

Perception and knowledge of black Africans on physical activity and non-communicable diseases

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Author's contribution and declaration

Author	Contribution
Ms S.J. Makamu (MSc student)	First author, collected, processed and analysed data. Responsible for all manuscripts and dissertation.
Prof. S.J. Moss (Supervisor)	Supervisor, co-author, conceptualisation of study, design and planning of manuscripts, analysis and interpretation of results critical reading of the manuscripts and finalisation of the manuscripts.
Prof. M. Cameron (Co-Supervisor)	Co-supervisor, co-author, assistance in writing of manuscripts, data coding and acquisition of qualitative data, analysis and interpretation of data. Critical reading of the manuscripts and finalisation of the manuscripts.
Mr. F.G. Watson (Co-author)	Co -author of Chapter 4, training for performing interviews, qualitative data extraction and interpretation of results, critical reading of final manuscript.
Prof. C.J. Wilders (Assistant-Supervisor)	Co-author on Chapter 3

The co-authors of the two manuscripts, as listed below, hereby give permission to Miss. S.J. Makamu to include the two manuscripts as part of the Masters dissertation. The contribution of the co-authors was kept within limits in assisting with the planning and execution of the study, as well as supervising and guidance in completing the dissertation. The dissertation, therefore serves as fulfilment of the requirements for the M.Sc. Degree in Biokinetics. Further to be declared that Miss. S.J. Makamu had a great enough input to be the primary author of the articles.



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Abstract

Perception and knowledge of black Africans on physical activity and non-communicable diseases

The burden of non-communicable diseases (NCDs) is high in South Africa. Behavioural conducts and lifestyle factors, unhealthy diets and physical inactivity are the major contributors to the development of NCDs among South Africans. Physical activity (PA) is a modifiable risk factor that is also low in cost for preventing and managing NCDs. PA for health outcomes remains low among black South Africans. Regular engagement in PA is influenced by the knowledge and perception that a person has about the influence of PA as a healthy lifestyle. No studies that investigate perceptions and knowledge of NCDs and PA among black South Africans could be found in literature. The main purpose of this study was to explore and determine the knowledge and perceptions of NCDs and PA among black South Africans.

A total of 93 black South Africans from the Northern Cape and North West provinces voluntarily participated in the study. The participants consisted of groups of employed and unemployed men and women residing in an urban community, men working in unskilled labour conditions residing in rural areas and unemployed women residing in a deep rural area. The recruitment procedures included flyers, local radio announcements, participants recruited from previous researchers, mass communication, and word of mouth. A mixed method approach was performed that consisted of quantitative and qualitative methods. Quantitative methods were employed to determine the point prevalence of NCD risk factors among 93 participants. Of these participants, 54 participated in a survey to determine knowledge of NCDs and PA. Participants from deep rural areas were excluded from the survey owing to a high incidence of illiteracy. A qualitative exploration of perceptions of NCDs and PA was performed.

The quantitative procedures included a survey for heart disease knowledge and PA knowledge questionnaires. This was followed by NCD risk factor profile measurements; weight, height, waist and hip circumference, resting blood pressure, peripheral blood measurements for glucose and total cholesterol and objective PA measurements using combined accelerometry and heart rate (Actiheart®) for seven consecutive days. Qualitatively, focus group discussions (FGDs) were conducted to explore perceptions of

the PA and NCDs using an open-ended semi-structured questionnaire. SPSS version 22 was used in all quantitative statistical analyses. Descriptive statistics reporting means and standard deviations and frequencies were performed to determine knowledge of NCD risk factors and PA, and to determine the point prevalence of NCD risk factors. Partial correlation analyses were performed to determine the relationship between knowledge of heart disease, knowledge of PA and current PA and risk factors of heart disease. Statistical significance was set at $p < 0.05$. Qualitative data was analysed. FGDs were audio recorded and transcribed for analysis. The Noticing, Thinking and Coding approach was used to analyse data using Atlas.ti7.

Black South Africans have high risk profiles for NCDs. The highest prevalence was for systolic blood pressure (71%), physical inactivity (68%) and markers of overweight and obesity with 67%. NCD knowledge was $59 \pm 8\%$ and the total sample mean for PA was $84 \pm 16\%$. The results of this study found a significant relationship between NCD knowledge and activity levels among males ($r = 0.38$; $p = 0.03$). Among women PA knowledge positively associated with PA, though not statistically significant ($r = 0.29$; $p = 0.42$). The knowledge of NCDs and NCD risk factors results from the qualitative exploration of this study showed that black South Africans have limited knowledge about NCDs and negative perceptions about NCDs. They have an undistinguished knowledge of PA and are unable to apply the PA knowledge for disease prevention or management. It is therefore concluded that among black South Africans there is limited knowledge and misconception about PA. Black South Africans also lack knowledge on NCDs and have negative perceptions about NCD. An improved understanding of the perceptions of the population about physical activity and disease outcomes should be assessed in future studies in order to ensure the adoption of physical activity for the management of risk factors for NCDs.

Key words: knowledge, perceptions, physical activity, non-communicable diseases, black South Africans, health believe model

Opsomming

Persepsies en kennis onder swart Afrikane van fisieke aktiwiteit en nie-oordraagbare siektes

Die las van nie-oordraagbare siektes (NOS) is hoog in Suid-Afrika. Gedrag- en leefstylfaktore, ongesonde dieet, en fisieke onaktiwiteit is die grootste bydraers tot die ontwikkeling van NOS onder Suid-Afrikane. Fisieke aktiwiteit (FA) is 'n goedkoop veranderbare risikofaktor in die voorkoming en bestuur van NOS. Fisieke aktiwiteit vir gesondheidsredes bly laag onder swart Suid-Afrikane. Gereelde FA word beïnvloed deur die kennis en persepsie wat 'n persoon het oor die invloed van FA op 'n gesonde leefstyl. Geen studies wat persepsies en kennis van NOS en FA onder swart Suid-Afrikane ondersoek kon in die literatuur gevind word nie. Die hoofdoel van hierdie studie was om die kennis en persepsie van NOS en FA onder swart Suid-Afrikane te bepaal.

'n Totaal van 93 swart Afrikane uit die Noord Kaap en Noordwes provinsies van Suid Afrika het vrywillig aan die studie deelgeneem. Die deelnemers het bestaan uit groepe werknemers en werklose mans en vroue wat in 'n stedelik gemeenskap woon, mans wat as ongeskoolde arbeiders werk en in die landelike gebiede werk, en werklose vrouens wat in 'n diep landelike gebied woon. Die werwingsmetodes het bestaan uit pamflette, plaaslike radio-aankondigings, deelnemers gewerf van vorige navorsers, massakommunikasie, en mond-tot-mond-kommunikasie. 'n Benadering van gemengde metodes is gevolg, waarin sowel kwantitatiewe en kwalitatiewe metodes vir data insameling gebruik is. Kwantitatiewe metodes is gebruik om die punt voorkoms NOS se risikofaktore onder 93 deelnemers te bepaal. Van hierdie deelnemers het 54 deelgeneem aan 'n opname om kennis van NOS en FA te bepaal. Deelnemers in diep landelike gebiede is uitgesluit van die opname as gevolg van 'n hoë voorkoms van ongeletterdheid. 'n Kwalitatiewe ondersoek is uitgevoer om die persepsies van NOS en FA te bepaal.

Die toetsprosedures het 'n opname ingesluit oor kennis van hartsiektes en FA. Dit is gevolg deur die meting van die NOS se risiko faktore soos massa, lengte, middel- en heupomtrek, bloeddruk, perifere bloedmetings vir glukose en totale cholesterol. FA-metings is bepaal met behulp van gekombineerde versnelling en hartklopmonitering

(Actiheart®) oor sewe dae. Kwalitatief is fokusgroepbesprekings (FGBs) uitgevoer om persepsies oor FA en NOS te ondersoek met behulp van 'n oop semi-gestruktureerde vraelys. SPSS weergawe 22 statistiese sagtewareprogram is gebruik in alle kwantitatiewe statistiese ontledings. Beskrywende ontledings is gedoen om statistiese gemiddeldes en standaardafwykings asook frekwensies te rapporteer oor die kennis van deelnemers ten opsigte van NOS se risikofaktore en FA, en om die voorkoms van NOS risikofaktore te bepaal. Gedeeltelike korrelasie-analise is uitgevoer om die verhouding te bepaal tussen kennis van hartsiektes en kennis van FA en huidige FA-vlakke en risikofaktore vir hartsiektes. Statistiese betekenisvolheid is vasgestel op $p \leq 0.05$. Kwalitatiewe data is ontleed deur FGBs op te neem met 'n bandopnemer en te transkribeer vir ontleding. Die Opmerk,-Dink,-en-Kodeer-benadering is gebruik om die data te analiseer met behulp van Atlas ti7.

Swart Suid-Afrikaners het hoë risiko-profiel vir NOS. Die hoogste voorkoms was vir sistoliese bloeddruk (71%), gevolg deur fisieke onaktiwiteit (68%) en dan oorgewig en obesiteit gesamentlik (67%). Kennis van risikofaktore vir NOS was $59 \pm 8\%$ en die totale steekproefgemiddelde vir FA was $84 \pm 16\%$. Alhoewel die resultate van hierdie studie nie kwantitatief 'n beduidende verband toon tussen die kennis van NOS en FA en bepaalde risikofaktore *per se* nie, het die resultate van die kwalitatiewe verkenning van hierdie studie getoon dat swart Suid-Afrikaners 'n beperkte kennis het van NOS en negatiewe persepsies het oor NOS. Hulle het 'n vae kennis van FA en is nie in staat om FA kennis toe pas vir die voorkoming of beheer van nie-oordraagbare siektes nie. Daar is derhalwe tot die gevolgtrekking gekom dat daar beperkte kennis en wanopvattinge oor FA onder swart Suid-Afrikaners bestaan. 'n Beter begrip van die persepsies van die bevolking oor fisieke aktiwiteit en siektetoestande moet in toekomstige studies beoordeel word ten einde te verseker dat fisieke aktiwiteit aanvaar word as bekostigbare intervensie om die risikofaktore vir NOS te verminder.

Sleutelwoorde: kennis, persepsies, fisieke aktiwiteit, nie-oordraagbare siektes, swart Suid-Afrikaners, Gesondheidsoortuiging-model.

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List of abbreviations

AEE	activity energy expenditure
AIDS	acquired immune deficiency syndrome
BMC	biomedical central
BMI	body mass index
BP	blood pressure
CHW	community health workers
Cm	centimetres
DBP	diastolic blood pressure
DR	deep rural
F	false
FGDs	focus group discussions
HBM	health belief model
HDL	high- density lipoprotein
HIV	human immune virus
ISAK	international society of advancement of kinanthropometry
Kg	kilograms
kg/m ²	kilograms per metre squared
m	metres
MET	metabolic equivalents

MGDs	millennium development goals
mmHg	millimetres of mercury
mmol/L	millimole per litre
NCDs	non-communicable diseases
NCT	noticing, collecting, thinking approach
P	significance level
PA	physical activity
PAL	physical activity level
R	rural
RMR	resting metabolic rate
SA	South Africa
SADHS	South African demographic and health survey
SANHANES	South African national health and nutrition education survey
SBP	systolic blood pressure
SD	standard deviation
Sec	seconds
SPSS	statistical package for social sciences
T	true
TC	total cholesterol
TEE	total energy expenditure
TG	triglyceride
UR	urban-rural

USDHHS	United States department of health and human services
WC	waist circumference
WHO	world health organization
WHR	waist to hip ratio

Chapter 1: Introduction

1.1 INTRODUCTION

There is a rise in death from non-communicable diseases (NCDs) in all strata of South Africa, accounting more than a third (38%) of all deaths (Mayosi *et al.*, 2009:11 & Bradshaw *et al.*, 2006:13). NCDs is the terminology used in burden of disease studies to denote chronic diseases caused by behavioural and environmental factors (Schneider *et al.*, 2009:1). NCDs were the number one cause of death in 2000 in South Africa accounting for 40% of deaths in women and 21% of years of life lost, while in men NCDs accounted for 36% of deaths and 20% of years of life lost (Reddy 2005:179). Physical inactivity, obesity, poor nutrition and cultural perceptions have been indicated as the main contributors to the development of NCDs in black Africans (Puoane *et al.*, 2006:61). Risk factors to NCDs can be classified as non-modifiable risk factors such as age, gender and family history, and potentially modifiable risk factors such as upper-segment fat distribution and physical inactivity (Levitt *et al.*, 1999:949). Additional major risk factors of NCDs include high blood pressure, tobacco addiction, dyslipidaemia, and glucosemia, (Mayosi *et al.* 2009: 936). These risk factors contribute to various disease processes such as strokes, heart attacks, tobacco and nutrition-induced cancers, chronic bronchitis, and emphysema, (Puoane *et al.*, 2012:116).

1.2 PROBLEM STATEMENT

The burden of NCDs is increasing rapidly in the developing world, including South Africa, as a result of changes in lifestyle (Pekka *et al.*, 2002:245). Overall mortality rates differ across the provinces of South Africa due to inequalities in socio-economic status (Bradshaw *et al.*, 2006:4). In contrast, NCDs' disease mortality is similar across all provinces although the causes differ among provinces (Bradshaw *et al.*, 2006:98). NCDs affected both the poor and the wealthy in South Africa (Mayosi *et al.*, 2009:934 & Schneider *et al.*, 2009:1). South Africans, especially poor urban populations are at increased risk for NCDs, through exposure to unhealthy diets, smoking, alcohol abuse, and leading a sedentary lifestyle (Puoane *et al.*, 2008:83). All these lifestyle factors give rise to obesity, which was identified as the most vulnerable health profile for future risk of the metabolic syndrome (Schutte *et al.*, 2005:66).

Obesity as the largest contributing factor of NCDs in South Africa (Monteiro *et al.*, 2004: 43), tends to shift towards the populations with a lower socio-economic status in developing countries. Urbanisation therefore increases the prevalence of NCDs, especially in Indian women (Yadav & Krishnan, 2008:400).

In South Africa it is noted that black women, with the highest levels of inactivity, overweight and obesity, are at greater risk of developing chronic diseases of lifestyle (Walter *et al.*, 2011:538). This high burden of disease can be reduced by addressing the risk factors for NCDs (Kolbe–Alexander *et al.*, 2008:228). Physical inactivity is recognised by the World Health Organisation (WHO) and in other international health promotion work and by international agencies as a major modifiable risk factor for NCDs (Bull *et al.*, 2010:421).

The scientific evidence is strong that a change in dietary habits and physical activity can positively influence several of the NCD risk factors in populations (Reddy 2005:177, Puoane *et al.*, 2008:77; Reiser & Schlenk, 2009:89). Adults aged 18 - 64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or at least 75 minutes of vigorous –intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity (WHO 2010:26). Regular physical activity is beneficial in maintaining and improving health similar to medicine. (Vina *et al.*, 2012:9).

For persons to become active and lead healthy lifestyles, they should perceive physical activity (PA) as part of a healthy lifestyle (Dishman *et al.*, 1985:166). Knowledge of and perceptions about PA play a role in predicting, adoption and maintenance of PA, (Sallis *et al.*, 1986). In the South African context a limited number of studies have investigated the perception and knowledge of adults on physical activity and non-communicable diseases. However among children the current literature indicates that the perceptions of grade 10 learners with regard to physical education (PE) in schools are explained by: 1) value of PE, 2) the enjoyment, 3) support to be active, 4) the preferred sport and 5) obstacles to PA (Surujlal, *et al.*, 2007:188). There appeared to be a lack of knowledge among community health workers about hypertension and diabetes, and misconceptions about causes and treatment of hypertension and diabetes and the risk factors for NCDs (Puoane *et al.*, 2006:59). Economic constraints, cultural beliefs and practices influence the community's food choices and their participation in physical activity (Bradley & Puoane 2007:49).

Cultural beliefs play a major role in the perception of black Africans on physical activity as certain black societies believe that exercise is only for men and that if women exercise, they will not be able to bear children (Tshabangu & Coopoo, 2001:27). Often thinness is associated with HIV/AIDS (Kruger, *et al.*, 2005:494). There is a clear need to assess why South African adults are particularly inactive, and to ensure that physical inactivity is addressed as a national health priority (Joubert *et al.*, 2007:725). Although studies have been done on perception and knowledge, they have not been done in the same study population in order to determine if there are any relationships between perception and knowledge. Therefore the question to be answered with this study is: What is the perception and knowledge of black Africans on physical activity and non-communicable diseases? The outcome of this study will help the South African Health Sector and policy makers to develop cost effective NCD managing programs in order to address the risk factors related to developing NCDs.

1.3 OBJECTIVES

The objectives of the study are to determine:

- Point prevalence of risk factors leading to non-communicable diseases in black Africans.
- Relationship between knowledge and perception of black Africans on non-communicable diseases and physical activity
- Perception and knowledge of black Africans on non-communicable diseases and physical activity. .

1.4 HYPOTHESES

This study will be based on the following hypotheses:

- The point prevalence is high for risk factors leading to non-communicable diseases are present in the of black Africans
- A significant positive relationship exists between the knowledge and perception on non-communicable diseases and physical activity of black Africans.
- That black Africans will have a poor perception and a limited knowledge and a poor perception about non-communicable diseases and physical activity.

1.5 STRUCTURE OF DISSERTATION

This dissertation is presented in the following format:

Chapter 1: Introduction. This is the introductory chapter where the research problem, objectives, and hypotheses are stated. Throughout unpublished section of this thesis the references at the end of each chapter are presented according to the Harvard style as prescribed by the North-West University.

The introductory chapter is followed by Chapter 2, a review of the literature with the title: “Non-communicable diseases and physical activity in South Africa.” An overview of trends in non-communicable diseases in South Africa is presented, including the effects of NCDs on morbidity and mortality. Physical activity patterns amongst South Africans and the influence of PA on non-communicable diseases in the country are discussed.

Chapters 3 and 4 are formatted as publishable research articles. The first article chapter 3, is a report of all the quantitative data. Entitled “Relationship between knowledge of risk factors for non-communicable diseases and prevalence of NCDs in black Africans”, has been prepared for submission to *BMC Public Health*. In this article we report a quantitative exploration of the knowledge and perceptions of NCD and PA among black Africans. Referencing will be according to the guidelines of the journal.

The second article, entitled “Perceptions and knowledge of non-communicable diseases and physical activity of black Africans” this article includes discussion of the perceptions and knowledge of non-communicable diseases and physical activity of black Africans. This article has been prepared for submission the journal *Ethnicity and Disease*. Referencing will be according to the guidelines posed by the journal.

An overall discussion, as well as conclusions, limitations, and recommendations for future research are presented in Chapter 5.

References are listed at the end of each chapter. Appendices follow at the end of the dissertation.

