least important of the risk factors. In the white population, "Heart disease" (94.3%) was the most important and "Weight loss" (60.7%) the least important. The Black population reported "Heart disease" (92.4%) and "Blood pressure" (90.1%) to be the most important with "Weight loss" (59.2%) the

Table 6: Beliefs of South Africans regarding food and cardiovascular health

Variable	Heart disease		Weight loss		Cholesterol lowering		Blood pressure		Diabetes		Stroke		Healthy blood vessels		Heart Symbol	
	Un	Im	Un	Im	Un	Im	Un	Im	Un	Im	Un	Im	Un	Im	Disa	Agree
Total group																
	4.0	93.5	20.9	61.4	6.5	79.9	4.6	89.1	6.8	85.6	6.4	86.2	3.8	88.6	45.7	34.9
Gender																
Male	4.3	93.4	24.1	57.3	6.2	79.4	4.5	89.0	6.1	85.5	6.7	85.9	3.8	88.8	48.1	32.4
Female	3.7	93.6	17.6	65.6	6.8	80.5	4.8	89.2	7.6	85.7	6.0	86.5	3.7	88.4	43.2	37.6
Race																
White	2.4	94.3	17.4	60.7	5.3	83.6	6.0	83.7	10.8	75.7	10.2	79.0	5.3	83.6[a]	33.3	42.6
Black	5.4	92.4	23.8	59.2	7.2	76.4	4.1	90.1	5.2	88.5	5.2	88.3	3.3	89.5	51.4	29.4
Coloured	2.2	95.2	14.5	72.8	6.3	86.1	6.5	92.3	8.5	89.5	4.7	90.1	2.6	95.0[a]	43.7	41.6
Indian	0	98.4	19.7	63.7	6.3	86.2	0	95.8	2.8	89.9	5.4	88.1	4.7	87.4	44.4	46.0
Age group																
<45 years	4.7	92.6	19.9	63.6	7.8	78.7	5.2	88.2	7.3	85.3	7.1	85.2	4.2	88.4	46.9	32.7
≥45 years	2.1	96.0	23.4	55.8	3.3	83.0	3.2	91.4	5.8	86.3	4.6	88.7	2.7	89.2	42.6	41.0
LSM group																
LSM 2	10.8	87.5	23.8	56.1	0.1	73.8	5.2	88.6	3.2	91.5	5.3	89.6	3.6	83.0	65.1	18.9[bcde]
LSM 3	2.5	94.3	24.4	48.4	8.2	68.6	6.4	85.0	5.1	84.8	6.3	84.8	3.0	84.6	62.6	23.5[fgh]
LSM 4	5.7	91.7	21.6	60.7	6.3	77.3	3.2	91.2	4.2	90.2	3.9	87.5	4.4	88.6	52.8	31.9
LSM 5	4.0	94.4	24.8	57.0	8.2	74.2	3.0	90.8	4.8	89.1	4.8	90.1	2.8	90.3	48.8	31.7
LSM 6	4.0	93.4	21.6	66.9	7.4	83.7	6.1	89.7	8.4	85.8	7.6	85.7	3.6	92.1	46.5	33.6
LSM 7	3.8	94.6	21.5	66.6	6.6	79.4	3.4	91.6	7.5	86.1	6.0	88.7	4.0	89.5	48.7	36.1[b]
LSM 8	3.0	92.7	17.4	65.4	6.7	86.3	5.8	89.0	6.4	86.5	4.7	85.0	6.4	85.5	34.0	37.7[cf]
LSM 9	1.8	96.5	15.5	57.3	3.5	84.6	5.2	84.5	11.5	74.1	8.1	83.1	2.9	86.1	31.5	46.8[dg]
LSM 10	3.2	93.0	15.6	67.4	5.7	86.9	5.5	87.4	9.1	80.4	10.1	80.1	4.5	87.3	33.4	45.2[eh]

Un: unimportant; Im: important; Disa: disagree; Agr: agree. Results are reported as %. Percentages with similar symbols indicate groups that differed from each other with a practical significance of d > 0.5.

least important. "Heart disease" (95.2%) and "Healthy blood vessels" (95.0%) were the most important in the Coloured population whereas "Weight loss" (72.8%) was the least important. With regard to the "Weight loss" statement the Coloured population had the highest percentage of people finding this important at 72.8% with the Black population being the lowest at 59.2%.

Regarding the consumer's responses to "Looking for the Heart Foundation symbol", only 34.9% of South Africans agreed with the statement, while 45.7% disagreed with the statement. The highest percentage of consumers agreeing with the statement were found within the Indian population (46.0%) and the lowest amongst the black population (29.4%). Practical significance was found between the various LSM groups as illustrated in Table 4. There were practical significant differences between LSM 2 and LSM 7, 8, 9 and 10, where in LSM 2 a much smaller percentage (18.9%) of the study population agreed with the statement compared to 36.1-45.2% in LSM groups 7-10. Similarly, a practical significant smaller percentage of respondents (23.5%) in LSM 3 agreed with the statement compared to LSM groups 8, 9 and 10. Thus, there was a greater tendency for the higher LSM groups to look for the Heart Foundation symbol than the lower LSM groups.

Means (SD) and practical significant differences in South Africans' beliefs regarding the importance of food and cardiovascular health between gender, age and LSM groups within different race groups are summarized in Table 7.

Gender and age groups did not differ practically significantly within race groups. Practical significant differences were found only between LSM groups, in particular between the lower and higher LSM groups within all four race groups. In the white population group, LSM 3 (the lowest LSM group in this population) differed with practical significance from all other LSM groups, with LSM 3 finding the statement most important. In contrast, the subsequent LSM group (LSM 5) differed with practical significance from LSM 6, 7, 8, 9 and 10, with LSM 5 finding the statement least important. The same trend was seen in the coloured population with the lowest LSM group (LSM 3) that found the statement most important, and differed with practical significance from LSM groups 4, 5, 6, 7 and 10, while LSM 4, in contrast, found the statement least important, and differed with practical

significance from LSM groups 5, 6, 7, 8, 9 and 10. Furthermore, LSM 5 found the statement practically significantly less important compared to LSM 8 and 9.

Table 7: Means[#] (SD) and practical significant differences for importance of heart disease within race groups

Variable	White	Black	Coloured	Indian
Gender				
Male	4.5±0.7	4.5±0.8	4.7±0.5	4.6±0.6
Female	4.6±0.7	4.5±0.8	4.6±0.7	4.7±0.5
Age group				
<45 years	4.5±0.7	4.5±0.9	4.7±0.6	4.7±0.5
≥45 years	4.6±0.6	4.6±0.7	4.7±0.6	4.6±0.5
LSM group				
LSM 2	-	4.4±1.0[a]	-	-
LSM 3	5.0±0[abcdef]	4.5±0.7[b]	5.0±0.0[abcde]	-
LSM 4	-	4.6±0.9[c]	4.0±0.0[afghijk]	4.0±0.0[abcdef]
LSM 5	4.0±0.7[aghijk]	4.6±0.8[d]	4.5±0.7[bflm]	4.4±0.5[aghij]
LSM 6	4.5±0.6[bg]	4.5±0.8[e]	4.6±0.7[cg]	4.7±0.5[bg]
LSM 7	4.5±0.5[ch]	4.5±0.9[f]	4.7±0.6[dh]	4.7±0.5[ch]
LSM 8	4.5±0.6[di]	4.2±1.0[g]	4.8±0.5[il]	4.7±0.5[di]
LSM 9	4.6±0.6[ej]	5.0±0.0[abcdefg]	4.9±0.6[jm]	4.7±0.5[ej]
LSM 10	4.5±0.8[fk]	-	4.7±0.5[ek]	4.5±0.6[f]

Means with similar symbols indicate groups, within the different race groups, that differed from each other with a practical significance of d > 0.5.

[#]Mean score on 5 point likert scale

In the black population LSM 9 found the statement most important and this group differed with practical significance from LSM groups 2-8, with LSM 8 finding the statement least important. In the same context as noted above, the higher LSM groups in the black population had the least amount of respondents (0.3% and 2% in LSM groups 9 and 8 of the total black population).

In the Indian population, the lowest LSM group was group 4 (containing 0.7% of the total Indian population) and this group found the statement least important and differed with practical significance from all the other LSM groups. The mean value in LSM group 5 (containing 5.6% of the total Indian population) was also significantly lower compared to LSM groups 6, 7, 8 and 9. Thus, there was a trend in the Indian population for the lower LSM groups to find the statement less important than the higher LSM groups. When

excluding the lowest LSM group in the coloured population the same trend could be seen. There was no obvious trend in the white and black populations.

Differences in beliefs regarding the food and CVD scale between gender, age and LSM-groups within the different race groups were also analysed. Similar results as the above discussion of Table 7 were seen. In the white population LSM 3 and 5 reported practical significant lower responses compared to LSM 10. LSM 5 also reported practically significantly lower responses compared to LSM 7, 8 and 9. In the black population group, the highest LSM group was 9, which reported practical significant higher values compared to all the other LSM groups (LSM 2-8). In the coloured population group, LSM 4 had practical significant lower responses compared to LSM 3, 7, 8, 9 and 10. In the Indian population group LSM 4 had practical significant lower responses compared to LSM groups 5, 6 and 10, and LSM 5 also had practical significant lower responses compared to LSM groups 8 and 9. Thus, the results from the food and CVD scale, show a trend in all four race groups for the lower LSM groups to find the statement less important than the higher LSM groups.

In Figure 1 the ranking of the link between food and CHD by the respondents in terms of importance is compared to HIV/AIDS and cancer.

In the white population group, heart disease (94.3%) and cancer (91%) were both very important, with heart disease being ranked slightly higher than cancer. The white population was the least concerned about HIV/AIDS compared to the other population groups at 60%. In the black and coloured populations, the results were very similar. All three diseases were of great importance to them, with heart disease being ranked slightly higher than the other 2 diseases. The Indian population found heart disease (98.4%) and cancer (99%) both extremely important, with HIV/AIDS only at 81%.

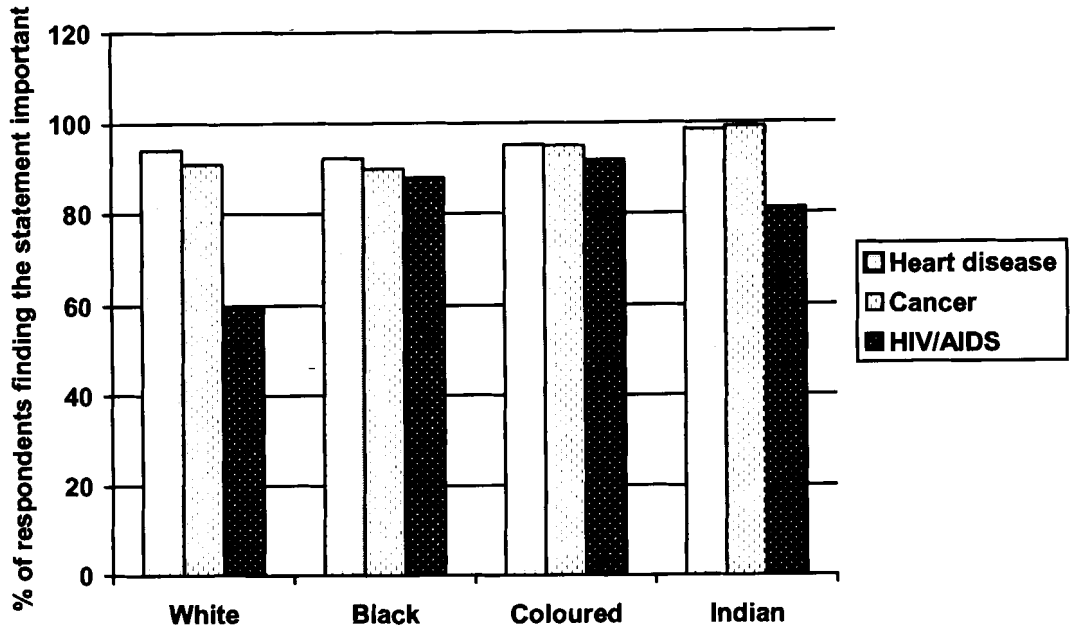

Figure 1: Ranking of importance of the link between food and some diseases in different race groups

Discussion

The present study aimed to investigate beliefs of South African adults living in the metropolitan areas of the country towards the importance of the link between food and cardiovascular health. More specifically, differences in beliefs towards food and cardiovascular health between the different races, living standards, age and gender groups were investigated. A randomized cross-sectional study design with questionnaires was used and the results were extrapolated to the total South African metropolitan adult population.