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Chapter 2: Literature review: Non-communicable diseases and physical activity in South Africa

2.1 INTRODUCTION

Non-communicable diseases (NCDs) account for more than 63% of deaths globally (Wagner & Brath, 2012: S39; Terzic & Waldman, 2011:225; Morris, 2010:1859). Though previously thought of as an epidemic of the developed world, NCDs have recently risen alarmingly in the developing world (Wagner & Brath, 2012: S39). In sub-Saharan Africa, NCDs account for a third of the disability-adjusted life year burden (Ebrahim *et al.*, 2013:1). South Africa (SA) is currently undergoing development and also experiencing heightened levels of NCDs (Daar *et al.*, 2007:494). With urbanisation and the far-reaching effects of globalisation, NCDs have become more prevalent (Alberts *et al.*, 2005:347). According to Bradshaw (cited by Bradley & Puoane, 2007:49) data from SA indicate that the burden of NCDs, particularly diabetes and cardiovascular diseases such as hypertension and stroke, is increasing in the urban black African population.

Bourne *et al.* (2002:157) stated that modifiable risk factors such as obesity and physical inactivity contribute to the development of NCDs in SA. SA stands out as having particularly high levels of physical inactivity with 49% of adult women and 43% of adult men reported to be insufficiently active to achieve health benefits, compared with the global average of 17% or Africa's average of about 10% (Joubert *et al.*, 2007:729). Health care providers are encouraged to discuss concerns regarding physical activity (PA) with their patients (Peltzer & Phaswana-Mafuya, 2012:457). A recent study done in Gauteng reported that 84% general practitioners encourage their patients to be physically active (Watson *et al.*, 2013:20).

Data from cohort studies suggest that physical inactivity is associated with at least 1.5 to 2.0 – fold higher risks of most chronic diseases of lifestyle such as ischemic heart diseases, type 2 diabetes mellitus and hypertension (Joubert *et al.*, 2007:725). More than half the people who have hypertension and diabetes in SA are not aware of their condition, with approximately 17 million visits at health centres per annum, which results in significant health care costs and use of human resources. The participants in the SA Summit on the Prevention and Control of NCDs, who gathered in Gauteng from 12-13 September 2011, concluded that a shift towards a “whole of government” and a

“whole of society” approach is imperative in dealing with NCDs, given that NCDs are caused or strongly influenced by behavioural, environmental, social and economic factors.

For people to adopt healthy lifestyle changes, perception and knowledge plays a role, since health and healthy lifestyle depend on what is perceived as the most acceptable way of life (Sridhar & Madhu, 2002: 1556). Shafae *et al.*, (2008:249) quoted that many health promotion strategies have had only modest success; prevailing knowledge and perceptions often seem to override biomedical assumptions and considerations. This chapter will review literature about the burden of NCDs among South Africans, effects of PA on NCDs among South Africans and the current knowledge and perception of NCDs and behavioural lifestyle conduct that South Africans have about engagement in habitual PA. The understanding of perceptions will be interpreted based on the Health Belief Model.

2.2 THE BURDEN OF NCDs IN SOUTH AFRICANS

Eighty percent of deaths from NCDs occur in low and middle-income countries of the developing world (WHO – news release 2011). NCDs account for 28% of deaths in Mozambique (low-income country), a country located on the east coast of Africa (Silva-Matos & Beran, 2012:37). In SA (low-middle-income country) 37% of deaths and 21% of years of life lost in the year 2000 were owing to NCDs (WHO – country co-operation strategy 2008 – 2013). The Western Cape had the lowest death rates compared to all the provinces of SA regarding NCD in 2000, but NCDs accounted for 58% of death rates, a large proportion compared to the national 38% (Bradshaw, *et al.*, 2006:13). NCD is the terminology used in burden-of-disease studies to denote chronic diseases or conditions excluding injuries (Schneider *et al.*, 2009: 176). NCDs are a chronic non-transmissible group of medical conditions or diseases (Puoane, *et al.*, 2012:116; Daar *et al.*, 2007:495; WHO, 2006:4).

The priority diseases included in the NCD cluster are cardiovascular diseases and their comorbidities such as hypertension, coronary heart disease, and cerebrovascular accidents in addition to diabetes, cancers, injuries, chronic respiratory and mental diseases (Mufunda *et al.*, 2006:521; Daar *et al.*, 2007:494). The burden of NCDs – such as cardiovascular diseases, hypertension, obesity, and diabetes is rising, accounting for approximately 50% of deaths in high mortality regions of SA (Hofman *et al.*, 2006:145). According to WHO’s country co-operation strategy (2008 – 2013), the African Health

Report 2007 states that twice as many deaths from cardiovascular disease now occur in SA and was the number one cause of death in 2000. The average age of death from cardiovascular disease is at least 10 years younger than in developed countries and as a result adults die in their most productive years. Table 1.1 shows the percentage of deaths for NCDs between genders from the national burden of disease studies (Reddy 2005:178). Age – standardised death rates due to NCDs were found to be similar in the provinces of SA, with both less developed and more developed provinces accounting for about 750 deaths per 100 000 of the populations (Bradshaw *et al.*, 2006:6).

Table 2.1 Percentage distribution of deaths attributable to specified diseases from the National Burden of Disease list, according to gender (Reddy 2005:178)

Disease (%)	Men	Women
Cardiovascular diseases	14%	19%
Cancer	8%	8%
Other chronic diseases	7%	6%
Respiratory	5%	4%
Diabetes	2%	3%
Total chronic diseases	36%	40%

The risk of certain NCDs is higher in specific ethnic groups, as seen that diabetes is more common in South Asians (Anthony *et al.*, 2012:2497). A comparison of available mortality figures of some NCDs for the different SA population groups from 1984 to 1986 showed that in urban black people stroke had the highest mortality, followed by hypertension, diabetes mellitus and then ischaemic heart disease (Vorster, 2002:239). Although the white and black African people have similar rates for these diseases, their patterns differ considerably. White African people mainly reflect a pattern of death caused by heart attacks, while the black African people reflect a pattern of death caused by stroke and diseases of the heart muscle and high blood pressure (Steyn 2007:8). Hypertensive heart disease, diabetes mellitus, chronic obstructive airways disease, asthma, oesophageal cancer and cirrhosis of the liver all rank among the top twenty single causes of deaths in SA (Reddy, 2005: 179).

In Africa NCDs are anticipated to overtake mortality from communicable, maternal, perinatal and nutritional diseases by 2030. Controlling NCDs in low and middle-income

countries would result in more gains in life expectancy (Hofman, 2006:415). Death rates from diabetes and obesity rose between 1997 and 2004, and female death rates were always higher than male death rates, although the gap between the sexes narrowed over time (Anderson & Phillips, 2006). Obesity in the developing world can no longer be considered solely a disease of groups with higher socioeconomic status; the burden of obesity in developing countries tends to shift towards groups of lower socioeconomic status (Monteiro *et al.*, 2004:943). WHO (2008:5) states that unless addressed, the mortality and disease burden from these health problems will continue to increase, with NCDs global deaths projected to increase by 17% over the next ten years and the greatest increase seen in the African region (27%) and the Eastern Mediterranean region (25%).

2.2.1 NCDs in South African men

A comparison of healthy men (no pre-existing chronic disease) and unhealthy men (one or more chronic diseases) showed a reduction in mortality in the population of men who maintained or improved physical fitness (Blair *et al.*, 1995:1097). Through 1977 to 1985, Paffenbager *et al.*, (1993:543) found in middle-aged and older Harvard alumni (45-84 years) that engaging in moderate PA and lifestyle changes such as the cessation of cigarette smoking, maintenance of normal blood pressure, and avoidance of obesity were separately associated with reduced rates of mortality from all coronary heart diseases. Barreto and Figueiredo (2009:6) stated that men seem to have a poorer perception of their health status than women. Furthermore chronic disease reporting was higher among older men and women of lower level of schooling with a Body Mass Index $\geq 30 \text{ kg/m}^2$ and who were on diet.

Age-specific death rates for chronic diseases are higher in many low-income and middle-income countries than in high-income countries (Abegunde *et al.*, 2007:1931). Figure 1.1 shows that SA male deaths from NCDs increases with age, however in the more recent years male deaths from NCDs appeared in younger men and seem to have remained the same in older men aged between 60 – 64 years. A survey by Anand *et al.* (2007:118), showed that 7.4% of men reported leisure-time activity, 13.8% reported work-time activity and 81.6% reported transport-related activity. The percentage reporting leisure time activity was highest at the extremes of age among men (11% in

the 15–24 years and 55–64 years age groups compared with 5.1% for the 35–44 years age group).

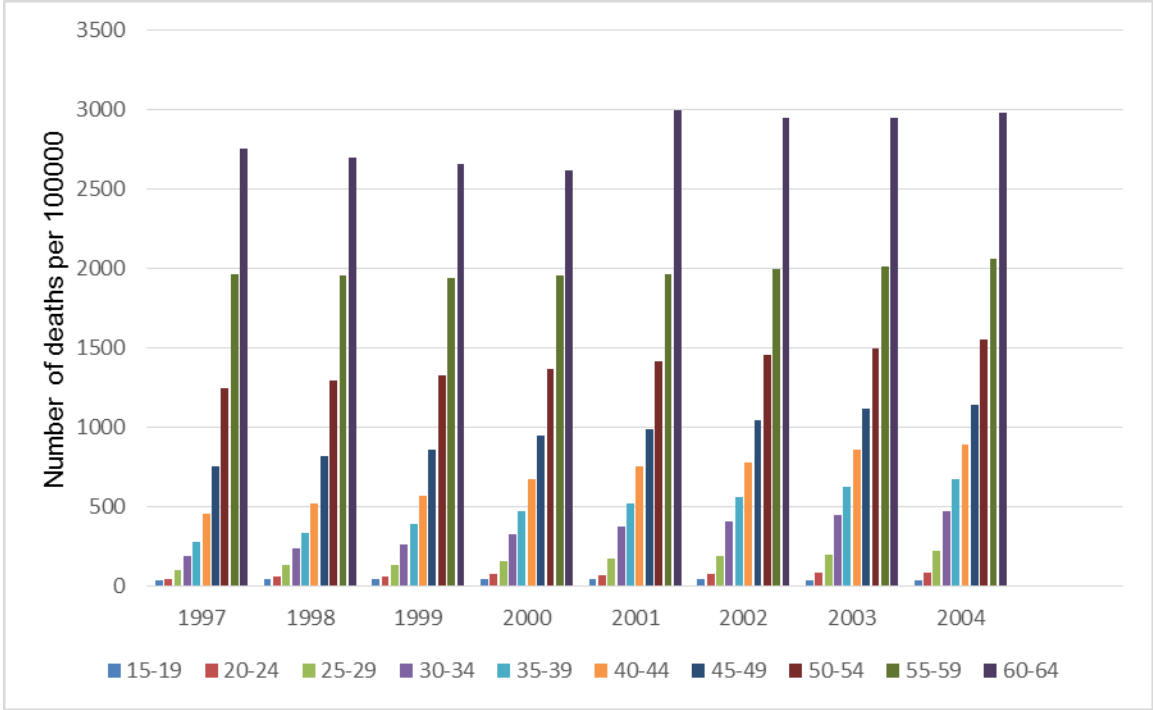


Figure 2.1: Male death rates by age per 100 000 from NCDs in 1997 - 2004. (Anderson & Phillips, 2006)

2.2.2 NCDs in South African women

During a health survey about cardiovascular diseases in SA, the prevalence of diabetes was consistently higher for women, affecting 5.7% of women for all population groups except for Indians (Bradshaw *et al.*, 2007:702). In their study, Schutte *et al.* (2005:65) compared lean, overweight and obese women and found that the obese group had the worst exposures, namely the poorest living conditions, smallest income, lowest level of education, least sense of spiritual well-being and highest self-reported alcohol intake. They also presented with higher risk factors associated with metabolic syndrome such as significantly higher blood pressure, triglycerides, fasting blood glucose levels, and highest alcohol intake.

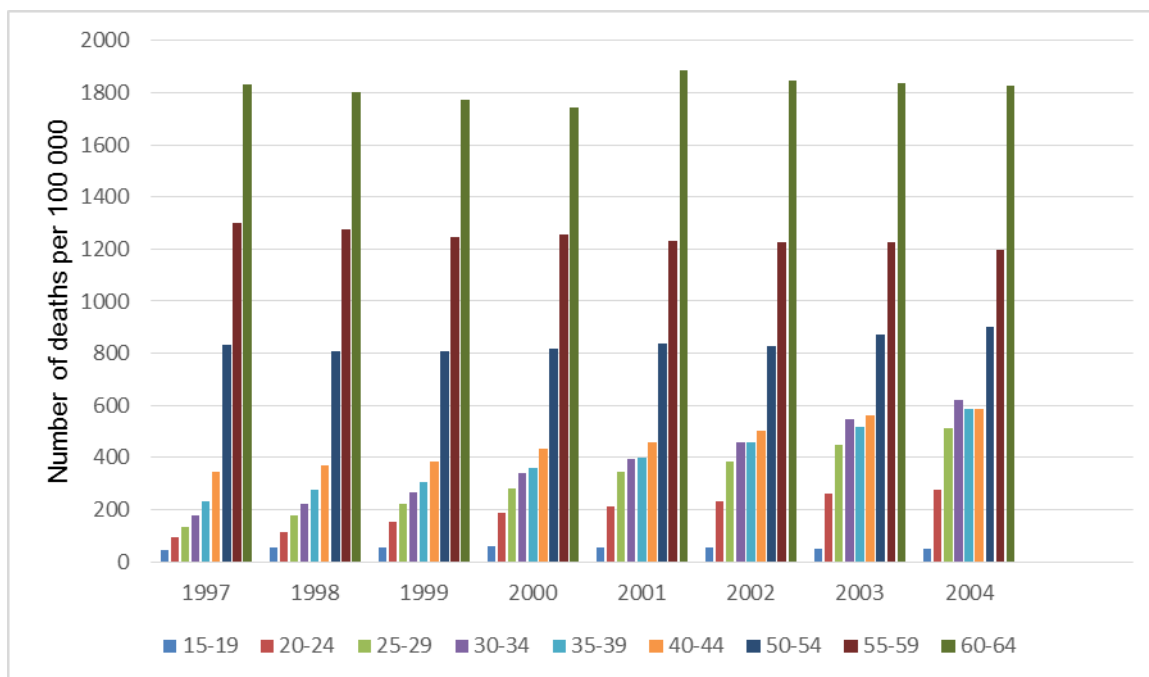


Figure 2.2: Female death rates by age per 100 000 from NCDs, 1997 – 2004. (Anderson & Phillips, 2006)

Objective measurements among younger generation and older generation SA women found both groups to be insufficiently active (Walter *et al.*, 2011:543). Robertson (2001:2318), found that most women (62%) still believe cancer is the greatest threat to women's health, while in fact, cardiovascular diseases (503 927) claimed the lives of nearly double the amount claimed by cancer in 1998 (259 467). In the 2003 health and demographic survey it was found that mainly African women often ate salty food. Figure 2.2 shows SA female deaths from NCD. Female death rates in more recent years is seen to increase much quicker in younger women and has dropped in older women age 55 – 59. In Black South African women, the highest rate of obesity is predominantly in the urban women (Pouane *et al.*, 2002:1046).

2.2.3 Urbanisation and NCDs

Rapid urbanisation of SA in the context of globalisation has been accompanied by large shifts in health patterns, thereby increasing the prevalence of NCDs (Puoane *et al.*, 2008:74). This NCD increases are mainly due to demographic transitions and population lifestyle changes associated with urbanization (Puoane *et al.*, 2008:74). According to Schneider *et al.* (2009:184) data suggests that as SA undergoes development, the current risk profile will translate into increasing rates of cardiovascular diseases, unless policies are introduced to ameliorate the detrimental effects of the key risk and lifestyle factors.

In Africa, NCDs are anticipated to overtake mortality from communicable, maternal, perinatal and nutritional diseases by 2030. Haskell *et al.* (2007:1424) stated that technology tends to discourage PA by reducing the energy needed for activities of daily living. Vorster (2002:239) states that available cardiovascular data on different SA population groups suggests that urbanization of black South Africans is characterised by an early emergence of stroke. According to Demaio *et al.* (2011:961), in order to set quantifiable goals and priorities for reducing NCDs, countries must collect local data on disease and risk burden as well as the knowledge and attitudes of the population. Tobacco use, poor diet and physical inactivity are major lifestyle risk factors for chronic cardiovascular diseases. Figure 2.3 shows the vicious cycle of barriers to millennium goals, with NCDs located centrally.

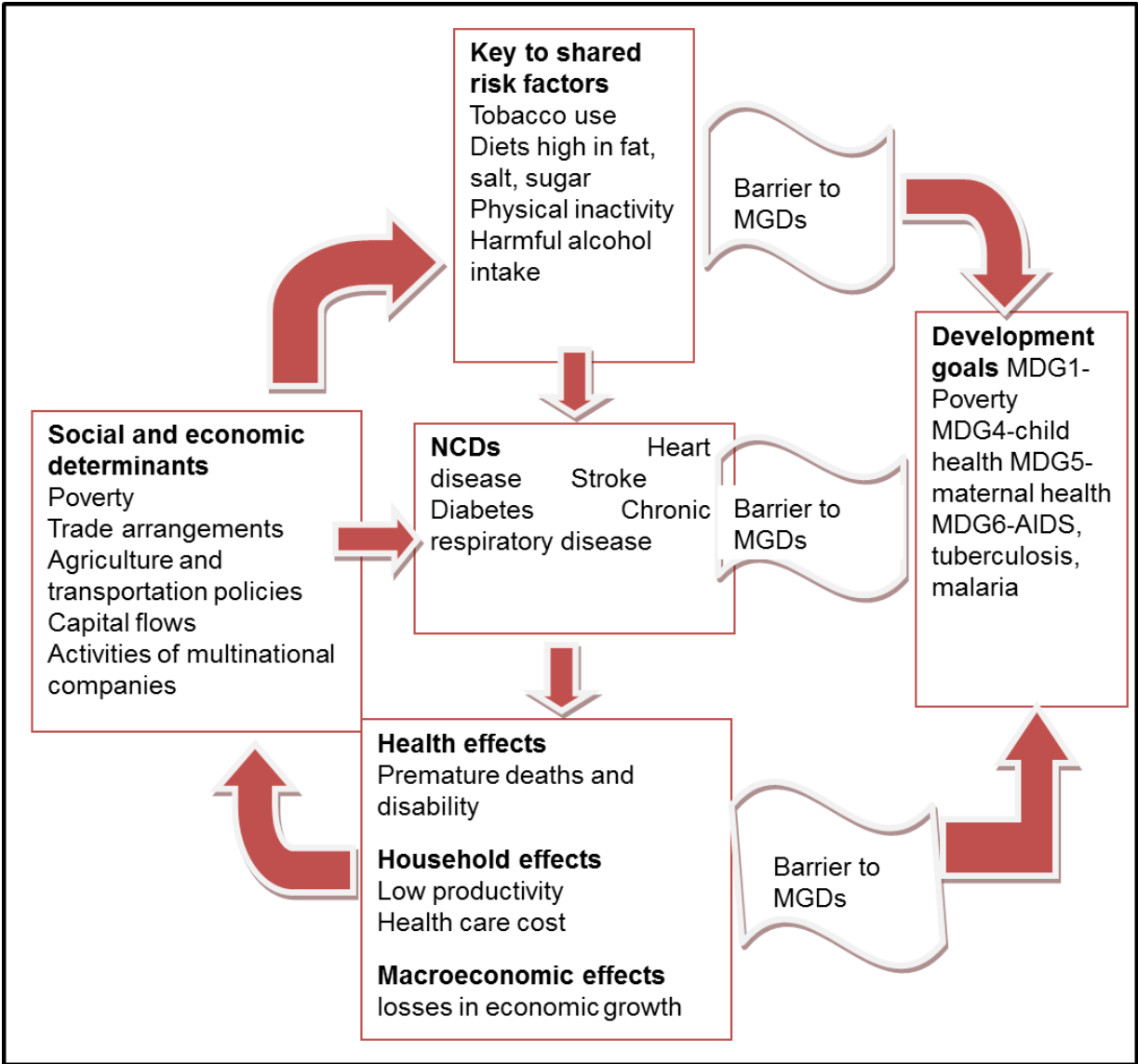


Figure 2.3: Associations between poverty, NCDs and development goals, MDG – millennium development goals, (Beaglehole *et al.*, 2011:1440)

2.3 PHYSICAL ACTIVITY AND HEALTH

Regular PA has long been regarded as an important component of a healthy lifestyle (Pate *et al.*, 1995: 402 & Kahn *et al.*, 2002:73). PA has been defined as all movements in everyday life, including work, recreation, exercise and sporting activities (Reddy, 2005:178 & Baecke *et al.*, 1982:940). PA comprises all types of muscular activity that substantially increase energy expenditure substantially (Shephard, 2003:197). Exercise is also a regular and structured subset of PA, performed deliberately and with a specific purpose such as preparation for athletic competition or the improvement of health. According to Chaudhury and Shelton (2010:1343), participation in PA is influenced by a multiple of factors which include social, economic and cultural facets of society. PA participation was lower in most non-white ethnic groups as compared to white groups. Vigorous work, moderate work, and transportation were the main forms of PA in Mozambique, a country in which 96.2% of people met the WHO criteria for PA (Silva-Mantos & Beran, 2012:38).

To promote and maintain health, all healthy adults aged 18 to 65 years need moderate intensity aerobic (endurance) PA for a minimum of 30 minutes on five days per week or vigorous –intensity aerobic activity for a minimum of 20 minutes on three days each week. A combination of moderate and vigorous can be performed to meet this recommendation (Haskell *et al.*, 2007:1423). Habitual PA improves NCDs risk factors such as blood lipid profile, resting blood pressure in borderline hypertensive, body composition, glucose tolerance and insulin sensitivity, bone density, immune function, and psychological function (Pate *at el.*, 1995:402). Regular PA that is performed on most days of the week reduces the risk of developing diabetes, hypertension, colon cancer and feelings of depression and anxiety. It also prevents death from heart diseases. PA helps reduce blood pressure complications, controls weight, help build and maintain healthy bones, muscles, and joints, helping in decreasing risk of falling in older adults and promoting psychological well-being.

2.3.1 Physical inactivity and non-communicable diseases

Physical inactivity, excessive alcohol, tobacco use and unhealthy diet are established conventional risk factors for NCDs (Ogoina *et al.*, 2009:14; Mufunda *et al.*, 2006:521 & Reddy, 2005:176). The SANHANES (2013:131) states that physical inactivity is the fourth leading risk factor for mortality and causes NCDs. Changes in lifestyle risk

factors, changes in work, transport and leisure time that have reduced PA (a modifiable risk factor) (Warbuton *et al.*, 2006:801) have led to a rise in unhealthy behaviours (Hofman *et al.*, 2006:415 & Schutte *et al.*, 2005:66). It has been estimated that as many as 250 000 deaths per year in the United States, approximately 12% of the total are attributable to a lack of regular PA (Pate *et al.*, 1995:403). A slightly reduced probability of PA was observed among non-whites compared to whites in North West England (Harrison *et al.*, 2006:212). Knowledge about the relationships between physical inactivity, heart disease and hypertension was identified most often by whites and least by African Americans (Morrow *et al.*, 1999:28).

During the last Demographic and health survey in SA in 2003 (Department of Health, 2007), 67.3% of women and 67% of men aged 55 to 64 years were found to be physically inactive (Kolbe-Alexander *et al.*, 2013:2017; Peltzer & Phaswana-Mafuya, 2012:448). SA compared to other countries was found to have high levels of physical inactivity with 48% and 63% in men and women respectively (SADHS, 2007). PA decreases with age and sufficient activity is less common among women than men, and among those with lower incomes and less education (USDHHS, 2007:2). There are only a few regional cross-sectional studies that have attempted to quantify PA patterns in representative samples of South Africans who are undergoing transition (Bourne *et al.*, 2006:160). According to Mufunda *et al.* (2006:59) it has been demonstrated that what pertains to Caucasians does not necessarily occur to the same magnitude in other races, especially the black population.

2.3.2 Influence of physical activity on non- communicable disease

It is widely accepted that many problems previously thought of as primarily medical and hence demanding conventional medical intervention, are in fact more appropriately disentangled by changing individual and social attitudes and behaviours. Both men and women who reported increased levels of PA and fitness were found to have reductions by about 20 – 35% in relative risk of death (Warburton, 2006: 801). According to Haskell *et al.* (2007:1427) recent data indicates that vigorous intensity activities may have greater benefit for reducing cardiovascular disease and premature mortality than moderate-intensity PA, which is independent of their contribution to energy expenditure. Aadahl *et al.* (2009: 22) found in their study in Denmark of five-year changes in PA that changes in PA level were significantly associated with change in weight, waist circumference, diastolic blood pressure and serum lipids in a population-based cohort of

adult men and women. Harrison *et al.* (2006:210) also found that current smokers, but not past smokers, and those not eating the recommended amounts of fruits and vegetables per day were less likely to be participating in regular PA, therefore suggesting a relationship between PA and other health promoting behaviours. Associations between lifestyle risk factors and PA indicate a need to address the issue of healthy aging by means of a multi-factorial approach (Peltzer & Phaswana-Mafuya 2012:457).

2.3.2.1 Hypertension

Blood pressure (BP) is the force of the blood pushing against the walls of the arteries. BP is highest when the heart muscle contracts, pumping the blood to all parts of the body. This is called systolic blood pressure (SBP). When the heart relaxes between beats, the BP drops, this lower pressure is called the diastolic blood pressure (DBP). The blood flow does not stop when the heart muscle is relaxed. Blood pressure is expressed as two values, the SBP and DBP, written as SBP/DBP (measured in millimetres of mercury, a unit for measuring pressure). High blood pressure known as hypertension is a BP reading of 140/90 mmHg or higher (ACSM, 2010:47). According to Leung Ong *et al.*, (2007:69) hypertension affects about 65 million adult Americans and is a major risk factor for myocardial infarction, stroke, heart failure and renal failure in the USA.

Hypertension ranked the second highest cause of death following sexual transmitted disease in SA in the year 2000 (Norman, 2007:639). Increase of hypertension among black South African is associated with alcohol intake and abdominal obesity, (Schutte *et al.*, 2012:1122). Furthermore lifestyle factors such as physical inactivity and unhealthy diet are the main cause to the development of hypertension among black Africans. PA decreases body weight and blood pressure (Bravata, *et al.*, 2007:2303 & Warburton, *et al.*, 2006:174). However increased daily PA reduces BP independent of body size or composition (Luke *et al.*, 2005:131). Endurance training at low intensities is associated with modest BP reductions and moderate to high intensities reduces BP remarkably (Cornelissen & Smart, 2013:7).

Reductions in BP follows aerobic exercise programs of low to moderate intensity (Kokkinos & Myers, 2010:1639). Both aerobic fitness and physical activity are associated with decreases in BP (Carnethon *et al.*, 2010:53). Patients with severe stages of hypertension can tolerate and benefit from moderate intensity exercises

(Kokkinos *et al.*, 2008:54). Evidence presented in the position statement of the ACSM indicate that regular aerobic exercise will lower the resting blood pressure by 3 mmHg/5 mmHg. Mufunda *et al.* (2006:63) found in their study in Eritrea that awareness of hypertension among the respondents was less than 20%, making the majority of the newly diagnosed patients unaware of their condition. In the USA a total of 69% of people with hypertension were aware of the diagnosis, 58% received treatment, and only in 31% was the BP controlled (Leung Ong *et al.*, 2007:69). Parker *et al.* (2012:511) stated that the majority of patients attending primary health facilities want to receive lifestyle modification education. There is however not one method for managing hypertension that can be regarded as the golden standard. Patients' preferences regarding health education methods differ, and they are more likely to be susceptible to methods that do not involve much reading. Parker *et al.* (2012:508) found that the majority of health professionals reported that they perceived lifestyle modification to have a positive role in the management of NCD patients.

Chronic disease, risk factors, and knowledge about chronic disease vary according to demographic variables (Morrow *et al.*, 1999: 25). One third of adults in Mozambique were hypertensive however less than 15% were aware of their condition though some were under pharmacological treatment (Damasceno *et al.*, 2009:80). According to SADHS, (2003:236) most of the respondents prescribed chronic medication for diabetes (89 %) and hypertension (93%) report that they know what the drugs are prescribed for. Similar levels of awareness were reported in men and women. Medication used is generally similar in urban and non-urban residents for diabetes and hypertension. With regard to age, there is no difference in the knowledge of the respondents taking antihypertensive medication.

2.3.2.2 Diabetes

Diabetes is an ever-increasing health care problem in SA, similar to many other low-middle income countries (Levitt 2010:451). According to Bradshaw *et al.* (2006:703) there was over 20 000 deaths that could be attributed to diabetes, accounting for 4.3% of all deaths in SA in 2000. According to the American diabetes association (2010:S62) "diabetes is defined as a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both". There are two main forms of diabetes Type 1 diabetes is due primarily to autoimmune-mediated destruction of pancreatic β -cell islets, resulting in absolute insulin deficiency whilst type 2 diabetes

is characterised by insulin resistance and/or abnormal insulin secretion (Zimmet *et al.*, 2001:782).

As a chronic medical condition, diabetes is by its nature largely self-managed (Bazata *et al.*, 2008:1026). Type 2 diabetes is increasingly common, indeed epidemic, primarily because of the increases in the prevalence of a sedentary lifestyle. Obesity pronounced changes in the human environment, human behaviour and lifestyle have accompanied globalization, and these have resulted in escalating rates of obesity and diabetes (Zimmet *et al.*, 2001: 782). The Finnish diabetes prevention study found that modest lifestyle changes, including weight loss, dietary changes and increased leisure time PA reduced the risk of type 2 diabetes by 58% in individuals with impaired glucose tolerance (Laaksonen *et al.*, 2005:158). Regular PA reduces the incidence or at least postpones the occurrence of diabetes mellitus type 2. PA is effective in improving insulin sensitivity (Hawley & Lessard, 2008:132), even low to moderate of exercise is associated with insulin sensitivity (Dubé *et al.*, 2012:798). In type 1 diabetes PA reduces the need for insulin due to increased usability of energy reserves (Mujović & Čubrilo, 2012:43). In their study Shafae *et al.* (2008:249) found that though 56.8% subjects reported that they were aware of the meaning of the condition called diabetes, when asked to define it only 46.5% were able to give a rudimentary definition. In their investigation of behaviour change in diabetes Bazata *et al.* (2008:1033) found that respondents in the United States of America with diabetes and those at risk for diabetes had appropriate knowledge and healthy attitudes regarding exercise, diet and weight control, yet were not reporting healthy behaviour, especially in the type 2 diabetes respondents. A comparison of P-related social-cognitive factors between those with type 1 diabetes, type 2 diabetes and diabetes free adults revealed that both diabetic groups reported lower response efficacy (perceived benefits) scores compared to the group without diabetes (Plotnikoff *et al.*, 2009:539).

2.3.2.3 *Dyslipidemia*

Dyslipidemia remains a major cardiovascular risk factor in the South African population. It affects some groups more than others, but is also affecting those previously at lesser risk who are now caught up in the changes brought about by development, the association with a westernised lifestyle, and the HIV epidemic (Maritz 2005:97). Mashiya *et al.* (2014:194) found in their study among HIV positive South Africans had higher levels of total triglyceride (TG) than HIV negative persons. High level of Total

cholesterol is an important cardiovascular risk factor in all population groups of SA (Norman *et al.*, 2007:708). Traditionally total cholesterol values were lower among the black African population, with higher values among younger suggesting that the youth might have adopted a westernised diet and lifestyle (Norman *et al.*, 2007:713). PA increases high-density lipoprotein (HDL) while reducing total cholesterol (T-Chol) and TG, when PA is performed at moderate intensities, (Durstine *et al.*, 2001:1045; Faradian *et al.*, 2013:82). Increased levels of HDL-cholesterol have strong protective effects against cardiovascular diseases and coronary heart diseases, regardless of fitness level (Skretteberg *et al.*, 2012:255). Borel *et al.*, (2012:1231) found that PA has similar lowering effects on triglycerides and LDL however more increasing effects compared to pharmacotherapy alone. Moderate to vigorous PA is associated with reduced waist circumference, low triglycerides, low LDL and increased HDL (Glazer *et al.*, 2013:113).

2.3.2.4 Stroke

Stroke, also known as a cerebrovascular accident, occurs when the blood flow, and therefore oxygen, to the brain is interrupted. This could either happen when a blood vessel to the brain ruptures, causing bleeding, or a blood vessel becomes blocked by a blood clot. The affected brain cells then start to die because of a lack of oxygen and other nutrients. The severity of a stroke varies from a passing weakness or tingling in a limb to a profound paralysis, coma or death. A survey among American Women found improvements in knowledge about stroke following stroke and heart disease awareness and have a misconception that heart problems is found only in elder women, thereby the *women tend to delay lifestyle adjustments to improve health (Robertson, 2012:2318)*. Hypertension is a major risk factor for stroke and this is more apparent in woman, (Gorgui *et al.*, 2014:780; Howard *et al.*, 2010:39 & Mancia, 2004:644). Hypertension can lead to plaque rupture, clot formation and embolization of the clot to cerebral artery causing a stroke (Bandasak *et al.*, 2011:1244). Research indicated that regular physical activity could reduce blood pressure in hypertensive persons. Though no South African literature could be found about the effect of physical activity on stroke, research done in other countries is beneficial. (Bandasak *et al.*, 2011:1244 & Lu *et al.*, 2005:59). Regular PA is therefore of particular importance to reduce the risk of cardiovascular disease and stroke especially for people with a family history to prevent early occurrence of cardiovascular diseases (Mujović & Čubrilo, 2012:43).

2.3.2.5 Obesity

SA is currently experiencing an obesity epidemic along with its associated chronic diseases (Puoane *et al.*, 2012:117). Obesity is a term referring to a person's body mass index (BMI) that is 30 kg/m² or higher. BMI reflects a person's weight (kg) in terms of his/her height (m) and is defined as the weight in kilograms divided by height in metres squared (kg/m²) (Steyn 2007:17). BMI is used to estimate general adiposity; however it is limited by failure to identify differences in body composition and fat distribution (Pasco *et al.*, 2012:1). The definition of obesity is a function of weight and height and not on body fatness, which highly correlates with body fat. The correlation of BMI to body fat within the age groups is (0.72 to 0.79) among men and (0.72 to 0.84) among women (Flegal *et al.*, 2012:495). Cost-effective interventions aimed at tackling obesity by improving diets and increasing physical activity could usefully be added to a package of measures designed to deal with chronic diseases in low-income and middle-income countries (Checchini *et. al.*, 2010:1775). A comparison between African countries with regards to meeting the WHO criteria for PA (at least 150 minutes of moderate activity per week or equivalent) showed that South Africa in comparison reported 52% of the population are not achieving the recommended guidelines (WHO 2012). In Mozambique 96.2% of the population met the guidelines for physical activity mainly through vigorous work, moderate work and transportation (Silva–Matos & Beran, 2012:39). A study employing self-reporting questionnaire found that 67% urban black women in South Africa were classified as active according to Global Physical Activity Questionnaire criteria; however there was still a high prevalence of obesity and metabolic disease in these women, (Gradidge *et al.*, 2014:943).

Physical activity improves body weight in obese and overweight individuals (Shaw, *et al.*, 2006:9). PA alone results in 1 to 3 kg weight loss, as PA reduces fat mass and increases lean muscle mass which is beneficiary for health (Catenacci & Wyatt, 2007:521). According to Shaw *et al.* (2006:5) PA has positive effects on body weight and cardiovascular risk factors. In SA, black African women perceived a larger body as desirable by men. These women associate an overweight body image with dignity, respect, wealth, strength, happiness and health, as well as being treated well by their husbands, (Case & Menendez 2009:281; Joubert *et al.*, 2007:688; Puoane *et el.*, 2002:1044). Puoane, *et al.* (2005: 10) explored perceptions about body weight among urban black female community health workers; they found that these women felt that a woman should be round, and should feel herself when she moves. The lack of sufficient PA corresponds to the prevalence of overweight and obesity in SA. Among Black South

Africans, there is a trend toward higher levels of obesity in the urban setting compared with the rural setting (Low *et al.*,2009:61).

2.3.2.6 Smoking

According to Beaglehole *et al.*, (2011:1439) the total NCDs are rising because of population ageing and the globalization risks, particularly tobacco use. Research in the developed world has shown that much of the burden of chronic diseases is attributable to environmental and lifestyle factors, including tobacco consumption and decreased PA (Miranda *et al.*, 2008:1226). Tobacco use has been associated with numerous NCDs such as ischemic heart disease, cardiovascular obstructive pulmonary disease and a wide variety of cancers. The leading causes of death from smoking in SA are chronic obstructive pulmonary disease, tuberculosis, lung cancer, and ischaemic heart disease (Saloojeea, 2005:50). Puoane *et al.* (2012: 117) stated that in SA the prevalence of smoking is relatively high. The survey conducted in 2003 showed that 35% of adult men and 10% of adult women were considered daily or occasional smokers. The WHO Africa regional director recalled that tobacco – once almost exclusively used by the elderly in Africa, is now widely used by people of all ages, especially in the youth. It is estimated that between 6 to 36% adults in Africa are smokers. A study conducted in SA found 26.8% and 24.3% male and female students were smokers. A lack of knowledge about diseases caused by tobacco smoking exists among students (Kamanzi & Adejumo, 2006:87). More university female students (75%) indicated a desire to stop smoking than male students (57%) (Mudhvozim, *et al.* 2012:127).

A study of health, lifestyle, belief and knowledge differences between two ethnic groups, found that two barriers for stopping smoking among British men that appear different from Asians, the perception that they might gain weight and presence of smokers around them (Anthony *et al.*,2012:2501). Smoking rates that have decreased in SA (Puoane, *et al.*, 2012: 121; Saloojeea, 2005:48) indicate South Africa has made significant progress in the past decade in reducing tobacco use. Fewer people smoke, and fewer cigarettes per person are being smoked. This in time will translate into fewer deaths from diseases caused by tobacco use. The Nicorette® (2010:290) SA smoking survey 2010 showed that more people stopped or considered to stop smoking in SA. PA participation is known to reduce both smoking and smoking volume (Papathanasiou *et al.*, 2012:23). The type of PA underlie the effect of clustering health behaviours such as

cigarette smoking, alcohol intake which is associated with metabolic syndrome (Santose *et al.*, 2007:330; Poortinga, 2007:69) .