The majority of the study population (>80%) of all races, age groups, gender and LSM groups considered the link between food and CVD and some of its risk factors (cholesterol, blood pressure, diabetes and healthy blood vessels) to be "important" or "very important". Additionally, compared to other highly prevalent diseases in South Africa, such as HIV/AIDS and cancer, the link between food and CVD ranked higher in terms of importance in the white and black population groups and equally important in the Indian

and coloured population groups. This finding, combined with the fact that CVD is the second leading cause of death (due to disease) in South Africa at 16.6%[3], should have a positive effect on motivation for participation in food programs aimed at the prevention of CVD in this country.

In the Indian population the higher LSM groups found the link between food and heart disease more important than the lower LSM groups, whereas no clear trends could be seen in LSM groups in the white, black and coloured population groups. It should be noted that the lower LSM groups in white and coloured populations contained the lowest number of respondents (0.2%, 0% and 0.8% in LSM groups 3, 4 and 5, respectively, of the total white population and 0.5% and 1.1% in LSM groups 3 and 4 of the total coloured population). This may explain the inconsistent results. Results from the food and CVD scale showed a possible trend in all four race groups for lower LSM groups to find the statement less important than the higher groups. The availability of radios are widespread in LSM groups 2 and 3 (80 and 92%), television sets less so at only 30 and 55%, compared with LSM groups 9 and 10 with nearly 100% having radios and television sets. These higher LSM groups also have high percentages owning personal computers (access to internet) and satellite television[17]. These groups therefore have a lot more exposure to health messages from various organizations. This is possibly one of the reasons why most of the higher LSM groups found the statements important. Other possible reasons may include the higher income, as well as a higher regard for the importance of health in these higher LSM groups.

Of the five known risk factors for CVD included in the statements, weight loss and its link to food was believed to be of least importance, especially in the black population group. Sixty-one percent (n=6.5 million) of the total study population believed that it is important, 21% (n=2.2 million) believed that it is unimportant and 18% (n=1.9 million) were undecided whether it is important or not. LSM groups 2 and 3 consisted mainly of black respondents; these two groups also had the lowest positive response to this statement. This corresponds with results from other studies that have shown that in the black culture there is no social pressure to loose excess weight, especially in the rural areas[20,21]. Obesity is a well-established cause of diabetes mellitus, hypertension and lipid abnormalities[22]. In a review of published data on mortality from and risk factors of CVD in South Africans, Vorster *et al*

found that the prevalence of obesity in black women was higher than in other groups of women, while white men showed the highest prevalence among the male groups[2]. In the THUSA study, a cross-sectional study on the black population of the North West Province of South Africa, obesity was the most important factor associated with elevated total serum cholesterol and LDL-cholesterol concentrations during urbanization[23]. When looking at the black women in the same study, a high rate of obesity was found that was associated with risk for non-communicable disease[24]. The large number of South African adults who did not consider the link between food and weight loss important, is of great concern and identifies another area where education is necessary.

From the observation that the majority of South Africans consider the link between food and CVD to be important, it could be expected that existing programs in South Africa that promote foods that are good for heart health would be known and used. However, only 35% (n=3.7 million) of metropolitan South African adults agreed with the statement that they look for the Heart Foundation symbol, 46% (n= 4.9 million) disagreed and 19% (n= 2.0 million) were undecided. The respondents in the lower LSM groups (1 and 2) as well as the Black population group agreed the least with the statement to look for the Heart Foundation symbol. It is therefore important to investigate why such a large proportion of the South African adult metropolitan population does not look out for the Heart Foundation symbol.

It can be speculated that the food products targeted by the South African Heart Foundation are not affordable by the lower LSM groups or are not part of their usual diet pattern and it is therefore not important for them to look for the Heart Foundation symbol. It was shown in the United Kingdom that the little success made in changing the population's diet, occurred mostly where consumers were able to make similar choices at no extra cost[25]. Few of the products endorsed by the South African Heart Foundation are part of the staple foods consumed by black South Africans in lower LSM groups. The Heart Foundation also has various educational days and events, which are also perhaps missing the lower LSM groups[12,26].

A similar question regarding a "cancer symbol" was included in the questionnaire that could serve as validation for the question regarding the Heart Foundation symbol. At the time the questionnaire was administered, there was no "cancer symbol" on South African products.

Twenty nine percent (29%) of the respondents stated that they agreed with this statement. This might be an indication that the respondents did not understand the statement fully or were not being completely honest with their answers. It could, however, also be argued that these statements gave an indication of whether respondents look for any type of "health symbol". The data may, therefore, still indicate concern regarding the effectiveness of using "health symbols" and this needs to be investigated further.

This study has limitations in that all the conclusions made are based on just a few statements about peoples' beliefs. The conclusions are not based on any type of in-depth data on this specific topic, such as a group of questions to assess the attitude and other possible related factors such as knowledge and social influence. There is, therefore, a need for additional research, especially into the knowledge and attitudes of the lower socio-economic groups, to be able to develop effective prevention programs.

Conclusion and recommendations

CVD is an important cause of morbidity and mortality in South Africa and nutrition plays an important role in the prevention and treatment thereof. This study shows that the metropolitan South African adult population considers the influence of food on CVD important and finds CVD as important and in some race groups even more important than other major diseases in this country. There was a tendency for the higher LSM groups within all four race groups to have a stronger belief in the importance of the link between food and CVD than the lower LSM groups. Nutritional education, therefore, needs to be aimed at both genders and all ages of the lower socio-economic groups of South Africa.

Obesity has been proven to be a major risk factor for CVD, but the link between food and weight loss was not found to be that important to participants of this study compared to other risk factors for CVD, despite its high prevalence. The South African metropolitan population needs to be made aware of the risks associated with obesity and the role of nutrition in weight loss.

The Heart Foundation makes use of the Heart Symbol, to identify foods that are suitable as part of a healthy eating plan. Awareness programs seem to be reaching only the higher LSM groups and race groups using the specific products targeted by the Heart Foundation. The possible reasons why such a large percentage of the South African metropolitan adults do not look for the symbol or are undecided about it needs to be investigated and addressed.

This study shows that this population considers CVD an important issue and some risk factors are considered more important than others. Prevention programs promoting a healthy lifestyle, which would address the risk factors associated with CVD, should be received with a positive attitude. This will only be effective if the programs are aimed at specific LSM groups, are via the type of media that they listen to and address products and behaviors that they are familiar with.