2.3.2.7 Alcohol consumption

There is a strong link between alcohol and non-communicable diseases, particularly cancer, cardiovascular disease, liver disease, pancreatitis and diabetes. These findings, support calls by the WHO to implement evidence-based strategies to reduce harmful use of alcohol (Parry *et al.*, 2011:1718). Alcohol is causally linked (to varying degrees) to eight different cancers, with the risk increasing with the volume consumed. Similarly, alcohol use is related detrimentally to many cardiovascular outcomes, including hypertension, haemorrhagic stroke and atrial fibrillation (Parry *et al.*, 2011:1718). Alcohol consumption ranked third highest, first in middle-income countries, eighth highest in low-income countries and second highest in high-income countries (Parry *et al.*, 2011:1719). Given the overwhelming evidence that alcohol is a major risk factor for NCDs, attention must now be directed towards addressing the drivers of alcohol use, especially of heavy use, and particularly those drivers operating at the social and environmental level using strategies that have been shown to have a high probability of having an impact (Parry *et al.*, 2011:1722).

The relationship between PA and alcohol use is unclear. Though some studies indicate alcohol abuse to be associated with PA, in particular among person's with alcohol use disorders and in younger people, (Vancampfort *et al.*, 2014:6; Musselman, & Rutledge, 2010:614). Liangpunsakul *et al.* (2010:672). Hazardous alcohol consumption is associated with less PA compared to non-drinkers, moderate and social drinkers.

2.3.2.8 Stress

Psychological, social and cultural factors have an intimate role in the course of managing disease and may in some way have a role in the cause of disease (Sridhar & Madhu, 2002:1556). Depression and psychological stress are associated with NCDs such as diabetes, hypertension and coronary artery disease (Khuwaja & Kadir, 2010:167). Depression may lead to type 2 diabetes causing an increase in central synthesis of pro-inflammatory mediators which are able to interact with insulin sensitivity (Stuart & Baune, 2012:670), and through negative behavioural lifestyle factors associated with stress (Renn *et al.*, 2011:1242) Also repeated daily stress promotes acute increases in blood pressure thus increasing vascular inflammation which may

lead to the development of hypertension (Marvar *et al.*, 2012:781). Among black Africans depressive symptoms are associated with higher NCD risk factors (Hamer, *et al.*, 2012:4). Moderate to vigorous PA reduces stress (Gerber *et al.*, 2014:20). PA has anti-neuroinflammatory effects, at disease level where pathogenesis might be related to chronic low-grade inflammation, with regular PA associated to C-reactive protein reduction.

2.4 KNOWLEDGE AND PERCEPTION ABOUT RISK FACTORS FOR NON-COMMUNICABLE DISEASE AND PHYSICAL ACTIVITY

Risk factors for NCDs include socioeconomic factors, modifiable behaviours and genetic factors (Miranda *et al.*, 2008:1228). Since NCDs have modifiable risk factors, which are easy to measure and can assist with planning effective PA interventions (Anand *et al.*, 2007:115), knowledge of PA and NCDs are important when contemplating to address interventions to change lifestyle. In their study in Senegal Holdsworth *et al.* (2006:979) found that women had less knowledge about the causes of NCDs than about the consequences of obesity. It is believed that increased knowledge of health benefits derived from PA, influences one's practice of habitual PA (Hui & Morrow, 2001:372). According to Holdsworth *et al.* (2006: 975) one of the obstacles to slowing down NCDs management in some low-and medium – income countries could be a lack of individuals' knowledge of their causes and relationship to factors such as poor diet and lack of PA.

A study in North – West England showed a clear relationship reported between PA and perception of one's own health during a year and with respect to specific chronic health problems, mental health, mobility and pain (Harrison *et al.*, 2005:209). Men who reported having two or more risk factors for NCDs were more active than those who reported no risk factors for NCDs. However, low levels of PA were also noted among people with risk factors for coronary heart/vascular disease, and among those who had already suffered a stroke or a myocardial infarction (Harrison *et al.*, 2005:211).

2.4.1 Knowledge and perceptions about risk factors of NCDs

According to Bradley and Puoane (2007:49) findings from situational assessment indicated a lack of knowledge among community health workers (CHW) about hypertension and diabetes and the risk factors for these NCDs. A community survey to

establish knowledge and perception of CHW on hypertension and diabetes and an identification and documenting of community activities by the CHW revealed key findings (Table 2.2) of community health workers and community assessment (Bradley & Puoane 2007:51).

Table 2.2: Summary of key findings of community health workers and community assessment (Bradley & Puoane 2007:51)

Category	Findings
Individual lifestyle factors	Lack of knowledge about hypertension and diabetes and risk factors, such as diet, obesity, lack of PA Eating patterns very haphazard High use of oil in cooking Large portions eaten
Social and community influences	Cultural perceptions influence type and amount of eaten Strong family influences on cooking and eating practices Positive cultural perceptions about large body weight
Living and working conditions	Limited choice and availability of food locally Street vendors sell very fatty (cheap) foods Transport costs incurred in shopping at supermarkets situated outside area
General socioeconomic, cultural, and environmental conditions	Little money available for purchasing food Lack of opportunity and suitable venues for exercise and participation in sports Concerns about physical safety limit opportunities to be PA

2.4.2. Knowledge and perceptions about physical activity

Chaudhury and Shelton, (2010:1343) asked adults aged 60 - 64 years about PA knowledge and found that very few respondents knew the recommended PA target. However, more than one-half of the participants thought they accumulated enough PA in their daily life, and over three-quarters thought they were very or fairly PA compared with age peers. A study on the level of participation and knowledge of PA in Hong Kong Chinese adults and their association with age revealed that older individuals report more PA than primarily young and middle-aged individuals (Hui & Morrow, 2001:380). Young *et al.* (1996:271) found in central California significant age and education effects for PA knowledge, self – efficacy, and several of the PA behaviour variables for most of the analysis of covariance models. More highly educated participants had greater PA knowledge and self-efficacy for vigorous activity, participated in a greater number of usual activities, and was more likely to regularly engage in vigorous activity. In contrast

to the findings, men in the independent samples who had a higher education level felt lack of time was a barrier to exercise compared with less educated men (Young *et al.*, 1996:271).

In a qualitative study to determine perception of PA among older adults in Perth, Jancey *et al.* (2009: 201) found that older adults believed that PA provided mental and physical health benefits, kept muscles active and the blood circulating however, there was little acknowledgement of many recognised positive health outcomes related to diabetes and osteoporosis. According to Jancey *et al.* (2009:200) three major themes emerged: 1) Beliefs about PA, majority participants felt PA should be engaged throughout their life, 2) Barriers to PA, pains and aches were the most apparent barrier and 3) Social support for PA, many felt unsupported to engage in PA (Chaudhury & Shelton, 2010:1352). PA participation was lower in most non-white ethnic groups compared to white groups. In a study of SA employees by Kolbe-Alexander *et al.* (2008:228) found that nearly two thirds (62%) of employees who were identified as insufficiently active expressed the desire to increase their weekly levels of habitual PA, 11% reported that they were doing sufficient exercise, while 23% indicated that they were not intending to become more active. Programs tackling physical inactivity problems needs to be tailor-made for specific population group due to human diversity, which includes age, gender, ethnicity, health status, society, environment, nutrition and fitness level (Amusa *et al.*, 2012:1003; Noorbhai,2013:995). A South African study investigating the knowledge, attitudes and practices among Caucasian elderly (65 years and older) in Bloemfontein found that these have a positive attitude about PA, however lacked knowledge about the positive effect of PA on health (Pienaar *et al.*, 2004:19). Studies investigating knowledge and perceptions of PA among minor ethnic groups are limited, none were found in SA.

To study health behaviour such as knowledge and perceptions, a theoretical framework should form the basis. The health belief model (HBM) is one of the most widely used conceptual frameworks in health behaviour research, (Rosenstock *et al.*, 1988:182; Champion & Skinner in Glanz, *et al.*, 2008:45).

2.5 HEALTH BELIEF MODEL

According to Champion and Skinner (in Glanz *et al.*, 2008:46) the HBM was developed in the 1950s by social psychologists in the U.S. Public health service to explain the

widespread failure of people to participate in programs to prevent and detect disease. The HBM contains primary concepts that predict why people will take action to prevent or control illness; these include perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, cues to action, and self- efficacy (Table 2.3). The HBM has been extensively used in research aiming to develop recommendations for health educational interventions (Holt, *et al.*, 2009:878). The HBM was used in a South African study to explore the relationship of prescribed medicine and alternative medicine among hypertensive out-patient attenders (Peltzer, *et al.*, 2004:16). Peltzer et al. (2004:22) explained that health care providers can help improve pharmacological hypertension treatment compliance by incorporating the regiments into their daily routine.

Table 2.3: Key concepts and definitions of the health belief model (Champion & Skinner in Glanz, *et al.* 2008:48)

Concept	Definition	Application
Perceived susceptibility	One's belief regarding the chance of getting a condition	Define population at risk levels; personalize risk based on a person's characteristics or behaviours; make perceived susceptibility more consistent with an individual's actual risk
Perceived severity	One's belief of how serious a condition and its sequel are	Specify consequences of the risk and the conditions
Perceived benefits	One's belief in the efficacy of the advised action to reduce the risk or seriousness of impact	Define action to take: how, where, when ; clarify the positive effects to be expected
Perceived barriers	One's belief about the tangible and psychological costs of the advised action	Identify and reduce perceived barriers through reassurance, correction of misinformation, incentives, assistance.
Cues to action	Strategies to activate one's readiness	Provide how-to info, promote awareness, employ reminder systems
Self-efficacy	One's confidence in one's ability to take action	Provide training, guidance in performing action; use progressive goal setting; give verbal reinforcement; reduce anxiety; demonstrate desired behaviour

The HBM is adopted as a theoretical framework to understand NCDs and PA in health. The HBM is based on the understanding that a person will take a health-related action if

that person: 1) feels that a negative health condition (i.e., NCDs) can be avoided or managed, 2) has a positive expectation that by taking a recommended action he/she will avoid a negative health condition (i.e., adopting PA will be effective in preventing or managing NCDs), 3) believes that he/she can successfully take a recommended health action (i.e., can adopt PA as part of a healthy lifestyle). In this perspective a person's behaviour is influenced by their desire to avoid sickness or to get well and their confidence that their actions will achieve this.

2.6 SUMMARY

Around 58 million people died in 2005 globally, and 60% of these deaths were due to NCDs, mainly cardiovascular diseases, diabetes, cancers, and chronic respiratory diseases (Abegunde *et al.*, 2007: 1930). NCDs were the number one cause of death in the year 2000 in SA, accounting for 37% of deaths and 21% of years of life lost due to premature mortality (YLLs) (Reddy, 2005:176). Puoane *et al.* (2012:116) states that aside from the tremendous burden NCDs place on individuals, they also can deepen poverty, reduce economic productivity and strain an already under-resourced health care system. There is abundant information on the control and prevention of NCDs from high income countries that may benefit low to middle income countries in the management of NCDs (Ebrahim *et al.*, 2013:1). In sub-Saharan Africa, it is understandable that governments, donors and research – funding agencies have channelled most resources into infectious diseases: 5.9% of adults between the ages of 15 to 49 are HIV positive and malaria alone kills a million kids under the age of five each year (Daar *et al.*, 2007:494). There is however strong evidence that many of the NCD risk factors are modifiable and can be prevented and controlled through comprehensive and integrated actions (Pouane *et al.*, 2009:79, Pouane *et al.*, 2012:116). PA is a powerful means of preventing chronic diseases for individuals; for nations, it can provide a cost-effective way of improving public health across the population, (Thompson *et al.*, 2003:3110; Kruk, 2007:335).

Though there are ample PA campaigns and initiatives nationwide, the people of SA are leading low PA lives. In order to set quantifiable goals and priorities for reducing NCDs, countries must collect local data on disease and risk burden as well as the knowledge and attitudes of the population (Demaio *et al.*, 2011: 961). Limited evidence about the perception and knowledge of NCDs and PA among black South Africans are available.

There is a need for studies investigating the perception and knowledge black South Africans have about NCDs, the risk factors of NCDs and in particular about PA. During the last Demographic and health survey in SA in 2003 (Department of Health, 2007), 67.3% of women and 67% of men aged 55 to 64 years were found to be physically inactive (Peltzer & Phaswana – Mafuya, 2012:448). Studies investigating the perception and knowledge of PA among black South Africans are needed to assist policy makers and national stake holders to develop strategies that will enable efficient prevention and management of NCDs in South Africa. In order to embark on culture specific lifestyle changes, knowledge and perceptions must to be understood. A theoretical framework such as the HBM is needed to understand how to develop interventions to explain perceptions and knowledge about health. The information will assist the government; national, provincial, multi-sectorial and non – government organisations to address NCDs at reasonable cost. This information will also enable researchers to develop interventions that will be appropriate for NCDs management and create an awareness of the possible positive effects of PA on NCDs among the South African population at large.

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Chapter 3: Article 1

RELATIONSHIP BETWEEN KNOWLEDGE OF RISK FACTORS FOR NON-COMMUNICABLE DISEASE AND PREVALENCE OF NON-COMMUNICABLE DISEASE IN BLACK AFRICANS

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ABSTRACT

Background: Non-communicable diseases (NCDs) are on the rise in SA with physical activity (PA), an established modality to address NCDs, reported to be sufficient for health enhancement. Limited information is available about the knowledge of NCDs and PA among black South Africans. The aim of this study was to determine the relationships between knowledge of NCDs risk factors, physical activity knowledge, and quantitative measures of NCD risk factors and PA among black South Africans.

Methods: Questionnaires were used to determine knowledge of risk factors for NCDs and knowledge of physical activity among 93 men and women from rural, deep rural, and semi-urban areas. Risk factors for NCDs were measurements of body mass index, waist and hip circumference, blood pressure, peripheral blood glucose and total cholesterol. PA was measured objectively by means of combined heart rate and accelerometer during a 7-day period.

Results: High point prevalence of NCD risk factors were identified for hypertension (71%), overweight and obesity (67%), and physical inactivity (68%). Moderate knowledge scores for PA (87%) and limited knowledge scores for NCDs (59%) were reported. A statistically significant, positive correlation was found between NCD knowledge and activity levels among males ($r = 0.38$; $p = 0.03$). A positive, non-significant trend between PA knowledge and PA ($r = 0.29$; $p = 0.42$) among women was found. PA knowledge was detrimentally related to BMI ($r = 0.36$, $p = 0.04$), WC ($r = 0.35$, $p = 0.05$), and SBP ($r = 0.37$, $p = 0.04$) in males, and a positive relationship between NCD risk factor knowledge and BMI ($r = -0.070$, $p = 0.02$), WC ($r = -0.76$, $p = 0.01$).

Conclusion: Relationships are emerging between knowledge of risk factors for NCDs and physical activity and the determined PA levels and risk factors of NCDs among Black South Africans. We recommend that health educational programmes consider processes for translation of knowledge to behaviour in order to obtain improved health outcomes through reduced NCD risk and increased PA.

Keywords: Knowledge, Physical activity, Non-communicable disease risk factors, Black Africans.

BACKGROUND

Non-communicable diseases (NCDs) are the cause of 60% of deaths globally and 80% of deaths in the developing world [1, 2]. The statistics imply a high and increasing health care burden due to cardiovascular diseases and associated risk factors [3]. Tobacco use, unhealthy diet with foods high in saturated and trans fats, salt and sugar (especially in sweetened drinks), physical inactivity, and the harmful consumption of alcohol cause more than two-thirds of all new cases of NCDs and increase the risk of complications in people with NCDs [1].

Physical Activity (PA) is a broader construct than structured exercise to promote physical fitness; PA may be undertaken during leisure time, and this broad term incorporates play, spontaneous activity, and incidental activity as well as structured exercise and organised sport. Sedentary behaviour is not merely the absence of PA. Sedentary behaviour is little or irregular PA, and is emerging as a potential independent health risk. Physical inactivity, obesity, poor nutrition, and cultural perceptions about activity and food have been indicated as the main contributors to the development of NCDs among black South Africans [4]. Physical inactivity is recognised by the World Health Organisation (WHO), and in other international health promotion work [5] as the 4th leading cause of death [6]. Physical inactivity is a modifiable risk factor for NCDs, and can be undertaken at little or no cost. By increasing physical activity, individuals may be able to manage their NCDs more effectively or perhaps at a lower cost, than by pharmacological treatment alone.

Current PA guidelines for Americans are that to promote and maintain health, all healthy adults aged 18 to 65 years need either moderate intensity aerobic (endurance) PA for a minimum of 30 minutes five days per week, or vigorous–intensity aerobic activity for a minimum of 20 minutes three days per week. Combinations of the two PA intensities may be performed to meet this recommendation [7].

Beliefs, values, knowledge, and perceptions influence human behaviour. Hui and Morrow [8] asserted that increased knowledge of health benefits derived from PA would influence individuals' practices of habitual PA. According to Holdsworth *et al.* [9] one of the reasons for the increase in the rate of obesity and nutrition-related chronic diseases could be the lack of knowledge of what causes these diseases, and the relationship of the disease to factors such as poor diet and physical inactivity. Not much is known about how much black South Africans know about NCD risk factors and PA, and little is

known about the relationship between what they know about these topics and the prevalence of NCD risk factors or actual physical activity levels. The aim of this study was to determine the relationship between the knowledge black South Africans have about risk factors of NCDs and these risk factors *per se*.

METHODS

Study design and participants

In this observational study we gathered quantitative data from adults living in the Northern Cape (rural area) and North West (urban and deep rural areas) Provinces of South Africa. Participants were 93 black South African adults (men n=50, age range 20-64 years; women n=43, age range 20-69 years) drawn from three living settings. Rural participants represented men working in unskilled labouring jobs, urban-rural (U) participants were a mixed community including men and women, both employed and unemployed, and deep rural (DR) participants were unemployed women living in a remote rural community[10].

Recruitment and ethical procedures

Permission to undertake this study was granted by the Health Research Ethics Committee of the Faculty of Health Sciences at the North-West University (NWU-00028-12-A1). Recruitment strategies included leaving invitational flyers in churches, clinics and police stations, making local community radio announcements, directly inviting participants from previous research projects to contribute to this one, and snowball recruitment via word of mouth. The purpose and procedures of the study were explained to all people who expressed interest in the study. Among illiterate participants, explanations were done in their mother tongue. Participants were included in the study once they gave consent, and they documented this consent by signing the informed consent letter.

MEASUREMENTS

Demographic information

A self – report demographic questionnaire was administered to determine participant's socioeconomic status (SES), level of income, education level, age and gender. Age and

gender was used as part of the non-modifiable NCD risk factor classification. Men above the 45 years and women above 50 years were considered to be at high risk for NCDs [11].

Knowledge of heart disease questionnaire

The heart disease knowledge questionnaire [12] was used to determine participants' knowledge of healthy diet, physical activity benefits, pathophysiology, and risk factors relevant to heart disease as well as heart attack symptoms. The questionnaire consisted of 30 questions that were answered by circling either *T (True)*, *F (False)* or *Don't Know* for each question posed. Total score for the questionnaire was determined as a count of 1 for each question answered correctly, which was converted to a percentage score for questions answered correctly for data analysis. Bergman and colleagues had the questionnaire reviewed by experts in cardiovascular disease, health psychology, and psychometrics for content and face validity [12], although not specifically with a South African population.

Knowledge of physical activity questionnaire

The questionnaire for knowledge of physical activity, developed and used by Pienaar *et al.* [13] for an elderly South African population, was adapted for this study because no other validated South African-based questionnaire was available. This questionnaire included questions regarding the advantages of being physically active including the relevance to risk factors for heart disease. The questionnaire consisted of 10 questions that were answered by circling either *T (True)*, *F (False)* or *Unsure* for each question posed. The reliability of the questionnaire was evaluated by the use of Chronbach's alpha and was found to be 0.66.

NCD risk factors measurements

Height, weight, waist, and hip circumferences were measured using standard procedures described in the International Standard of Advancement of Kinanthropometry (ISAK) [14]. Height was measured to the nearest 0.01 m by using a stadiometer with the participants standing upright in the Frankfort Plane. Weight was measured to the nearest 0.1 kg by using a portable electronic scale (Seca, Italy). BMI was calculated as weight divided by height in metres squared, and participants were

classified according to the age- and sex-adjusted BMI cut-offs for overweight and obesity [11]. Waist and hip circumferences was measured with a flexible antropometric tape to the nearest 0.01m. (Cescorf, Brazil).

The anthropometric measurements were followed by blood pressure measurements recorded in mmHg using a BP710 automatic blood pressure monitor (Omron, Kyo Japan) on participants' left arms after they were seated for five minutes and had refrained from smoking cigarettes and ingesting caffeine for 30 minutes prior to measurement [11]. The average (arithmetic mean) of the two recorded measurements was used for risk classification.

Peripheral glucose and total cholesterol measurements were measured from fasting blood by means of an automated device (Accutrend: Roche Diagnostics, Germany) by inserting a test strip with a hanging drop of blood in the meter from a pierced finger waiting 12 seconds (sec) for glucose and 70 sec for cholesterol reading in the device in millimole per liter (mmol/L) according to the manufacturer's user manual [15].

Physical activity measurements

Physical activity measurements represented in metabolic equivalents (METs) were measured objectively using a combined heart rate and accelerometry chest – worn monitoring device ActiHeart®, (CamNtech, UK) in accordance with the manufacturer's user manual [16]. ActiHeart® devices were worn 24 hours per day for a period of seven days to capture data on energy expenditure during free living conditions in 1 minute epochs. MET cut-off points describe the intensity levels of PA: low 1.5 to 3 METs, moderate above 3 to 6 Mets, and vigorous above 6 METs. Physical activity level (PAL), activity energy expenditure (AEE), resting metabolic rate (RMR), activity counts, and days Actiheart® worn where determined using inbuilt equations in the Actiheart® software. Total energy expenditure (TEE), the total sum of energy used by an organism calculated by adding a component of resting energy expenditure (REE) and diet-induced thermogenesis (DIT). PAL is calculated by dividing TEE by RMR. PAL values were categorised as bed rested PAL < 1.2, low activity PAL 1.2 – 1.55, medium activity PAL 1.55 -1.71, high activity PAL 1.71-1.95 and very high activity PAL >1.95.

Classification of risk factors

Participants were classified as “at risk” if they reached the following thresholds: age (men \geq 45 years and women \geq 55 years); glucose concentrations larger than 5.6

mmol/L, total cholesterol concentrations larger than 5.2 mmol/L; resting blood pressure higher than 140/90 mmHg; waist circumference for women larger than 88 cm and for men 102 cm; overweight as a BMI between 25 and 29.9 kg/m²; and obese a BMI of larger than 30 kg/m² [11]. Frequency calculations, converted to percentages, were performed to determine the point prevalence of NCD risk factors.

STATISTICAL ANALYSES

The SPSS ver. 22.0 [17] software was used for statistical analyses. Descriptive analyses were performed to present the baseline characteristics of the participants, reporting means, standard deviations and frequencies. Pearson’s correlation analyses were performed to determine the relationship between knowledge of heart disease, knowledge of PA, current PA level, and risk factors of heart disease measurements. Adjustments were done for participant age, socio-economic status, level of income, and gender. Statistical significance was set at $p \leq 0.05$.

RESULTS

The characteristics of the participants (Table 1) indicate that the participants were all in their mid-forties, the age at which the clinical horizon starts to present. The females reported an average of five years less work experience than the males.

Table 1: Characteristics of participants

Variables	Total		Males	Females	p-value
	N	Mean \pm SD	Mean \pm SD	Mean \pm SD	
Age (years)	93	45.9 \pm 13.8	43.3 \pm 12.2	48.9 \pm 15.0	0.18
Stature (height: cm)	93	163.8 \pm 8.2	167.7 \pm 6.4	159.4 \pm 7.7	0.90
Body Mass (kg)	93	77.9 \pm 19.7	78.7 \pm 18.4	77.2 \pm 21.3	0.43
Hip circumference (cm)	91	106.0 \pm 15.6	102.3 \pm 13.2	110.3 \pm 17.1	0.27
WHR	91	0.89 \pm 0.01	0.93 \pm 0.10	0.84 \pm 0.12	1.00
Working years (years)	54	11.0 \pm 10.2	12.2 \pm 10.3	7.7 \pm 9.6	0.60

Working years – total working years regardless of fractional employment, SD Standard deviation, WHR Waist-to-Hip ratio; alpha level $p \leq 0.05$.

Prevalence of NCD risk factors

NCD risk factors measured in the participants are summarised in Table 2, reported as overall mean values for each risk factor as well as mean values for males and females separately. Although the women expended more activity energy (752 ± 497 kCal/week) than the men (499 ± 201 kCal/week), the men showed higher activity counts (45.0 ± 21 cpm) than the women (35 ± 14 cpm) over the seven-day period of objective measurements.

Point prevalence of NCD risk factors, including overweight and obesity based on BMI, WC, BP, T-Chol and glucose is presented in Figure 1. The risk factors for NCDs in the participants (Table 1) indicated that risk factor with the highest prevalence was found for hypertension with 71% of the participants reporting class I ($\geq 130/80$ mmHg) and 18% with class II ($\geq 160/100$ mmHg) hypertension. Findings related to body composition were the second most prevalent risk factor. Seven percent of the participants were classified as underweight ($\text{BMI} \leq 19.5$ kg/m²), 26% participants normal weight ($\text{BMI} \geq 19.5 - 24.9$ kg/m²) and 22% participants classified as overweight ($\text{BMI} \geq 25 - 29.9$ kg/m²). Class 1 ($\text{BMI} \geq 30-34.90$ kg/m²obesity (26%) and obese class 2 ($\text{BMI} \geq 35$ kg/m²) (19%) presented a 45% total prevalence. The mean total sample waist circumference was 93.62 ± 17.22 cm with 44% participants classified to have elevated waist circumference, 52% women had waist circumferences >88 cm and 36% men had waist circumferences >102 cm. The mean total cholesterol readings indicated that 25% participants had elevated blood cholesterol levels. The mean blood glucose measurements were (5.34 ± 2.83 mmol/L), 26% of participants had elevated blood glucose levels.

Table 2: Risk factors for coronary heart disease measured

Risk factors for NCDs	N	Total	Males	Females	p-value
		Mean \pm SD	Mean \pm SD	Mean \pm SD	
Body mass index (kg/m ²)	93	29.1 \pm 7.2	28.0 \pm 6.3	30.3 \pm 8.0	0.31
Waist circumference (cm)	91	93.6 \pm 17.2	95.0 \pm 17.3	95.1 \pm 17.3	0.84
Systolic BP (mmHg)	77	142 \pm 24	144 \pm 24	139 \pm 24	0.82
Diastolic BP (mmHg)	77	92 \pm 17	94 \pm 16	89 \pm 17	0.46
Glucose (mmol/L)	87	5.3 \pm 2.8	5.4 \pm 2.2	5.3 \pm 3.5	0.27
T-Chol (mmol/L)	73	4.6 \pm 1.0	4.4 \pm 1.1	4.8 \pm 0.9	0.51
PAL	87	1.55 \pm 0.30	1.43 \pm 0.13	1.68 \pm 0.39	0.00
Activity (counts/min)	87	40.45 \pm 19.06	45.0 \pm 21.2	35.1 \pm 14.8	0.09
AEE (kCal/week)	87	616 \pm 387	499 \pm 201	752 \pm 497	0.00
ActiHeart worn (days)	87	5.9 \pm 0.6	5.8 \pm 0.8	6.0 \pm 0.2	0.03

BP blood pressure, PAL physical activity level, AEE activity energy expenditure, NCDs non-communicable diseases.

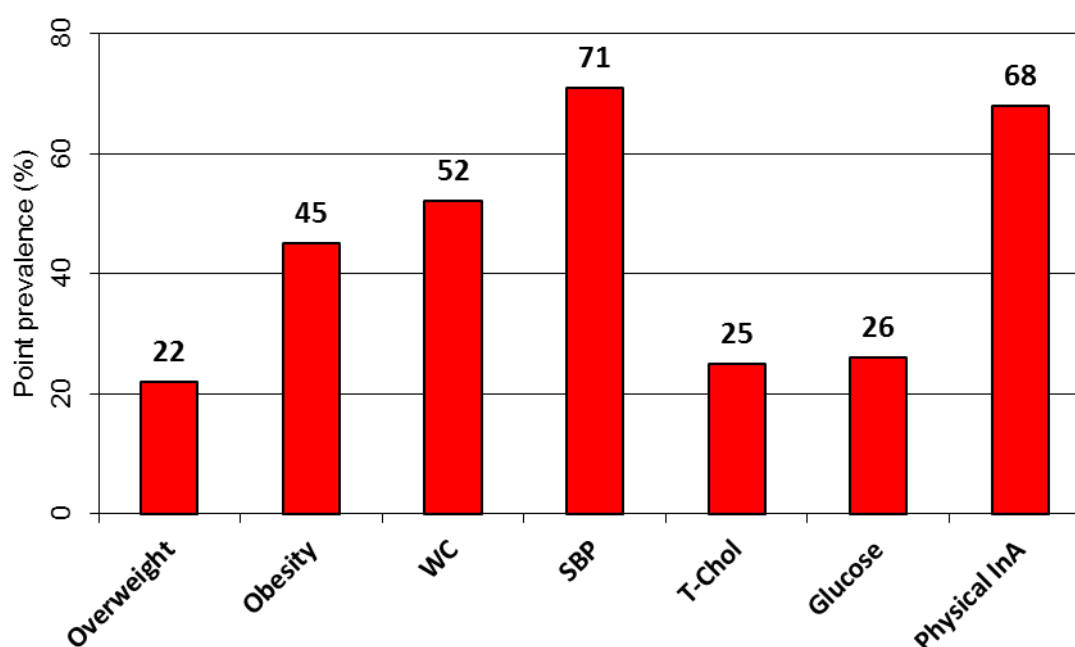


Figure 1: Point Prevalence of NCD risk factors among participants

WC = Waist circumference; SBP = systolic blood pressure; T-Chol = Total cholesterol; Physical InA = Physical inactivity

Knowledge of risk factors of NCDs and PA

The NCD and PA knowledge survey included 54 participants. The total means score for the knowledge of risk factors for NCD was 59.01 ± 8.48 % and the total sample mean for PA knowledge was 84 ± 16 % (Table 3). The NCD knowledge survey showed that 59% of the participants believed that most people can tell whether or not they have high blood pressure and 67% participants believed that high blood pressure is defined as 110/80 mmHg or higher. The participants believed that the most important cause of heart attacks is stress. Only 46% participants indicate that heart disease is better defined as a chronic, long-term illness and not a short term illness, while 87% believed that women are more likely to die from breast cancer than heart disease (Table 4).

Table 3: Knowledge scores of coronary heart disease and physical activity questionnaires

Knowledge scores	Total		Males	Females	<i>p</i> -value
	<i>N</i>	Mean \pm SD	Mean \pm SD	Mean \pm SD	
NCD score correct %	54	59 \pm 9	59 \pm 8	59 \pm 9	0.49
PA score correct %	54	84 \pm 16	84 \pm 16	82 \pm 15	0.75

NCD = non-communicable disease PA = physical activity. Significant difference between male and females $p \leq 0.05$

The PA knowledge survey showed that 84% participants have PA knowledge and only 24.1% participants stated that PA is good for some individuals. However 89% participants knew that exercise reduces high blood glucose (sugar)/ diabetic complications and 91% participants knew that PA is good for blood pressure, regardless of age, weight, race, or gender, and 5.6% where unsure (Table 5).

Table 4: Frequencies for correct answers on risk factors for NCDs

Question	Correct (%)
Polyunsaturated fats are healthier than saturated fats	82
Women are less likely to get heart disease after menopause than before	56
Having had chicken pox increases the risk of getting heart disease	44
Most people can tell whether or not they have high blood pressure	78
Most people can tell whether or not they have high blood pressure	41
Trans-fats are healthier for the heart than most other kinds of fats	57
The most important cause of heart attacks is stress	0
Walking and gardening are considered types of exercise that can lower heart disease risk	98
Most of the cholesterol in an egg is in the white part of the egg	30
Smokers are more likely to die of lung cancer than heart disease	7
Taking an aspirin each day decreases the risk of getting heart disease	54
Dietary fibre lowers blood cholesterol	96
Heart disease is the leading cause of death in the United States	94
The healthiest exercise for the heart involves rapid breathing for a sustained period	83
Turning pale or grey is a symptom of having a heart attack	67
A healthy person's pulse should return to normal within 15 minutes after exercise	96
Sudden trouble with seeing in one eye is a common symptom of having a heart attack	33
Cardiopulmonary resuscitation (CPR) helps to clear clogged blood vessels	24
HDL refers to "good" cholesterol, and LDL refers to "bad" cholesterol	70
Arterial defibrillation is a procedure where hardened arteries are opened to increase blood flow	22
Feeling weak, light-headed, or faint is a common symptom of having a heart attack	87
Taller people are more at risk for getting heart disease	65
"High" blood pressure is defined as 110/80(systolic/diastolic) or higher	33
Most women are more likely to die from breast cancer than heart disease	13
Margarine with liquid safflower oil is healthier than margarine with hydrogenated soy oil	83
People who have diabetes are at higher risk of getting heart disease	85
Men and women experience many of the same symptoms of a heart attack	80
Eating a high fibre diet increases the risk of getting heart disease	63
Heart disease is better defined as a short-term illness than a chronic, long-term illness	46
Many vegetables are high in cholesterol	82

Table 5: Frequency of correct answers for questions on physical activity knowledge

Questions	Correct (%)	Unsure (%)
PA is only good for some people eg. Elite sports men, young people and Caucasians	69	7
Exercise reduces high blood glucose levels/ diabetic complications	89	4
PA of moderate intensity at least 5 times per week has positive effects on health	94	4
Exercise decreases physical dependence	61	7
30 mins of PA daily supports weight loss	82	7
PA is good for your BP no matter what your age, weight, race and gender is	91	6
PA causes/worsens pain	74	4
Exercise contributes to cholesterol control	89	4
PA contributes to better state of mind	93	4
PA improves health and general well-being	96	4

PA = Physical activity

Relationship between knowledge of risk factors for NCDs and risk factors per se

The results of the correlation indicated that in the total group of participants an increase in the knowledge of risk factors for NCDs, translated to a decrease in the activity counts measured for PA ($r = -0.33$; $p = 0.03$) and the waist to hip ratio ($r = -0.32$; $p = 0.04$). The results of the PA knowledge indicated that an increase in the knowledge resulted in a significant increase in systolic blood pressure ($r = 0.36$; $p=0.02$); waist circumference ($r = 0.32$; $p=0.04$); glucose concentrations ($r = 0.32$; $p=0.04$) and BMI ($r = 0.31$; $p = 0.04$). Since gender influences the relationship, partial correlations with adjustment for age was performed (Table 6). The results indicate a significant relationship between knowledge of NCD risk factors and waist circumference ($r = -0.76$; $p = 0.01$) and BMI ($r = -0.70$; $p= 0.02$) among women. There was a positive trend for an association between moderate PA and PA knowledge among women ($r = 0.19$; $p= 0.60$) (Table 6). Among men increase in knowledge of PA was associated with increases in SBP ($r = 0.37$; $p=0.04$), increases in waist circumference ($r = 0.35$; $p= 0.05$) and increases in BMI ($r = 0.36$; $p = 0.04$).

Table 6: Relationship between knowledge of PA, knowledge of risk factors for NCDs and PA levels and risk factors of NCDs separated for males and females

Variables	PA knowledge				NCD knowledge			
	Males		Females		Males		Females	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Physical activity								
PAL	0.05	0.77	0.21	0.57	-0.13	0.47	0.12	0.74
Activity counts	-0.02	0.91	0.29	0.42	0.38	0.03	-0.11	0.75
Low act (<3 METs)	0.14	0.45	-0.18	0.62	0.06	0.75	-0.08	0.84
Mod act (3-6 METs)	-0.14	0.45	0.19	0.60	0.06	0.73	0.06	0.87
High act (>6METs)	0.05	0.79	-0.10	0.08	0.04	0.84	0.35	.032
Risk factors for NCDs								
SBP (mmHg)	0.37	0.04	0.34	0.34	0.23	0.21	-0.30	0.41
DBP (mmHg)	0.22	0.21	0.33	0.35	0.20	0.26	-0.22	0.53
WC (cm)	0.35	0.05	0.22	0.53	0.16	0.36	-0.76	0.01
Glucose (mmol/L)	0.29	0.1	0.43	0.21	0.16	0.36	-0.09	0.82
T-Chol (mmol/L)	0.14	0.44	-0.36	0.31	0.08	0.64	-0.02	0.96
BMI (kg/m ²)	0.36	0.04	0.17	0.64	0.25	0.16	-0.70	0.02
W/H	0.15	0.42	0.22	0.54	-0.28	0.12	-0.52	0.13

cpm = counts per minute; METs = metabolic equivalent; NCDs = non-communicable diseases; SBP = systolic blood pressure; DBP = diastolic blood pressure; mmHg = millimetres of mercury; cm = centimetres; mmol/L = millimole per litre; BMI = body mass index; kg/m² = kilogram per metre squared; WC = waist circumference; W/H = waist to hip ratio; significance $p \leq 0.05$

DISCUSSION

The main findings of this study that aimed at understanding the relationship between risk factors of CHD and the determined risk factors, found that the major risk factors were elevated blood pressure and physical inactivity. The present study revealed hypertensive blood pressures with similar measurements among both genders [18]. Hypertension was ranked the second highest cause of deaths in the year 2000 in SA [19]. A study done on rural SA showed BP in men and women was higher in the older age than younger groups, approximately 25% of the rural participants had hypertension [20]. In this study that included rural, deep rural and urban areas BP was elevated in all ages in both genders and approximately three quarters of the study population had hypertension. Studies show that the prevalence of hypertension increased from rural to urban areas. In United States of America 68.9% of people with hypertension were aware of the diagnoses, 58.4% received treatment, and only 31.0% had controlled BP [21].