Acknowledgements

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References

1. Joint WHO/FAO expert consultation on diet, nutrition and prevention of chronic diseases (2002: GENEVA). 2003. Diet, nutrition and the prevention of chronic diseases. WHO Technical report series: 916 [Online]. Available at: http://www.who.int/hpr/NPH/ docs/who.fao. expert.report. Accessed 23 September 2004.

2. Vorster HH. The emergence of cardiovascular disease during urbanisation of Africans. *Public Health Nutrition 2002;* **5**(1A):239-43.

3. Bradshaw D, Groenewald P, Laubscher R, Nannan N, Nojilana B, Norman R, *et al.* Initial burden of disease estimates for South Africa, 2000. *South African Medical Journal* 2003; **93**(9):682-688.

4. Seftal HC, Raal FJ, Joffee BI. Dyslipidaemia in South Africa. In: Fourie J, Steyn K, eds. *Chronic diseases of lifestyle in South Africa. MRC Technical report.* Cape Town: Medical research council. 61-71

5. South African Medical Association (SAMA) & Lipid and atherosclerosis society of Southern Africa (LASSA) working group. Diagnosis, management and prevention of the common dyslipidaemias in South Africa – clinical guideline 2000. *South African Journal of Medicine 2000;* **90**(2):164-178.

6. Kritchevsky D. History of Recommendations to the Public about Dietary Fat. *Journal of Nutrition 1998;* **128**:449s-452s.

7. Bazzano LA, He J, Ogden LG, Loria CM, Vupputuri S, Myers L, *et al.* Fruit and vegetable intake and risk of cardiovascular disease in US adults: the first national health and nutrition examination survey epidemiologic follow-up study. *American Journal of Clinical Nutrition 2002;* **76**:93-99.

8. Grundy SM, Cleeman JI, Merz B, Brewer B, Clark LT, Hunninghake DB, *et al.* Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III guidelines. *Circulation 2004;* **110**:227-239.

9. Wolmarans P. Position Statement on the dietary management of people with dyslipidaemia (ADSA). *South African Journal of Clinical Nutrition 2000;* **13**(1):16-22.

10. Vorster HH, Love P, Browne C. Development of food-based dietary guidelines for South Africa – the process. *South African Journal of Clinical Nutrition 2001;* **14**(3): s3-s6.

11. Steyn K, Steyn M, Swanepoel ASP, Jordaan PCJ, Jooste PL, Fourie JM, *et al.* Twelve year results of the Coronary Risk Factor Study (CORIS). *International Journal of Epidemiology 1997;* **26**(5): 964-917.

12. Heart Foundation of South Africa. The Heart Mark [online], 2003. Available at: http://www.heartfoundation.co.za/hmark.php. Accessed 12 July 2004.

13. Sargeant A, West DC. Understanding buying. Direct and interactive marketing. P 71-117. 2001.

14. Pelter K. Health behavior in Black South African University students. *South African Journal of Psychology 2000;* **30**(4):46-51.

15. Cody R, Lee C. Behaviours, beliefs, and intentions in skin cancer prevention. *Journal of Behavioral Medicine 1990*; **13**:373-389.

16. Farooqi A, Nagra D, Edgar T, Khunti K. Attitudes to lifestyle risk factors for coronary heart disease amongst South Asians in Leicester: a focus group study. *Family Practice 2000;* **17**(4): 293-297.

17. SAARF (South African Advertising Research Foundation). 2004. All Media and Products Survey (AMPS) 2003B. Bryanston : SAARF [CD-ROM.]

18. Haupt P. The SAARF universal living standards measure (SU-LSM™) – 12 years of continuous development 2003 [online], 2003. Available at: http://www.saarf.co.za/lsm-article.htm. Accessed 9 June 2004.

19. Steyn HS, Ellis SM. Practical significance (effect sizes) versus or in combination with statistical significance (P-values) 2003. Unpublished article, Potchefstroom University for CHE.

20. Walker ARP, Adam F, Walker BF. World pandemic of obesity: the situation in Southern African populations. *Public Health 2001;* **115**:368-372.

21. Mvo Z, Dick J, Steyn K. Perceptions of overweight African women about acceptable body size of woman and children. *Curationis 1999;* **22**(2): 27-31.

22. Manson JE, Tosteson H, Ridker PM, Satterfield S, Hebert P, O'Conner GT, *et al.* The primary prevention of myocardial infarction. *The New England Journal of Medicine 1992*; **326**(21):1406-1413.

23. Oosthuizen W, Vorster HH, Kruger A, Venter CS, Kruger HS, De Ridder JH. The impact of urbanisation on serum lipid profiles of Africans: The THUSA survey. *South African Medical Journal 2002;* **92**(9): 723 – 728, Sept.

24. Kruger HS, Venter CS, Vorster HH. Obesity in African women in the North West Province, South Africa is associated with an increased risk of non-communicable diseases: the THUSA study. *British Journal of Nutrition 2001;* **86**:733-740.

25. Kelly CNM, Stanner SA. Diet and cardiovascular disease in the UK: are the messages getting across? *Proceedings of the Nutrition Society 2003;* **62**:583-589.

26. Coutsoudis A, Maunder EMW, Ross F, Ntuli S, Taylor M, Marcus T, *et al.* A qualitative study on food security and caring patterns of vulnerable young children of South Africa. World Health Organization [Online], 2000. Available at:

http://www.who.int/nut/documents/ south_africa_hfns_vulnerable.pdf. Accessed 8 May 2005.

ADDENDA

ADDENDUM A

Public Health Nutrition Notes for Authors

Public Health Nutrition provides a forum for the presentation of original research findings in the field of Public Health Nutrition. It offers a population-based approach to the practical application of research findings. The Journal provides a timely vehicle for lively discussion of current controversies. In addition it also includes high quality reviews of key topics and seeks to identify and publish special supplements on major topics of interest to readers. As a contributor you should note and follow the guidelines set out below.

Content:

Original research findings - published as either full papers of 4000 words or short communications of around 2000 words on key issues, fast-tracked through the editorial system. Topical review papers - the Editors will invite topical reviews and also consider suggestions from authors who should submit an outline of the review in the first instance. Editorial comment - including guest editorials on key papers published in the journal. Letters to the Editors - addressing material published in *Public Health Nutrition.*

Refereeing: All contributions are read by two or more referees to ensure both accuracy and relevance, and revision may thus be required before final acceptance. Authors are asked to submit the names and contact details (including Email address if available) of up to four potential referees for their paper. On acceptance, contributions are subject to editorial amendment to suit house style.