This study revealed that the majority of participants were overweight. Obesity is presently an epidemic in SA [22], however in this study, overweight was most prevalent and to a lesser extent, obesity. Women presented with the highest body composition. The study revealed low total cholesterol among participants. A previous study showed that total cholesterol values were lower among the black population, with higher values among young people [23]. The present study revealed that seven participants had high cholesterol levels and average blood glucose levels while the younger age groups had low levels of blood glucose. Diabetes claimed 4.3% of all deaths in SA in 2000 [24]. Other lifestyle risk factors such as smoking and alcohol consumption reporting were found to be low among the participants; and less among women. This is consistent with previous surveys that found smoking in SA to be high with 35% men and 10% women smoking. Alcohol consumption reported was very high in men. According to Parry *et al.* [25] alcohol was ranked the highest in middle-income countries.

This current study revealed that participants have above-average knowledge about PA. Previous studies shows that though adults knew the recommended PA target, they thought they had enough PA in their daily life [26]. Similar to findings from a situational assessment which indicated a lack of knowledge among community health workers about hypertension and diabetes and the risk factors for these NCDs, participants in this study had below average knowledge about NCDs [27]. PA has been defined as all movements in everyday life, including work, recreation, exercise and sporting activities

[28]. A study in men showed 7% leisure time activity reporting, 14% work time activity and 81% transport activity [29].

The results of this study showed that 67% participants were generally leading a sedentary lifestyle or had low activity levels. These results are similar to findings of the demographic and health survey in SA in 2003 where 67% of men and 67% of women were physically inactive [30]. A previous study reported SA to have high levels of physical inactivity with 49% of adult women and 43% of adult men reported to be insufficiently active to achieve health benefits [31]. The SANHANES reported that one third of SA population was unable to complete a 6 min fitness test, this low fitness test are strongly associated with low PA levels among South Africans. Though the women expended more activity energy than the men, the women were heavier than the men accounting for the higher energy expenditure. Activity energy expenditure (AEE) is the modifiable component of total energy expenditure derived from volitional and non-volitional activities [32]. Participants in this study measured low AEE values. Data from cohort suggest that physical inactivity is associated with 1.5 to 2.0 fold higher risks for NCDs [30]. Higher levels of AEE have been reported to decrease the risk of blood pressure [33] and are associated with reduced risk factors for NCDs [34].

The findings reveal that there was a high prevalence of risk factors for NCDs among the majority of participants. It was also found that the knowledge of NCDs was low among this group. However, the interesting findings were that the participants had a relatively good knowledge about PA. Despite the participant's knowledge of PA, there was a low level of involvement. Based on the findings, there was a relationship between the low knowledge level about NCDs and non- involvement in physical activity, despite knowing about PA. From observations, it seems that the reason could be that there were physical activity barriers, which are hindering the participants of this study from participating in physical activity. Also, an association exist between the low knowledge level about NCDs and a high prevalence of NCDs among black South Africans.

LIMITATIONS

First, due to illiteracy, not all participants were able to complete surveys, thus reducing the number of participants. This limited the generalization of this study but not the validity.

Intensity of PA might have also been for the associations found. Participants of this study mainly engaged in low intensity PA.

CONCLUSIONS

In the present study, risk factors leading to non-communicable diseases were found to be present in the majority of the participants. The participants in the present study were moderately knowledgeable about physical activity but had limited knowledge about NCDs. There is no relationship between risk factors for NCDs and knowledge of NCD risk factors and knowledge of PA among black South Africans.

RECOMMENDATIONS

A qualitative study exploring knowledge and perceptions of NCDs and PA among black South Africans.

LIST OF ABBREVIATIONS

SA - South Africa; NCD - non-communicable diseases; PA - physical activity; ISAK - International Standard of Advancement of Kinanthropometry; SBP – systolic blood pressure; DBP – diastolic blood pressure; BMI – body mass index; WC – waist circumference; WHR – waist-to-hip ratio; PAL - physical activity level; MET –metabolic equivalents; AEE – activity energy expenditure; RMR- resting metabolic rate; UR - urban-rural; DR – deep rural; R – rural; SD - standard deviation; p – significance level; mmHg - millimetres of mercury; mmol/L - millimole per litre; cm – centimetres; kg/m² - kilo grams per metre squared; SPSS - statistical package for social sciences;

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

SM, SM* and MC were involved in the conception of the study, and participated in it's design and coordination and helped to draft the manuscript. SM* Performed the statistical analysis. All authors read and approved the final manuscript.

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Chapter 4: Article 2

Perceptions and knowledge of non-communicable diseases and physical activity of black Africans

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Running header: Perception and knowledge of non-communicable disease

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ABSTRACT

Purpose: The purpose of this study was to explore and describe the perceptions and knowledge of NCDs and PA among black South Africans.

Methodology: A mixed explorative research approach was used. Participants were 93 black African adults (50 men and 43 women) aged between 20 and 69 years. Focus group discussions were conducted by means of a semi-structured interview schedule to guide the discussion about perceptions and knowledge of PA and risk factors of NCDs. Concurrently, a structured survey was used to measure participants' knowledge of PA and NCDs. Participants' percentage of correct responses were graded for PA and NCDs. Discussions were analysed using Atlas.TI. Survey data reported descriptively (count, frequency, mean, SD) using SPSS.

Results: Participants scored an average of $84\% \pm 16\%$, $59\% \pm 8\%$ for PA and NCD knowledge respectively. Results from the discussions revealed that there is a misperception of NCDs and PA. Men have the most serious misconceptions about NCDs suggesting beliefs that nothing can be done to prevent or to manage NCDs while women show highest misconceptions about PA, with cultural perceptions that PA is confined within female gender roles.

Conclusion: Knowledge of NCDs and PA is poor among black Africans. Misconceptions abound, although the nature of the misconceptions differ somewhat between men and women.

Key words: Perceptions, Knowledge, Physical activity, Non-communicable diseases, Black Africans, Black South Africans

INTRODUCTION

The burden of non-communicable diseases (NCDs) is increasing rapidly in newly-industrialised countries similar to the developed countries.^{1, 2} In South Africa (SA), NCDs in 2000 accounted for 37% of deaths and 21% of years of life lost due to premature mortality.³ NCDs such as cerebrovascular diseases, diabetes mellitus, other forms of heart and hypertensive diseases were ranked among the top ten causes of deaths in the year 2010.⁴ NCDs are defined as a group of slowly progressive medical conditions or diseases of long duration which are characteristically non-infectious and non-transmissible among people.⁵ A lack of physical activity (PA), obesity, poor nutrition, and cultural perceptions have been indicated as the main contributors to the development of NCDs in Africans.⁶

Unsurprisingly, the burden of NCDs can be reduced by addressing NCD risk factors.⁷ NCD risk factors can be classified as non-modifiable, such as age, gender and family history, and potentially modifiable such as upper body fat distribution and sedentary lifestyle.⁸ It is broadly accepted across health care that NCDs are mainly caused by unhealthy diet and physical inactivity. SANHANES stated that, globally, physical inactivity is recognised as the fourth leading risk factor for premature mortality, and is responsible for NCDs such as coronary heart disease and type 2 diabetes.⁹ The latest South African national data on PA illustrates that a large proportion of adults are leading either sedentary or low PA lifestyles.¹⁰ Low levels of PA reported, correspond with the high levels of overweight and obesity observed among adults, particularly women. Obesity among women in South Africa has increased from 27% in 2003 to 39.2% in 2012.⁹

Individual perception and knowledge plays an important role in how persons perceive their health and lifestyle and how they respond to health problems.¹¹ Often behaviour is influenced by knowledge and or perceptions about issues that influence health and lifestyle and currently information on the perception and knowledge of NCD risk factors are lacking in the South African context. There is a clear need to assess why South Africans are inactive. If we do not understand the causes of inactivity, we are unlikely to ensure that PA is addressed as a priority.¹² In order to understand the roots of inactivity in black South Africans; we seek insight into the knowledge and perceptions about NCDs and PA. Findings will assist in directing future interventions with the aim to increase PA for health improvement and the reduction of NCD risk factors and NCDs. Therefore the purpose of this study was to 1) explore perceptions of NCD risk factors

and PA and 2) to determine the knowledge on NCD risk factors and PA among black South Africans. Findings from this study will inform health professionals applying exercise and PA as modalities to treat NCDs in their patients and the relevant PA knowledge to transfer with the correct perceptions about NCDs and PA.

The health belief model (HBM) was adopted for the theoretical framework to understand NCDs and PA in health. This model stipulates that an individual's health-related behaviour is influenced by the individual's perception of four critical areas namely: the severity of a potential illness, the person's susceptibility to that illness, the benefits of taking a preventative action, and the barriers to taking that action.¹³ The HBM was initially developed in the 1950's to explain why people do not participate in public health programs and it was subsequently used to guide compliance of intervention programs to promote adherence to preventative measures. The HBM is based on the understanding that a person will take a health-related action if that person 1) feels that a negative health condition (i.e., NCDs) can be avoided or managed, 2) has a positive expectation that by taking a recommended action he/she will avoid a negative health condition (i.e., adopting PA will be effective in preventing or managing NCDs), 3) believes that he/she can successfully take a recommended health action (i.e., can adopt PA as part of a healthy lifestyle). In this perspective a person's behaviour is influenced by their desire to avoid sickness or to get well and their confidence that their actions will achieve this.

METHOD

Aim: This was an explorative qualitative study using a phenomenological data collection approach to understand black Africans' perceptions and knowledge of NCDs and PA.

Participants: Informed consent was obtained from 93 black African adults in three regions of SA (Urban (U), Rural (R) and Deep rural (DR) who participated in the present study. These participants, although not representative of the entire SA population, represent men working in unskilled labouring work (R), women living in a rural community (DR), and a mixed community including men and women, both employed and unemployed (U).

Procedures: Recruitment strategies included flyers in churches, clinics, police stations, local community radio announcements, participants in previous research projects, mass communication and word of mouth.

Focus group discussions

All participants contributed to focus group discussions (FGDs), exploring their knowledge and perceptions about NCDs and PA. Fifteen FGDs consisting of 6 to 10 participants in a group lasting about an hour each were conducted. The discussion was initiated by asking open-ended questions, see Table 1. All FGDs were conducted in the mother tongue of the participants, which included English, Afrikaans and Tswana. Discussions were audio recorded, and then transcribed verbatim by an experienced transcriber proficient in all three languages for analysis (see Table 1).

Table 1: Open-ended questions asked to the participants

What do you understand about non - communicable diseases?

Which diseases can be classified as non - communicable diseases?

Who is most likely to develop/have non - communicable diseases?

Can non - communicable diseases be prevented? Explain how?

What is physical activity? Give examples

Is physical activity beneficial? Explain how?

Is there a connection between physical activity and non -communicable diseases? If so, what is the connection?

Surveys

Participant's completed a survey of structured questions on health and PA topics. This survey was used as a direct measure of participant's knowledge of PA and NCD. The questionnaire on knowledge of heart disease¹⁴ was used to determine the knowledge of the participants with regards to diet, epidemiology, medical information, risk factors and heart attack symptoms. A questionnaire on the knowledge of physical activity was developed, based on the one used on an elderly South African population.¹⁵No other South African- based questionnaire was found. The questionnaire included questions based on research findings with regard to the advantages of being physically active, related to risk factors for heart disease. Surveys were either completed in survey monkey. When internet or language was a barrier, pencil-and-paper surveys were done.

Data analysis

A content analysis of full transcripts of each FGDs was conducted using Atlas Ti7 (Thomas Muhr, Berlin) by using the NCT approach method of qualitative data analysis.¹⁶ Descriptive analysis of surveys were done for count, frequency, mean, and SD on SPSS vers.22.

RESULTS

The results of this study highlighted the participants' knowledge and perceptions of NCDs and PA respectively. The perceptions of the participants on non-communicable diseases and physical activity are presented in Table 2. The adapted HBM for the discussion of the results (Figure 1), were classified under three categories 1) modifying factors, 2) individual perceptions and 3) likelihood of action.

Table 2: The Perceptions of black South Africans about non-communicable diseases and physical activity

Main-categories	Sub-category	Further categories	Quotations from responses
Non-communicable diseases			
NCD defined	<ul style="list-style-type: none"> • Non-contagious • Life –style diseases • Types of NCD: <ul style="list-style-type: none"> -High -blood pressure -TB -Heart attack/ --asthma -arthritis -stroke -sugar diabetes -epilepsy -mental illnesses -depression 	<ul style="list-style-type: none"> • Diseases that is hereditary. • Overweight 	<p>“These types of diseases are more in overseas than Africa”</p> <p>“TB, no TB you can get from someone who has it.”</p> <p>“ I think overweight is non-communicable diseases”</p>
NCD causes	<ul style="list-style-type: none"> • Bad attitude • Hereditary • Bad luck • Stress • Chemicals • Lifestyle: <ul style="list-style-type: none"> -diet -exercise -alcohol 	<ul style="list-style-type: none"> • Death due to what we consume • Heart problems • Young people assets to those with money • Attacks • Alcohol to lower stress • Diet – fatty and salty foods • Lack of PA 	<p>“There is no equality some remain poor and unhappy while other are rich and happy”</p> <p>“Alcohol gives false sense of happiness”</p> <p>“We’ve got Dstv, all we do is eat , watch movies no PA, that adds to the problems”</p> <p>“We quarrel too much that’s why we get these diseases.”</p>
NCD prevention	<ul style="list-style-type: none"> • Avoid anger • Exercise • Setswana herbs • Balanced diet 		<p>“You must help yourself by drinking Setswana herbs, drink phatayangaka, African potato and sengaparile; you make tea out of them and drink and you become sharp.”</p>

Physical activity			
Preferences	<ul style="list-style-type: none"> • House chores • Walking • Running • Dancing • Stretching • Soccer 	<p>Walking is the only exercise, walking as means of transport, We use bicycles, ancient people walked. Running is a daily work routine – but unable to run. PA increases blood cells</p>	<p>“I walk from home to church on Sundays” “When there are funerals on Saturdays I walk.” “Doing a few stretches, it will be exercising.” “Some people dance when drinking, so they exercise” “I exercise with my husband in bed”</p>
Barriers to PA	<ul style="list-style-type: none"> • Working – lack of time • Not qualified to PA time at work • PA increases food intake • Fear of crime • Clothing for PA • Socio-economic conditions • Pain avoidance • Behaviour:- Watching TV, Lifestyle, Alcohol 	<p>After work I am tired Household responsibilities In the evening and early mornings there is crime TV viewing takes time We have knee problems I don't have friends to exercise with</p>	<p>“If I spot a criminal, my mind is far from running, I will blow and scream in order to initiate someone to run after the criminal.” “You ask yourself what is the purpose of exercising, because you don't want to live long and see yourself suffering.” “To exercise is to lower sickness so that it does not proceed ahead, when you exercise you become better.” “Running makes my knee painful” “While watching TV, exercise with dumpies/dumbbells” “After knocking off, you have 30 minutes to exercise, but with a glass of alcohol” “Our level of economy does not allow us”</p>
Gender differences	<ul style="list-style-type: none"> • Women: men desire shapely women • Women do house chores • Men do weekend sports • Men not familiar with exercise • Chasing money • TV viewing lowers PA • Alcohol around every corner, Play soccer 	<p>Women does the house chores, women work more than men Both males and females can do comrades, women exercise lighter than men Weekend soccer – inadequate PA</p>	<p>“If I am this size and wear tracksuits, people laugh.” “African men would say, me being an African man I want the shape, I'm working, why aren't you curvaceous (fuller figure).” “Ancient husbands would be gone from home for a long time.” “When you arrive home, you sit two minutes drinking tea, then you take a pot and cook, when you are peeling, washing dishes, you are exercising too much.” “Helping my woman with chores is my PA”</p>

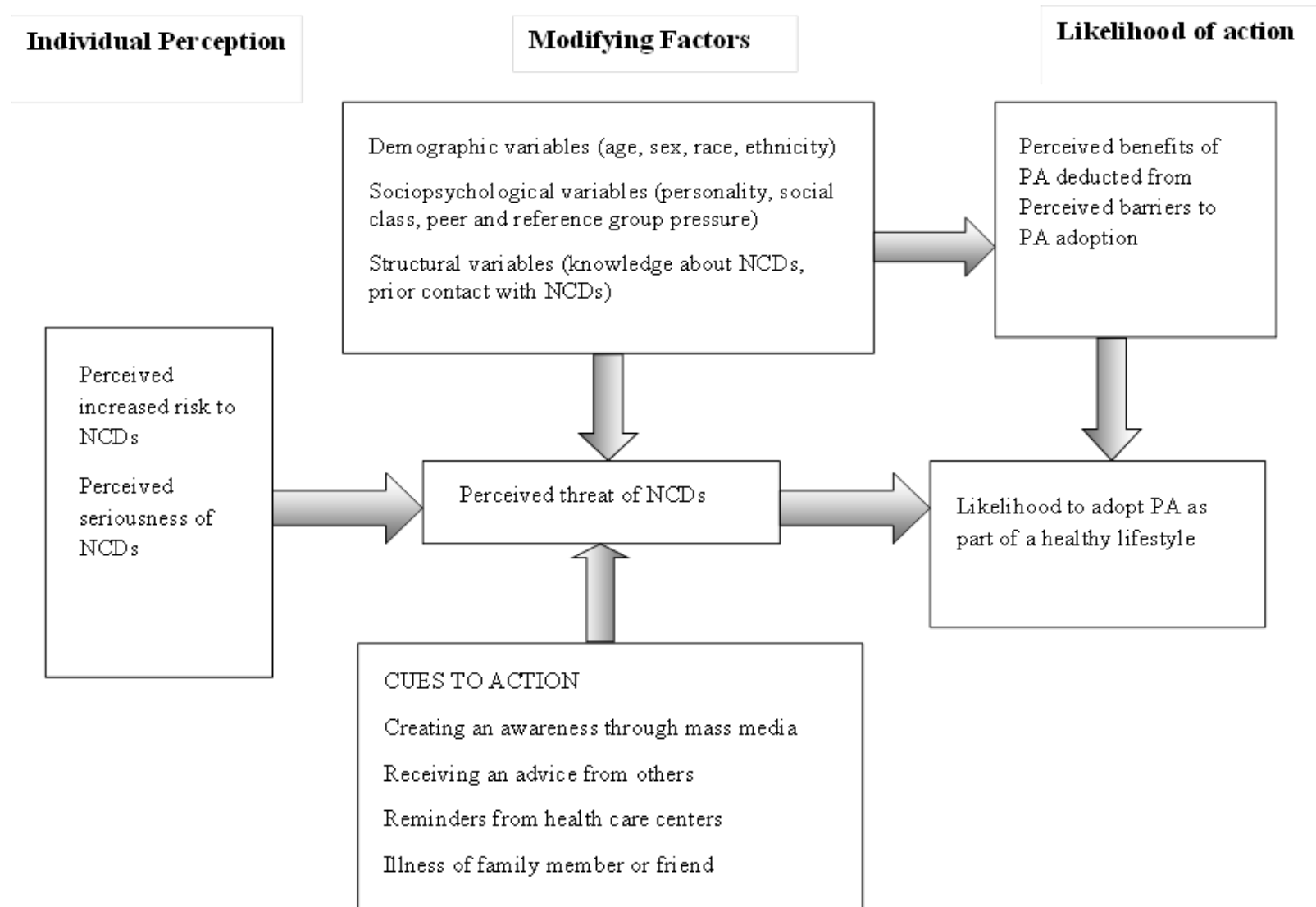


Figure 1: Adapted Health Believe Model for changing perceptions and knowledge of non-communicable diseases and physical activity

Modifying factors

Demographic variables included age and gender. Ninety-three participants (male n=50, female n=43) in the age range of 20-69 years formed part of the FGDs. FGDs grouping consisted of 4 – 11 men only, women only and both genders respectively.