Copyright: Papers should be accompanied by a signed statement to the effect that the author accepts the conditions laid down in these Notes for Authors. Contributors of accepted articles or their institutions retain copyright. It is the author's responsibility to obtain written permission to reproduce any material (including text and figures) that has appeared in another publication.

Preparation of Manuscripts
You should write in clear and concise English. Spelling should follow the Oxford English Dictionary. Authors whose native tongue is not English are assured that in-house editorial attention to their contributions will improve clarity.

Manuscripts should be prepared in a common word-processing package (Word '97 for Windows is preferred), in Times New Roman, or other common typeface, set up as double-spaced text with ample margins. Page numbers should be inserted. Standard abbreviations (e.g. Fig and Figs) and SI units must be used. When a paper has been accepted, electronic submission of word-processed text is encouraged, but it should be accompanied by a hard copy. All relevant financial interests should be declared.

Arrangement of Papers:

1. Title page including the article title, author(s), affiliation(s), keywords and one author identified for correspondence (please include the full postal address, telephone and fax numbers, and an Email address where available). A short title of up to 45 characters should be provided as a running head.
2. A structured abstract using the following headings: Objective, Design, Setting, Subjects, Results, Conclusions. The abstracts should be intelligible without reference to text or figures. It should not exceed 250 words in total.
3. The text divided under appropriate headings.
4. Acknowledgements (if any).
5. References.
6. Tables (each on a separate sheet).
7. Captions to illustrations (group on a separate sheet or sheets).
8. Illustrations, each on a separate sheet containing no text.

All submissions should be accompanied by a written declaration that the paper has not been submitted for consideration elsewhere. Details of submission on disk are available from CABI Publishing, Wallingford, Oxon OX10 8DE, UK.

Offprints: The main author will receive one copy of the issue in which their article is published and a PDF free of charge. Offprints can be ordered prior to publication.

Tables: Tables should be reduced to the simplest form and should not be used where the text or illustrations give the same information. They should be submitted on separate sheets at the end of the article. Each table must be accompanied by a clear and concise caption.

Illustrations: Copies of artwork should be submitted. The original illustrations should accompany the paper only after acceptance and revision. Avoid the use of grey tints or complex hatching. Half-tone photographs are acceptable where they make a real contribution to the text. Figure captions should be typed on a separate sheet and numbered corresponding to the relevant figures.

References: References are based on the Vancouver system. They should be numbered consecutively in the order in which they first appear in the text using superscript Arabic numerals. Where a reference is cited more than once in the text, use the same number each time.
Please ensure that references are complete, i.e. that they include, where relevant, author name(s), article or book title, volume and issue number, publisher and page reference.

Journal article

1. Ness AR, Powles JW. Fruit and Vegetables, and Cardiovascular Disease: A Review. *International Journal of Epidemiology.* 1997; **26:** 1–13.

Book chapter

2. Clayton D, Gill C. Covariate measurement errors in nutritional epidemiology: effects and remedies. In: Margetts BM, Nelson M, eds. *Design Concepts in Nutritional Epidemiology*. Oxford: Oxford University Press, second edition, 1997: 87-106.

Book
3. Eastwood M. *Principles of Human Nutrition*. London:Chapman & Hall, 1997.

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Three copies of the manuscript (with the word processor file) and artwork should be submitted to:

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ADDENDUM B

DEMOGRAPHIC QUESTIONNAIRE

MARKINOR

EXECUTIVE

METRO
MALES/FEMALES
- MAY 2002 -

2006/04/25
JOB NO: 02/0003/00MBUS2/fb
SETFIELD 1 - 4
TYPEFIELD 79 -80

DP NUMBER

RESPONDENT NAME: .....

RESPONDENT ADDRESS: .....

.....

.....

..... CODE: .....

TELEPHONE: (W) ..... (H) .....

(CELL) .....

SAMPLE NUMBER: | | | | | | | | | | 9- 10- 11- 12- 13- 14- 15- 16- 17-

INTERVIEWER NUMBER: | | | | | 18- 19- 20- 21-

INTERVIEW COMPLETED ON (DATE): 22- | | DAY | | MONTH | 2002

TIME TAKEN ON THIS INTERVIEW (IN MINUTES) (ENTER 99 IF GREATER THAN 99) | | 28- 29-

INTERVIEWER: I hereby certify that this interview has been carried out by me according to the instructions I received from Markinor and has been checked.

NAME: ..... SIGNED: .....

CHECKING TO FIELD/ INTERVIEWER		EDIT TO CHECKING		BACKCHECK:	
30-1	Yes	31-1	Yes	Personal	32-1
-2	No	-2	No	Telephone	33-2
				Neither	34-3

BRANCH NAME: .....

CHECKER NAME: .....

BACKCHECKER NAME: .....

EDITOR NAME: .....

PAGE AND QUESTION NUMBERS WITH ERRORS	TICK IF ERRORS SORTED	TICK IF ERRORS BACK-CHECKED	PAGE AND QUESTION NUMBERS WITH ERRORS	TICK IF ERRORS SORTED	TICK IF ERRORS BACK-CHECKED

DEMOGRAPHICS

A. **GENDER:**

1. Male 52-1
2. Female -2

B. **AGE:**

SHOW CARD: Into which age group do you fall? Just give the number.

1. 16 – 17 years 53-01
2. 18 – 19 years -02
3. 20 – 24 years -03
4. 25 – 29 years -04
5. 30 – 34 years -05
6. 35 – 39 years -06
7. 40 – 44 years -07
8. 45 – 49 years -08
9. 50 – 54 years -09
101. 55 – 59 years -10
1. 60 – 64 years -11
12. 65+ years -12

C. **WORKING STATUS:**

Which of these statements best describes your working life? ONE MENTION ONLY.

1. Working full-time 55-1
2. Working part-time -2
3. Not working:
   - 3.1 Housewife -3
   - 3.2 Student -4
   - 3.3 Retired -5
   - 3.4 Unemployed
     - looking for work -6
     - not looking for work -7

PERSONAL DETAILS

D. **GENDER:**

1. Male 56-1
2. Female -2

E. **LANGUAGE:**

E1. **SHOW CARD:** Can you please tell me what your home language is, i.e. the language that you mostly speak at home?

E2. Which languages can you understand?

E3. Which languages can you read?