Sociopsychological variables included social class and reference group pressure. Groups consisted of participants residing in deep rural areas, rural areas labouring in an unskilled work, and urban areas either employed or unemployed.

Structural variables consisted of Quantitative determination knowledge of NCD and PA knowledge making use of survey. Participants residing in DR region did not complete the survey due to illiteracy. The survey included (n=54; UR n=18, R n=36) of the study participants. Table 3 presents the demographic characteristics of the participants included in the survey

Table 3: Participants demographics

Variable	Frequency n (%)
Gender	
Female	19 (35)
Male	35 (65)
First Language (mother tongue)	
Tswana	33 (61)
Xhosa	13 (24)
Sotho	3 (6)
Afrikaans	4 (7)
Zulu	1(2)
Age groups	
20 – 29	12 (22)
30 – 39	12 (22)
40 – 49	18(33)
50 – 59	8 (15)
60 – 69	4 (7)
Highest level of Education	
Primary school	18 (33)
Secondary school	29 (54)
College/university	3 (6)
None	4 (7)
Work	
Full time	44 (81)
Part – time	10 (29)

Knowledge of NCDs

Participants were considered knowledgeable about NCDs if they defined NCDs as a group of diseases that are not transmittable among individuals. NCDs are mostly brought about by modifiable risk factors such as physical inactivity, unhealthy diet, and obesity.

The NCD survey revealed that participants scored 59% on knowledge about heart diseases. The NCD knowledge survey showed that 59.3% of the participants believed that most people can tell whether or not they have high blood pressure and 66.7% participants believed that high blood pressure is defined as 110/80mmHg or higher. The participants believed that the most important cause of heart attacks is stress. Only 46% participants believed that heart disease is better defined as a chronic, long-term illness and not a short term illness.

Furthermore, FGDs questions explored knowledge and perception of NCDs. There was confusion between NCDs and communicable diseases and some participants mentioned that NCDs are contagious and do not heal: “they are type of non-curable disease that stays for a long time in a person and are said to be contagious”. While some mentioned that they are not communicable “NCDs are diseases that you cannot take from someone else, are hereditary and maybe you were born with it”. Participants felt that not being open leads to stress, which at times was mentioned as a NCDs or NCD risk factor. Malnutrition and lack of exercise were also mentioned as causes of NCDs. Participants mentioned that NCDs are currently on the increase mainly due to lifestyle changes, “Those communicable lifestyle diseases”. Malnutrition also included improperly cooked food, too much salt, fast food, e.g. “when I eat fatty stuff I will have fat and fat-related diseases”. Some women mentioned overweight as an NCD mainly caused by malnutrition, eating disorders and eating non-balanced food. Some mentioned that the likes of sugar diabetes are hereditary and also depends on diet, exercise and body weight. Chemicals in food are also a cause of malnutrition and indirectly NCDs “Milk of today is diluted and has no nutrients that come directly from cows”. Other participants mentioned that smoking “hubbly bubbly” (also called a hubb /hookah /water pipe/shisha) an instrument for smoking tobacco, which is often flavoured) as one of the causes.

Knowledge of included awareness that PA is any form of bodily activity that causes the body to use energy. Daily PA includes house work, activity at work, leisure time PA, and sports. Increased PA is beneficial to good health and achievable by all people, regardless of gender, ethnicity or race.

Participants scored 83% in a PA-knowledge survey. The overall population (96% of the sample) knew that PA improves health and general well-being, with only 4% reporting that they were unsure. The majority of the participants (69%) knew that PA is beneficial for all populations, with only 24% who thought that PA is beneficial for certain individuals only. Almost the entire group of participants know that PA is effective in reducing blood glucose levels (91%), controlling blood pressure (91%) and cholesterol (90%). The majority of participants (92%) knew the positive effects of PA and that it improves their state of mind, and 94% knew that moderate intensity exercise at least five times a week has positive effects on health, while 19 % participants did not know that PA supports weight control.

During FGDs, participants defined PA to be, inter alia, vocational PA. Walking was mentioned as the most preferred form of PA, which often is a form of travelling for daily necessities. Black women perceived house chores as their main form of PA, “having to prepare supper for the family, children’s clothes for school the next day, theirs and the husband’s whilst white women have maids to assist with that”. Women in the cleaning industry regarded themselves to be more physically active than men, as they spend the entire day at work cleaning such as mopping the entire hall. Upon arrival at home, they have to do house chores and stated that: “even if you ask him to take water out of a wet blanket he won't and you end up putting that blanket on a crate to wring it”. In the olden days women stayed at home to take care of the home and children while men would be at work in order to provide for the family. Recently both genders are working outside the home, and women have to do house chores when they get home, however there are some men who also consider house chores as their main PA, “I help my woman with chores”.

Individual Perception

Perceived increased risk to NCDs: According to participants, young people are victims of those who have money. Some mentioned that NCDs are caused by emotions stating

that “I should avoid being angry, overexcited but moderately happy”. R women stated that stress causes NCDs while U groups stated that stress is an NCD. Some participants mentioned NCDs as spiritual ailments that cannot be explained to others and are not contagious, and that even doctors are unable to diagnose them: “sometimes people attend clinics and the doctors’ cannot find what the problem is”. Others mentioned that NCDs are more prevalent overseas than in Africa. Several participants mentioned that not being open causes NCDs” because you end up bottling it inside and that will suppress you”. Some participants stated that being open, eating healthy, getting exercise and avoiding stress can help prevent NCDs.

Perceived seriousness of NCDs: Some mentioned that once you have NCDs, there is nothing that can be done and this is an indication that it is your time to die. Participants from R and DR locations perceived that in order to avoid getting NCDs ,“you must help yourself by drinking Setswana herbs”. Traditional herbs, Western medication, preparing healthy food, and not talking too much were also mentioned to help prevent NCDs.

DISCUSSION

Likelihood of action

Perceived benefits of PA: PA was perceived to be an important part of health. Women perceived African men to desire fully figured women but they blamed their lack of PA to fear of mockery such as “if I am this size (big) and wear a tracksuit, people laugh and I become discouraged”. Most women participants associated a full figure with prestige and some said “you are working, so why are you not curvaceous?”

Barriers to PA: Lack of time was mentioned by both genders as a barrier to PA. Participants felt that their work and other demands do not allow time for PA. R women stating that “long ago husbands would be gone for long periods to work in the mines and recently they come home weekly” less time for exercise, increased expectation of sex. UR women echoed that as married professionals they have to give their husbands some attention after work and this reduces available time for exercise with one of the women saying “the only exercise I do is sleep with my man in bed”. Men mentioned that “they chase after money” thus spending time on what would generate it, and some

pointed to alcohol as a barrier for PA as they spend most of their time on after work. A coping mechanism for stress used by men is alcohol intake while women did not give any coping mechanism, participants did not perceive exercise as a tool for stress relief. Participants mentioned television viewing as a barrier for PA, with men stating “Even when you are watching television with your dumbbell not dumpies [alcohol]”. Socio-economic conditions were also mentioned as barriers by all groups, poverty being the main cause of stress. Poor infrastructure was mentioned as a barrier, the built environment was seen to lack safe and healthy infrastructure that promotes PA. Fear of crime seemed to impede PA in all groups. Fear of injury was also mentioned as one of the barriers to PA because once they get injured it will cost them money to rehabilitate the injuries.

Perceptions are related to gender, age, area of residence, and education levels.¹⁷ Women’s perception is that an overweight body is the type seen as desirable by their men. These women associate an overweight body with affluence. Overweight is associated with ample diseases of lifestyle and it was annoying that these women emphasized that success had to translate into an overweight body. A study done in the Western Cape province of SA among urban black female community health workers found that these women perceived overweight as a desired body ¹⁸ In SA, the acceptance and perceived advantages of being overweight may be a cultural factor among black women, associating overweight body image with dignity, respect, wealth, sufficient food, strength, happiness, health, and the absence of HIV / AIDS, as well as being treated well by their husbands.¹²

The participants have very little knowledge about NCDs. Even though participants indicated that they get education from primary health care concerning NCDs and PA, this did not translate into practical knowledge and did not alter their perception. A Study done in SA which used self-reported questionnaires, found that general practitioners regularly advise on the benefits of PA, and promote PA to as many of their patients as possible.¹⁹ The current results may be an indication that although the participants have the relevant knowledge, the interpretation of the knowledge but how to practically implement the knowledge might be the missing link between knowledge and behaviour.

Participants have an alarmingly negative perception about NCDs, these participants seem to have an external health locus of control or low self-efficacy. Men seem to have

a poorer perception of their status compared to women.²⁰ In this study, some men viewed illness as an indication of death not being contingent on what they do, thus also unlikely to take responsibility of their own health, which cannot be avoided.

A healthy diet, increased PA, and reducing stress was perceived to lower the prevalence of NCDs and its complications, they also perceived that their socio-economic status prevents them from adopting such behaviour. They perceived that “rich food’s” (healthy food) can only be afforded by those with money. A participant stated that due to lack of money he eats pap [maize meal porridge] and atchar [a dish made of unripe mango, spices and oil] and that he is unable to buy meat and vegetables. Some participants mentioned that buying food from local vendors (mainly prepared in fat) is more affordable than healthier foods.

Although PA was mentioned as one of the tools besides stress management and diet to prevent NCDs, they perceived PA barriers too large to overcome. In the present study, black South Africans perceive the most appropriate PA to be walking, with the main form of PA to be confined within transportation, occupation, and, to a lesser extent, leisure. Emphasizing that PA is confined within vocations, with participants in education stating that physical training periods taken out of school decreases PA. The researcher was saddened as she felt that participants were giving excuses for not adopting a healthy lifestyle. The findings from the present study contradicts findings that men’s work-related data show that 26% of total PA in men with no education is made up of work-related activity, in contrast to 7% of men with a post-matric education, however this does not hold in the case of women.²¹ Participants in R and lower education U areas expressed that the lack of PA was due to ‘not qualified to PA time at work’. Also men in the independent samples who had a higher education level felt that lack of time was a barrier to exercise whereas less educated men disagreed.²² Studies done in America showed that Americans may have correct knowledge of PA guidelines, but this does not necessarily translate into physically active behaviour.²³ In this study, participants seemed to know about PA but perceived it to be impossible for them, and were confused about health benefits they would get from PA. Participants expressed a great fear for PA injuries. Healthcare cost due to injuries from PA seemed to supersede healthcare cost due to chronic diseases of lifestyle which are mainly fired up by

sedentary behaviours. Economic constraints, cultural beliefs, and practices influenced the community's food choices and their participation in PA.²⁴

SA is experiencing a greater rise in women in the workplace, but there is a decline in labour-intensive sectors²⁵. This decline in workplace-PA has led to a further decrease in PA among black South Africans, leaving house chores as a lesser form of PA to be the desired PA besides walking. In recent times where both women and men are working, house chores among most African families is left to women therefore they felt that they were more physically active than men. Thus, the way in which time out of the paid labour force is used to serve the demands of the family differ by sex in ways consistent with traditional sex roles²⁶. There are some men, however, who also consider house chores as their main PA, though primarily done by the female gender. Studies done in India a decade ago show a strong gender pattern whereby 24% of men and 14% of women are insufficiently active.²¹ Over time, various associations for professionals have made recommendations on the frequency, intensity, duration, and types of PA necessary to derive a health benefit.²⁷

It was interesting that the discussions ended with participants voicing their gratitude for the learning opportunity, though no education was given. Focus group discussions were conducted with the intention of understanding and describing black Africans nature concerning NCD's and PA.²⁸ The focus group discussions seemingly served as a platform that probed this group of people to think about NCD's and PA. We have adapted the health belief model²⁹ to explain behaviour in order for an individual to engage in PA as a treatment and/or prevention for NCD's. They must be convinced that PA will be beneficial and that they are able to lead an increased-quality PA lifestyle.

CONCLUSIONS

Among black South Africans, knowledge of NCDs and PA is lacking. This may drive negative perceptions of these constructs. There are variations of the nature of perceptions between men and women. Risk and seriousness of NCDs is high, but black South Africans, though able to comprehend that PA is beneficial, experience serious barriers to adopting PA, therefore the likelihood of action is low. The black public needs

to be informed about the role of PA in health and the feasibility of adopting an active lifestyle..

RECOMMENDATIONS

The use of frequent radio talks on the subject may be able to inform black South Africans of the importance of PA. Such talks may be given by instructors from, and should be sponsored by, health and fitness gyms all over the country. Fitness competitions, challenges, and sports days can also be held in deep rural areas, where the public can be informed and convinced. Cycling is popular in black communities, and should be encouraged as a sporting and fitness activity.

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Chapter 5: Summary, conclusion, limitations and recommendations

5.1 SUMMARY

More than half of the South African population is estimated to be suffering from non-communicable diseases. In conjunction with the high prevalence of NCDs, a similar percentage of South Africans are also estimated to be physically inactive. In order to understand the underlying reasons for this high level of physical inactivity, perceptions and knowledge about NCDs and their associated risk factors should be considered.

The main purpose of this study was to determine and explore the perceptions and knowledge about non-communicable diseases (NCDs) and physical activity (PA) among black South Africans. To accomplish the set goal, it was necessary to reach some prerequisite objectives.

Determining the presence of risk factors leading to NCDs and the actual PA levels among black South Africans in relation to their knowledge and perceptions of these constructs was of paramount importance as demonstrated by the literature review of this dissertation. Related to that effort, it became important to understand black South Africans' knowledge and perception of NCDs and PA. The health belief model (HBM) was adapted for this purpose. The HBM is used to explain and predict preventive health behaviour and illness behaviour. This chapter serves to summarise the research performed, and presents the conclusions, limitations, and recommendations that resulted from the research.

In Chapter 1, the research problem statement, objectives, and hypotheses were stated and the structure of the dissertation was explained. Chapter 2 reviewed the literature showing that over half the deaths worldwide are owing to NCDs. In a developing country like South Africa, NCDs are among the highest causes of deaths. In the past, NCDs have been given little or no attention compared to the high attention given to combating the high mortality rate caused by communicable diseases. Morbidity owing to NCDs is equally high, and straining an already under-resourced health care system. Nevertheless, NCDs can be managed through lifestyle and behavioural modifications.

Since NCDs are mainly caused by modifiable risk factors such as physical inactivity and unhealthy diets, physical activity is known as a possible low-cost prevention, treatment, and management modality. South Africans lead low physical activity lifestyles, with the average South African adult not performing enough PA to achieve health benefits. Researchers, organizations, health-care professionals, government sectors and non-government bodies around the world and in SA are in agreement that PA is beneficial to overall health. The majority of black South Africans lead a sedentary lifestyle characterized by long periods of sitting or lying down, with little and irregular PA. Little is known about the perceptions and knowledge of NCDs and PA among black South Africans. NCDs are defined as a medical conditions or diseases of long duration which are characteristically non-infectious and non-transmissible among people. Literature shows that the diseases included in the NCD cluster are cardiovascular diseases and their risk factors such as hypertension, coronary heart disease, and cerebrovascular incidents in addition to diabetes, cancers, injuries, chronic respiratory diseases, and mental diseases. Increased NCDs are mainly due to demographic transitions and population lifestyle changes associated with urbanization. Literature shows that focusing on reducing known modifiable risk factors is central in dealing with NCDs.

Physical activity is a powerful means for individuals to prevent chronic diseases and is seen as a cost-effective way of improving public health across the population. Furthermore, perception and knowledge influence individual behaviour. While much research is done on NCDs and PA as a tool for dealing with NCDs, no previous studies have investigated the perception and knowledge about NCDs and PA within a South African context. There is a need for understanding the knowledge and perceptions of NCDs and PA among black South Africans. If we do not understand the roots of physical inactivity in black South Africans, we are unlikely to develop appropriate strategies to ensure that PA is addressed as a priority in changing lifestyle and reducing chronic diseases of lifestyle.

This leads to the formulation of the research question of this study: What is the perceptions and knowledge of black Africans about non-communicable diseases and physical activity?

In Chapter 3, the results investigating the point prevalence of risk factors for NCDs, PA levels, as well as the knowledge of non-communicable diseases and physical activity

among black South Africans are reported. The findings of the quantitative observational study are presented in the form of a manuscript prepared with the title “Relationship between knowledge of risk factors for non-communicable disease and prevalence of NCDs in black Africans” for submission to *BMC Public Health*. The results revealed that 67% participants were overweight with 44% participants classified to have elevated waist circumference. Seventy-one percent of the participants were classified as having hypertension. Eight percent had high cholesterol levels, and 26% participants had high blood glucose concentrations. The results of this study showed that 67% participants had metabolic equivalents (METs) of less than 3. The results show that the participants scored 87% and 59% respectively on the PA and NCD knowledge survey questionnaires. The results of the relationship between PA, risk factors for NCDs, and the knowledge of PA and NCD showed that SBP, WC, blood glucose and BMI significantly correlated with knowledge about PA. WHR and physical activity counts inversely correlated statistically significant with NCD knowledge. Among males, SBP, blood glucose concentrations, and BMI significantly correlated with PA knowledge. Physical activity counts significantly correlated with NCD risk factor knowledge. Among females, WC and BMI significantly correlated with NCD risk factor knowledge. Although not statistically significant, there was a trend for a positive association between moderate PA and PA knowledge among females.

In Chapter 4, a manuscript prepared for the submission to *Ethnicity & Disease* with the title “Perceptions and knowledge of non-communicable diseases and physical activity of black Africans”. Based on data collected by means of qualitative design knowledge and perceptions about non-communicable diseases and physical activity is given. Participants had a alarmingly negative perceptions about NCDs, with some participants stating that “NCDs are spiritual ailments that cannot be explained; even doctors cannot diagnose and cure it”. Though participants stated that they get information about NCDs, this did not translate into practical knowledge. PA was perceived to be beneficial for health, with walking and house chores as the main form of PA. PA was perceived to be one of the tools to treat and/or manage NCDs; participants perceived, however, that they were unable to increase their PA levels. Perceived barriers to PA included lack of time, socio-economic conditions, fear of mockery, fear of crime, fear of injury and poor infrastructure.

5.2 CONCLUSION

The conclusion of this study is derived from the stated hypotheses

Hypothesis 1: The point prevalence is high for risk factors leading to non-communicable diseases are present in the of black Africans

Point prevalence results revealed the following NCDs risk factors present among black South Africans: 26% blood glucose, 25% cholesterol, 71% blood pressure, 67% increased body mass index 52% waist circumference, and 68% physical inactivity. Black South Africans have increased risks leading to NCDs, and women have the worst risk factor profile. In the present study, risk factors leading to non-communicable diseases were found to be present in the majority of the participants, the hypothesis is therefore accepted.