		OMO E1 HOME	MMP E2 UNDER-STAND	MMP E3 READ
1.	English	57-01	59-1	5-1
2.	Afrikaans	-02	60-2	6-2
3.	Zulu	-03	61-3	7-3
4.	Xhosa	-04	62-4	8-4
5.	N. Sotho (Pedi)	-05	63-5	9-5
6.	S. Sotho	-06	64-6	10-6
7.	Tswana	-07	65-7	11-7
8.	Tsonga/Shangaan	-08	66-8	12-8
9.	Venda	-09	67-9	13-9
10.	Swazi	-10	68-0	14-0
11.	Ndebele	-11	69-1	15-1
12.	Other	-12	70-2	16-2
13.	None			17-3

F. **EDUCATION:**

SHOW CARD: What is the highest level of education you personally have achieved? Just give me the number. ONE MENTION ONLY.

1. No schooling 18-01
2. Some primary school -02
3. Primary school completed -03
4. Some high school -04
5. Matric -05
6. Artisan's certificate obtained -06

POST-MATRIC (DEGREES/DIPLOMAS/ CERTIFICATES)

7. Technikon diploma/degree completed -07
8. University degree completed -08
9. Professional -09
10. Technical -10
11. Secretarial -11
12. Other (STATE) -12

→ **IF OTHER, PROBE THOROUGHLY AND FIND OUT WHETHER MATRIC OR NOT**

G. **WORKING STATUS:**

ONE MENTION ONLY.

1. Working full-time 20-1
2. Working part-time -2
3. Not working:
   - 3.1 Housewife -3
   - 3.2 Student -4
   - 3.3 Retired -5
   - 3.4 Unemployed
     - looking for work -6
     - not looking for work -7

H. **IF WORKING: OCCUPATION:**

What is your occupation?

21-

I. **AGE:**

SHOW CARD: Into which age group do you fall? Just give me the number.

1. 16 – 17 years 22-01
2. 18 – 19 years -02
3. 20 – 24 years -03
4. 25 – 29 years -04
5. 30 – 34 years -05
6. 35 – 39 years -06
7. 40 – 44 years -07
8. 45 – 49 years -08
9. 50 – 54 years -09
10. 55 – 59 years -10
11. 60 – 64 years -11
12. 65+ years -12

J. **MARITAL STATUS:**

SHOW CARD: What is your marital status?

ONE MENTION ONLY.

1. Single 24-1
2. Married -2
3. Living together -3
4. Widowed -4
5. Divorced -5
6. Separated -6

CARD 2

PERSONAL DETAILS

K. **TYPE OF DWELLING:** (BY OBSERVATION)

ONE MENTION ONLY.

1.	Informal dwelling/shack, not in a back yard	25-01
2.	Informal dwelling/shack in a back yard	-02
3.	Caravan or mobile home	-03
4.	Traditional hut	-04
5.	Matchbox-type house or 51/9 (3 – 4 rooms) on a separate stand/yard	-05
6.	Improved matchbox-type house on a separate stand/yard	-06
7.	Suburban-type house (2 or more bedrooms, inside bathroom) on a separate stand/yard	-07
8.	Second house/cottage on this property	-08
9.	Granny flat on this property/flatlet	-09
10.	Garage/modified garage/rooms in the back	-10
11.	Rondavel/Zozo hut	-11
12.	Part of a house/share a house	-12
13.	Townhouse or cluster house in complex	-13
14.	Semi-detached or joint house	-14
15.	A unit in a block of flats	-15
16.	RDP house	-16

L. **TOTAL MONTHLY HOUSEHOLD INCOME:**

Purely for statistical purposes, could I ask how many people in your household earn money?

Please include those who have an income from pensions and investments, but exclude children's part-time earnings.

Number of people earning money:

Total: [ ] 27- ⇦

SHOW CARD: What is the total monthly household income before tax or deductions? Just give me the number.

1.	R20 000+	29-01
2.	R18 000 – R19 999	-02
3.	R16 000 – R17 999	-03
4.	R14 000 – R15 999	-04
5.	R12 000 – R13 999	-05
6.	R10 000 – R11 999	-06
7.	R9 000 – R9 999	-07
8.	R8 000 – R8 999	-08
9.	R7 000 – R7 999	-09
10	R6 000 – R6 999	-10
11	R5 000 – R5 999	-11
12	R4 000 – R4 999	-12
13	R3 000 – R3 999	-13
14	R2 500 – R2 999	-14
15.	R1 400 – R2 499	-15
16	R1 200 – R1 399	-16
17	R900 – R1 199	-17
18	R500 – R899	-18
19	Up to R499	-19
20.	Refused	-20

CARD 3/4

PERSONAL DETAILS

		GO TO:
PD1.	Which one of these phrases best describes your own case? Are you the person who is ....? READ OUT.	
1.	Mainly responsible for day-to-day household purchases 5-1	PD2
2.	Partially responsible for day-to-day household purchases -2	
3.	Not at all responsible for day-to-day household purchases -3	PD4
PD2.	IF MAINLY/PARTIALLY IN PD1: SHOW CARD: Here is a list of shops. Please tell me at which shop or shops you usually do your bulk/full-up (food and groceries) shopping.	
PD3.	IF MAINLY/PARTIALLY IN PD1: SHOW CARD: At which ONE food and grocery store do you estimate that you spend the MOST money?	PD5
PD4.	IF NOT AT ALL IN PD1: SHOW CARD: Where does the person who is responsible for the day-to-day purchases for your household shop for food and groceries? (We are NOT talking about DAILY purchases, such as bread and milk.)	
PD5.	ASK ALL: SHOW CARD: Please tell me which one(s) of these shops you usually buy your toiletries from.	

		PD2 MMP	PD3 OMO	PD4 MMP	PD5 MMP
1.	Shoprite/Checkers	6-1	28-01	30-1	52-1
2.	Clicks	7-2	-02	31-2	53-2
3.	Diskom	8-3	-03	32-3	54-3
4.	Friendly Grocer	9-4	-04	33-4	55-4
5.	Hyperama	10-5	-05	34-5	56-5
6.	Multisave	11-6	-06	35-6	57-6
7.	OK Supermarket	12-7	-07	36-7	58-7
8.	Pick 'n Pay Hypermarket	13-8	-08	37-8	59-8
9.	Pick 'n Pay Supermarket	14-9	-09	38-9	60-9
10.	Rite Valu	15-0	-10	39-0	61-0
11.	Score Supermarket	16-1	-11	40-1	62-1
12.	Sentra Stores	17-2	-12	41-2	63-2
13.	Spar	18-3	-13	42-3	64-3
14.	Super Value	19-4	-14	43-4	65-4
15.	Woolworths	20-5	-15	44-5	66-5
16.	Chemist/pharmacy	21-6	-16	45-6	67-6
17.	Local neighbourhood supermarket	22-7	-17	46-7	68-7
18.	Garage convenience shop	23-8	-18	47-8	69-8
19.	Spaza shop	24-9	-19	48-9	70-9
20.	Township supermarket	25-0	-20	49-0	71-0
21.	Any other outlet	26-1	-21	50-1	72-1
22.	None/Don't know	27-2	-22	51-2	73-2

PD6. SHOW CARD: The following questions are of a personal nature but the information is only going to be used for noting different trends in different parts of the country. Your name will never be related to your answers or given to anybody else. Could you please tell me which of the following, if any, you have in your home? Just give me the number/s.

1.	Electricity	5-1
2.	Running water (water laid on) inside or outside the house (on your property)	6-2
3.	Motor car/station wagon/bakkie/minibus/kombi in running order (including company cars)	7-3
4.	Domestic servant or helper (part or full-time)	8-4
5.	Dishwashing liquid	9-5
6.	Flush toilet (in or outside house)	10-6
7.	Hot running water from a geyser	11-7
8.	Microwave oven	12-8
9.	Fridge/freezer	13-9
10.	Deep freeze	14-0
11.	Floor polisher/vacuum cleaner	15-1
12.	Electricity switched on	16-2
13.	Washing machine	17-3
14.	Tumble drier	18-4
15.	Durable items bought on credit in last 12 months	19-5
16.	Television set	20-6
17.	Hi-fi/music centre	21-7
18.	Access to the Internet on your PC at home	22-8
19.	Access to a PC at home	23-9
20.	Access to a cellular phone at home	24-0
21.	M-Net	25-1
22.	DStv	26-2
23.	Built-in kitchen sink	27-3
24.	Dishwasher	28-4
25.	Stove/hotplate (electric)	29-5
26.	Sewing machine	30-6
27.	Video cassette recorder	31-7
28.	Home security service	32-8
29.	None of these	33-9

CARD 4/5

PERSONAL DETAILS

PD7. **SHOW CARD:** Here is a list of different types of policies and plans which you can take out with an insurance company. Can you please tell me which, if any, you **PERSONALLY** have?

1.	Whole life policy	36-1
2.	Endowment/savings/investment policy	37-2
3.	Retirement annuity/personal pension policy or plan	38-3
4.	Funeral insurance	39-4
5.	Medical insurance	40-5
6.	Short-term insurance (motor vehicle/household contents insurance)	41-6
7.	Other (SPECIFY):	42-7
8.	None of these	43-8

PD8. **SHOW CARD:** Here is a list of different financial services. Which services, if any, do you **PERSONALLY** have or make use of?

1.	Cheque/current account	46-1
2.	Savings account/book	47-2
3.	Transmission account	48-3
4.	Investments/subscription/paid-up shares	49-4
5.	Credit card	50-5
6.	Petrol/Garage card	51-6
7.	ATM card	52-7
8.	Loan	53-8
9.	None of these	54-9

PD9. **TELEPHONE INCIDENCE**

Do you have a Telkom telephone (not cell phone)?

	READ OUT:	YES	NO
1.	In-home	57-1	-2
	IF YES IN PD9.1:		
2.	Operating/working	58-1	-2
	IF YES IN PD9.1:		
3.	In directory/telephone book	59-1	-2

PD10. **RACE: (BY OBSERVATION)**

1.	White	60-1
2.	Black	-2
3.	Coloured	-3
4.	Indian	-4

PD11. Please could you tell me your exact age?

61- 62-

Refusal -99

PD12a. Are there any children 15 years or younger, living in this household?

1.	Yes	63-1
2.	No	-2

PD12b. **HOUSEHOLD COMPOSITION:**

How many people, excluding servants and household helpers, but including yourself, are there in each of the following groups, currently living in this household?

→ **RECORD BELOW BY CATEGORY**

	MALES	FE-MALES
Under 12 months	5-	31-
12 – 23 months	7-	33-
24 – 35 months	9-	35-
36 – 47 months	11-	37-
4 – 6 years	13-	39-
7 – 9 years	15-	41-
10 – 12 years	17-	43-
13 – 14 years	19-	45-
15 years	21-	47-
16 – 18 years	23-	49-
19 – 24 years	25-	51-
25 – 34 years	27-	53-
35+ years	29-	55-

OFFICE USE ONLY. **MALES** [ ] 57-

FEMALES [ ] 59-

PD13a. How many cars does this family own/have the use of (including company cars) (in running order)?

61- [ ]

PD13b. **IF NUMBER 3 IN PD6 ON PREVIOUS PAGE, ASK:** You said you had a motor vehicle in running order. Is this motor vehicle a ... (READ OUT)?

1.	Car/sedan	63-1
2.	Car/hatchback	64-2
3.	Beach buggy	65-3
4.	2-seater coupé	66-4
5.	Bakkie	67-5
6.	4 X 4	68-6
7.	Other (SPECIFY):	69-7

PD14. How many radios does this family own/have the use of (in working order)?

72- [ ]

PERSONAL DETAILS			
1 To which religious denomination or group do you belong?	1.	Buddhist	74-1
	2.	Christian: Roman Catholic	-2
	3.	Christian: Protestant	-3
	4.	Hindu	-4
	5.	Jewish/ Judaism	-5
	6.	Muslim/ Islam	-6
	7.	ZCC/Zion Christian Church/ Church of Shembe/ Other African Independent Church	-7
	8.	Other (SPECIFY):	-8
			-9
	9.	None	-0

ADDENDUM C

QUESTIONNAIRE

2.	SHOW CARD: If you could influence the following **health issues by eating certain food types**, please use the showcard to indicate how important each health issue would be to you?						
READ OUT → (OMO)		VERY IMPORT-ANT	IMPORTANT	NEITHER IMPORTANT NOR UNIMPONTANT	UNIMPORTANT	VERY UNIMPORTANT	DON'T KNOW
1.	Heart disease	-5	-4	-3	-2	-1	-6
2.	Cancer	-5	-4	-3	-2	-1	-6
3.	Osteoporosis	-5	-4	-3	-2	-1	-6
4.	Constipation	-5	-4	-3	-2	-1	-6
5.	Weight loss	-5	-4	-3	-2	-1	-6
6.	Eyesight	-5	-4	-3	-2	-1	-6
7.	Energy (physical)	-5	-4	-3	-2	-1	-6
8.	Mental performance and brain development	-5	-4	-3	-2	-1	-6
9.	Cholesterol lowering	-5	-4	-3	-2	-1	-6
10.	Blood pressure	-5	-4	-3	-2	-1	-6
11.	Cold hands & feet	-5	-4	-3	-2	-1	-6
12.	Sexual performance	-5	-4	-3	-2	-1	-6
13.	Immune boosting	-5	-4	-3	-2	-1	-6
14.	Reduction of menopausal symptoms	-5	-4	-3	-2	-1	-6
15.	Allergies	-5	-4	-3	-2	-1	-6
16.	Diabetes	-5	-4	-3	-2	-1	-6
17.	A well-functioning gut	-5	-4	-3	-2	-1	-6
18.	Bladder infection	-5	-4	-3	-2	-1	-6
19.	Healthy skin, hair and nails	-5	-4	-3	-2	-1	-6
20.	Healthy teeth	-5	-4	-3	-2	-1	-6
21.	Forgetfulness	-5	-4	-3	-2	-1	-6
22.	Lung function	-5	-4	-3	-2	-1	-6
23.	HIV/AIDS	-5	-4	-3	-2	-1	-6
24.	Arthritis	-5	-4	-3	-2	-1	-6
25.	Improved mood	-5	-4	-3	-2	-1	-6
26.	Stroke	-5	-4	-3	-2	-1	-6
27.	Wound healing	-5	-4	-3	-2	-1	-6
28.	Anti-ageing	-5	-4	-3	-2	-1	-6
29.	Healthy blood vessels	-5	-4	-3	-2	-1	-6

3. SHOW CARD: Now let's discuss the **health information contained on the packaging of food products.** Please indicate to what extend you agree or disagree with the statements by using the following scale on the show card.

	READ OUT → OMO	STRONGLY AGREE	AGREE	NEITHER AGREE NOR DISAGREE	DISAGREE	STRONGLY DISAGREE	DON'T KNOW
1.	I don't take any notice of them	-5	-4	-3	-2	-1	-6
2.	They seem to be on the increase but I don't take any notice of them	-5	-4	-3	-2	-1	-6
3.	I never read them because I'm not interested in them	-5	-4	-3	-2	-1	-6
4.	I never read them because I don't have the time	-5	-4	-3	-2	-1	-6
5.	I don't worry about the information because I buy the cheapest brand	-5	-4	-3	-2	-1	-6
6.	I don't worry about the information because I buy based on my favourite brand	-5	-4	-3	-2	-1	-6
7.	I don't take any notice of them as they are an excuse for making products more expensive	-5	-4	-3	-2	-1	-6
8.	I have read some of the health messages on products	-5	-4	-3	-2	-1	-6
9.	I don't take any notice of health information as it is only a marketing hype	-5	-4	-3	-2	-1	-6
10.	I look for the Heart Foundation symbol	-5	-4	-3	-2	-1	-6
11.	I look for the Cancer Association symbol	-5	-4	-3	-2	-1	-6
12.	I think the Heart Foundation symbol is just a way for them to make money	-5	-4	-3	-2	-1	-6
13.	I only read health information on certain food items that I buy	-5	-4	-3	-2	-1	-6
14.	Health information cannot be believed as it is advertising	-5	-4	-3	-2	-1	-6
15.	Health messages can be backed up by scientific studies	-5	-4	-3	-2	-1	-6
16.	I would only buy products with a health message if I knew it was backed by scientific research	-5	-4	-3	-2	-1	-6
17.	I always look for health information	-5	-4	-3	-2	-1	-6
18.	I am concerned about my health and so try to choose from products that give me detailed health information	-5	-4	-3	-2	-1	-6

ADDENDUM D

SHOW CARDS

JOB NO.02/0003

METRO
SECTION– PROJECT MASTERS
SHOWCARD FOR Q.2

DEFINATIONS

ENGLISH:	
1. Heat disease	Heart attacks
2. Cancer	Cancer
3. Osteoporosis	Weak bones
4. Constipation	Constipation
5. Weight loss	Weight loss
6. Eyesight	Deterioration of eyesight, cataracts
7. Energy (physical)	Having enough energy to get through the day
8. Mental performance and brain development	Good concentration, being alert
9. Cholesterol lowering	Excess fat in blood that clogs blood vessels
10. Blood pressure	High blood pressure
11. Cold hands & feet	Cold hands & feet
12. Sexual performance	Having adequate sexual interest and activity
13. Immune boosting	Improving the body's ability to protect itself against germs
14. Reduction of menopausal symptoms	Hot flushes and mood changes generally experienced in mid-life
15. Allergies	Negative reactions to pollen and certain foods
16. Diabetes	High blood sugar
17. A well functioning gut	Absence of bloating, cramping or other stomach and intestinal problems
18. Bladder infection	Painful urination
19. Healthy skin, hair and nails	Healthy skin, hair and nails
20. Healthy teeth	Healthy teeth
21. Forgetfulness	Forgetfulness
22. Lung function	Absence of breathing problems
23. HIV/AIDS	HIV and associated problems such as diarrhoea, TB and weight loss
24. Arthritis	Painful joints
25. Improved mood	Feeling of happiness and of being content
26. Stroke	Brain attack
27. Wound healing	Fast healing of wounds
28. Anti-aging	Maintaining physical and mental youthfulness
29. Healthy blood vessels	Absence of problems of the blood flow in the body

MARKINOR

METRO A/B

SECTION E – PROJECT MASTERS

SHOWCARD FOR Q.E2
**TOONKAART VIR V.E2

ENGLISH:	AFRIKAANS:
5. Very important	5.
4. Important	4.
3. Neither important nor unimportant	3.
2. Unimportant	2.
1. Very unimportant	1.

MARKINOR

METRO A/B

SECTION E – PROJECT MASTERS

SHOWCARD FOR Q.E3, Q.E5, Q.E6, Q.E7, Q.E10, Q.E13, Q.E14 AND Q.E15

**TOONKAART VIR V.E3, V.E5, V.E6, V.E7, V.E10, V.E13, V.E14 EN V.E15

ENGLISH:	AFRIKAANS:
5. Strongly agree	5.
4. Agree	4.
3. Neither agree nor disagree	3.
2. Disagree	2.
1. Strongly disagree	1.

MARKINOR