Hypothesis 2: A significant positive relationship exists between the knowledge and perceptions on non-communicable diseases and physical activity of black Africans.

There is a significant positive relationship between the risk factors for NCDs and knowledge of non-communicable diseases and physical activity in black South Africans. The participants in the present study were moderately knowledgeable about PA but had limited knowledge about NCDs. Participants in the current study had low PA levels with men presenting with even lower PA values. This study found varied relationship, in that PA knowledge was positively significant related NCDs risk factors (BMI $r=0.31$, $p=0.04$; WC $r=0.32$, $p=0.04$; glucose = $r=0.32$, $p=0.0$; SBP $r=0.36$, $p =0.02$), while there was a significant negative relationship between NCD knowledge risk factor profile and the knowledge of NCDs and PA. The relationship between negative PA levels and NCDs risk factors (activity counts $r=-0.33$, $p = 0.03$; W/H $r=-0.32$, $P=0.04$). However, no significant relationship was found between PA knowledge and PAL, activity counts, low activity, moderate activity, high activity, DBP, T – Chol or W/H ($p>0.05$). Also no significant relationship was found between NCDs Knowledge and PAL, low activity, moderate activity, high activity, SBP, DBP, WC, glucose, cholesterol or BMI ($p>0.05$). Therefore Hypothesis 2 is partially rejected.

Hypothesis 3: That black Africans will have a poor perceptions and a limited knowledge and a poor perceptions about non-communicable diseases and physical activity.

The results in this study revealed that the participants have limited knowledge (87% and 59%) with regards to PA and NCDs respectively. Results revealed confusion between communicable diseases and NCDs, and poor perceptions about NCD's and PA. Participants were able to comprehend that PA is beneficial, but barriers to adopting PA were perceived as very high. Differences in Gender roles influenced perceptions and appeared to contribute to variance in perceptions between men and women. Hypothesis 3 is, therefore accepted.

There is a high presence of NCD risk factors among middle-aged black South Africans, these include: hypertension, physical inactivity, overweight bodies, waist circumference, glucose, and cholesterol, in descending order. Black South Africans in particular tend to have elevated blood pressures higher than the values stated by previous studies. Women in particular present with overweight bodies, less PA levels and higher cholesterol levels, while men show higher blood pressures, waist circumferences, and glucose levels. Both genders are insufficiently active to achieve health benefits.

The results obtained from this study indicate that black South Africans know about the positive effects of regular physical activity for health; however, they lack knowledge about non-communicable diseases, and in particular how physical activity levels relate to NCDs. Participants in this study perceived NCDs to be either spiritual ailments or communicable diseases and that nothing can be done to prevent or cure them. Participants perceived NCDs to be an indication of death. These participants perceived that the only form of physical activity they are able to engage in is limited to house chores and walking as a means of transport. Women in this study perceived themselves to be physically more active than men, since, according to the gender roles in the black African culture, women are mostly responsible for house chores and caring for the children. In contrast the activity counts determining objective PA indicate the males to be more active. Women preferred an overweight body and associated it with affluence and fertility. Participants perceived barriers to increase PA as: fear of mockery, crime, lack of time, lack of money, and poor infrastructure. It can be concluded that negative

perceptions are present among black South African's about non-communicable diseases and physical activity.

Though the results of this study did not quantitatively show a significant relationship between the knowledge of NCDs and PA and NCD risk factors *per se*, results from the qualitative exploration of this study showed that black South Africans have limited knowledge about NCDs and have negative perceptions about NCDs. They have a vague knowledge of PA and are unable to apply this for disease prevention or for management. Therefore, it can be concluded that among black South Africans there is limited knowledge and misconceptions about PA, black South Africans lack knowledge of NCDs and have a negative perception about non-communicable diseases. There is also a misunderstanding about the interaction between NCDs and PA. This may be the cause for the increased number of NCDs in the black South African population. For individuals to adopt physical activity as part of healthy lifestyle they must perceive PA as beneficial and that they are able to engage in an increased physical activity lifestyle. Unless this is addressed, NCD mortality and morbidity is speculated to increase in South Africa.

NCD risk factors are high and PA levels are low among black South Africans. Knowledge of non-communicable diseases and physical activity is limited and may drive the negative perceptions of these constructs. Black South African women have the highest NCD risk factor profile though more knowledgeable about NCDs and PA than men. The women are reporting low physical activity levels, and the men are presenting with even lower PA values. Barriers to regular PA seem to override physical activity participation. The current results may be an indication that although the participants have some knowledge, the interpretation of the knowledge and how to practically implement the knowledge might be the missing link between knowledge and behaviour. Employing the health belief model (HBM) for the interpretation of this study shows that risk and seriousness of NCDs is high, but though black South Africans are able to comprehend that PA is beneficial, barriers to adopting PA may be high, so the likelihood of action being taken is low.

The HBM attempts to predict health behaviour, so in this case the adoption of PA as a lifestyle modification may be the answer for NCD management. Among low socio-economic status and low education levels among black South Africans, low self-efficacy

exists. In these communities PA interventions coupled with education programs may improve general health beliefs and knowledge of the role that PA play in NCDs.

5.3 LIMITATIONS AND RECOMMENDATIONS

The following limitations were recognized during the execution of this study, and the interpretations of the results should be done against this background of limitations. Recommendations to improve future studies are presented:

The participants in this study were from different areas and mostly an availability sampling. Future research should focus on the compilation of a more randomized sample to ensure a representative sample of South Africans.

The sample did not include a diversity of black Africans based on SES difference and education. This limits the generalization of the findings. Future research should include a balance of participants based on gender, race, socio-economic status and level of literacy since this study included mainly black participants.

This study made use of both quantitative and qualitative approaches to collect and interpret data. Quantitative methods for the collection of knowledge of NCDs and PA among black South Africans were inadequate. The qualitative approach entailed focus group discussions which are ideal for tapping into human tendencies, understanding, and perceptions relating to concepts or programs developed in part by interaction with other people. Qualitative studies of knowledge generate more information about knowledge in participants of especially low to moderate educational levels.

The findings purport that creating awareness of NCDs may sensitize South Africans to engage in PA for disease prevention. It is recommended that PA programs aimed at reducing and combating the effects of NCDs among South Africans include educational components to increase knowledge of NCDs and PA.

5.4 FUTURE RESEARCH

This is a one-of-a-kind study trying to understand the perceptions and knowledge of black South Africans about NCDs and the management thereof. Future studies should determine the effect of a controlled exercise intervention on the knowledge and physical activity levels compared to an educational intervention. Qualitative and quantitative data should be collected jointly.

APPENDICES

Appendix A: Author's guidelines – Ethnicity & Disease

Ethnicity & Disease

MANUSCRIPT SUBMITTAL INFORMATION

Introduction

Ethnicity & Disease (Ethn Dis) is an international, peer-reviewed journal that provides information on causal relationships in the etiology of common illnesses through the study of ethnic patterns of disease. It is distributed to readers in more than 15 countries and reaches healthcare professionals interested in improving health outcomes for ethnic minority populations. *Ethn Dis* publishes original reports, reviews, editorials, special articles, reviews and commentaries, book and other media reviews, and letters on such topics as ethnic differentials in disease rates, the impact of migration on health status, social and ethnic factors related to healthcare access, and metabolic epidemiology. The journal also provides information in special sections dedicated to legislative and regulatory issues, grants and funding resources, clinical trials, and agency updates. Authors wishing to submit a manuscript for consideration should follow the guidelines herein.

Review Process

Each manuscript submitted to *Ethn Dis* enters the journal's peer-review process, which is governed by an editorial board. Authors can expect to receive a letter acknowledging receipt of manuscript within two weeks of submittal. Once received in the *Ethn Dis* editorial office, an article is submitted to a minimum of two reviewers who rate each article on merit of: content; scientific validity and integrity of data; appropriateness to *Ethn Dis* subject matter; and general presentation and readability of information. The first review is generally completed within one month from original submittal. Once reviewers' comments are collected, the author receives feedback and will be asked to make revisions as recommended by the reviewers and resubmit within three weeks (or earlier, as determined by the editorial calendar). The revised manuscript is then returned to the reviewers to ensure compliance with suggested changes (a process that generally takes two-three weeks); subsequent revisions may be necessary. Upon acceptance, the author is invited to submit the final version of the manuscript, adhering strictly to the guidelines listed herein.

Authors submitting articles not appropriate for publication in *Ethn Dis* will receive notification within two weeks of submittal.

Types of Submittals Accepted

Original Reports: Original works describing results of clinical trials, investigations, community-based re-search, or epidemiologic study. Manuscripts are evaluated and accepted through the peer-review process. Guidelines for Original Reports are provided herein.

Commentary/Review: Original works providing comment on existing policies, procedures, or observation of clinical approaches. This category also includes reviews of scientific literature. Manuscripts are evaluated and accepted through the peer-review process. Guidelines for Commentary/Review are the same as those for Original Reports.

Guest Editorials (invited only): Letter of invitations are issued to individuals with expertise related to an issue's scientific focus. Editorials are accepted by the editor-in-chief.

Letters to the Editor: *Ethn Dis* prints letters to the editor regarding issues important to health

care in ethnic minority populations or letters related to manuscripts published in the journal. Guidelines for content can be found herein.

Ethnicity & Disease Submittal Guidelines - 1

Book and Media Reviews: Individuals may submit reviews on books and other media related to the subject matter of *Ethn Dis*. Guidelines for content can be found in herein.

Manuscript Criteria and Preparation

Researchers and authors who would like to submit an article for publication in *Ethn Dis* must abide by the following guidelines when preparing and presenting their article for consideration by the journal's scientific and editorial review board. Authors should carefully refer to each section before final preparation and submittal of a manuscript.

Content Requirements of Manuscript:

When preparing a manuscript for submittal to *Ethn Dis*, an author should develop text in the following sequence and as described below: title page, introduction, methods, results, discussion, acknowledgments, references, figure legends, tables. *Ethn Dis* adheres to strict word or page limit. Submissions must not exceed 5,000 words, including **ALL** text found in the sections noted above and inclusive of all text found in tables. If figures are used, authors should count each figure as 500 words of the total count.

Example:

Manuscript, title page, all text, references and text in tables = 3,500
Two figures (500x2) = 1,000
Total word count = 4,500

Title page: The title page should carry in this order:

- 1) a short running head of no more than 40 characters (count letters and spaces);
- 2) the title of the article, which should be concise but informative;
- 3) the full name of each author with his or her highest academic degree (see Authorship below);
Rev. 11/07
- 4) the abstract (see Abstract below);
- 5) keywords (see Keywords below);
- 6) the name of the department and the institution to which the work should be attributed followed by the initials of the lead author(s) in parenthesis;
- 7) the department(s) and institu-tion(s) of each additional author, followed by the initials of related author;
- 8) the name, address, phone, fax and email address of the author for correspondence and requests for reprints of the manuscript. If reprints will not be available, provide a statement that reprints will not be available from the authors;
- 9) word count (as described above) number of figures, number of tables, number of references;
- 10) date of submittal (include date of revision submittal if also applicable).

Authorship: Each author listed should have participated sufficiently in the work to take public responsibility for appropriate portions of the content. The lead author should take responsibility for the integrity of the work as a whole, from inception to published article. Authors are required to identify each author's contribution to the manuscript. The Author Responsibility, Contributions and Financial Disclosure Form must be submitted with each manuscript.

Group Authorship: Increasingly, authorship of multi-center trials is attributed to a group. All members of the group who are named as authors should fully meet the criteria set forward on the Author Responsibility and Contributions Form. Group members who do not meet these criteria should be listed, with their permission, in the Acknowledgments.

Abstract and Key Words

Abstract: The abstract should appear on the title page and should be no more than 250 words for structured abstracts. The abstract should state the purposes of the study or investigation, basic procedures (selection of study subjects, observational or analytical methods), main findings (giving specific data and their statistical significance, if possible) and the principal conclusions. It should emphasize new and important aspects of the study or observations. A structured abstract will include the following headings: Objective(s); Design; Setting; Patients or Participants; Interventions; Main Outcome Measures; Results; Conclusions.

Key Words: Below the abstract, authors should provide 3 to 10 key words or short phrases that will assist indexers in cross-indexing the article. Key words are published with the article. Terms from the medical subject headings (MeSH) list of Index Medicus should be used, if at all possible.

Introduction

State the purpose of the article and summarize the rationale for the study or observation. Give only strictly pertinent references and do not include data or conclusions from the work being reported.

Methods

Describe your selection of the observational or experimental subjects (patients or laboratory animals, including controls) clearly. Identify the age, sex, and other important characteristics of the subjects.

Identify the methods, apparatus (give the manufacturer's name, city, and state in parentheses), and procedures in sufficient detail to allow other workers to reproduce the results. Give references to established methods, including statistical methods; provide references and brief descriptions for methods that have been published but are not well known; describe new or substantially modified methods, give reasons for using them, and evaluate their limitations. Precisely identify all drugs and chemicals used, including generic name, dose, and route of administration.

Ethnicity & Disease Submittal Guidelines – 2

Reports of randomized clinical trials should present information on all major study elements including the protocol (study population, interventions or exposures, outcomes, and the rationale for statistical analysis), assignment of interventions (methods of randomization, concealment of allocation to treatment groups), and the method of masking (blinding).

Statistics

Describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to verify the reported results. When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Avoid relying solely on statistical hypothesis testing, such as the use of *P* values, which fails to convey important quantitative information. Discuss the eligibility of experimental subjects. Give details about randomization. Describe the methods for, and success of, any blinding of observations. Report complications of treatment. Give numbers of observations. Report losses to observation (such as dropouts from a clinical trial). References for the design of the study and statistical methods should be to standard works when possible (with pages stated) rather than to papers in which the designs of methods were originally reported. Specify computer programs and software used.

Restrict tables and figures to those needed to explain the argument of the paper and to assess its support. Use graphs as an alternative to tables with many entries; do not duplicate data in graphs and tables. Avoid non-technical uses of technical terms in statistics, such as "random", "normal," "significant," "correlations," and "sample." Define statistical terms, abbreviations, and most symbols. For requirements on figure/chart sub-mittals, please see Illustrations/Figures
Results

Present your results in a logical sequence in the text, tables, and illustrations. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. sequence established by the first *Tables*
identification in the text of the See Tables, found in "Technical
particular table or figure. Requirements of Manuscripts."

Do not use the Footnote, End-mark, or Citation command in software.

Discussion

Emphasize the new and important aspects of the study and the conclusions that follow from them. Do not repeat data or other material given in the Introduction or the Results section. Include in the Discussion section the implications for future research. Relate the observations to other relevant studies.

Link the conclusions with the goals of the study, but avoid unqualified statements and conclusions not completely supported by the data. In particular, authors should avoid making statements on economic benefits and costs unless their manuscript includes economic data and analyses. Avoid claiming priority and alluding to work that has not been completed. State new hypotheses when warranted, but clearly identify them as such. Recommendations, if appropriate, may be included.

Acknowledgments

List all contributors who do not meet the criteria for authorship, such as a person who provided only technical help (eg, writing assistance, data input, or general support). Authors must have written permission from each person listed in the Acknowledgment section. Financial and material support should also be acknowledged.

References

References should be numbered consecutively in the order in which they are first mentioned in the text. Identify references in text, tables, and legends by Arabic numerals (in superscript font,

outside of punctuation marks including periods and commas). References cited only in tables or in legends to figures should be numbered in accordance with the

References should be prepared according to style guidelines based on Uniform Requirements style and presented in the *American Medical Association Manual of Style*, 9th edition (1997). Two examples of the most commonly used citations follow; please note and precisely employ text enhancements, capitalization, spacing, and punctuation.

Standard journal article.

Vega KJ, Pina I, Krevsky B. Heart transplantation is associated with an increased risk for pancreatic disease. *Ann Intern Med.* 1996;124(11):980-983.

If more than 6 authors, present the first 3 authors followed by ", et al."

Chapter or article in book.

Philips SJ, Whisnant JP. Hypertension and stroke. In: Laragh JH, Brenner BM, eds. *Hypertension: Pathophysiology, Diagnosis, and Management*. 2nd ed. New York: Raven Press; 1995: 465-478.

The titles of journals should be abbreviated according to style used in Index Medicus. This list of journals can be obtained through the National Library of Medicine's website (<http://www.nlm.nih.gov/>).

Figure Legends

Type legends for figures starting on a separate page, with Arabic numerals corresponding to the figures. When symbols, arrows, numbers, or letters are used to identify parts of the illustrations, identify and explain each one clearly in the legend.

Ethnicity & Disease Submittal Guidelines - 3

Technical Requirements of Manuscript

General

- Double-space all parts of the manuscript (except tables, which may need to be single-spaced).
- Review the sequence and make sure the manuscript is presented in this order: 1) title page (including abstract and key words), text, acknowledgments, references, tables, legends.
- Illustrations and figures should be no larger than 8 x 10 in. (203 x 254 and should be submitted as a ready-to-be published glossy print (see Illustrations/Figures for more details).
- Include permission to reproduce previously published material or to use illustrations that may identify human subjects.
- Submit the original manuscript and electronic file in required format.
- Use only standard 10- or 12-point font size.

Format of manuscript

- The text of original reports is usually divided into sections as described under "Content of Manuscripts."
- Submit the typed manuscript on white bond paper 8 1/2 x 11 in (216 x 279 mm) or ISO A4 (212 x 297 mm), with margins of at least 1 in (25 mm). Print on only one side of the paper. Also submit electronic file of the manuscript.
- Use double-spacing throughout, including the title page, abstract, text, acknowledgments, refer-ences, and legends.
- Number pages consecutively, beginning with the title page. Put the page number in the lower right-hand corner of the page.
- Leave right margins unjustified (jagged edge).

Tables

- Prepare each table on its own page in an electronic file separate from the main text file.
- Do not submit tables as photographs.
- Number tables consecutively in the order of their first citation in the text, and supply a brief title for each.
- Give each column a short or abbreviated heading.
- Place explanatory matter in footnotes, not in the heading or body of the table.

Explain in footnotes all nonstandard abbreviations that are used in each table. For footnotes, use the following symbols, in this sequence: *, single dagger, double dagger, section marker, parallel bars, paragraph marker, **, 2 single daggers, 2 double daggers, etc.

- Identify statistical measures of variations such as standard deviation and standard error of the mean.
- Be sure that each table is cited in the text.
- If you use data from another published or unpublished source, obtain permission and acknowledge them fully.

Illustrations/Figures

- Submit 2 complete sets of figures.
- Figures should be professionally drawn and photographed; freehand or typewritten lettering is unacceptable.
- Instead of original drawings, x-ray films, and other material, send sharp, glossy, black and white photographic prints, usually 5 x 7 in (127 x 173 mm) but no larger than 8 x 10 (203 x 254 mm).

- **Illustrations prepared in PowerPoint must be submitted as a sharp, glossy, black and white photographic print. Electronic files of PowerPoint figures are not acceptable.**
- Background color for all figures should be white.
- Do **NOT** send figures embedded in other word-processing software. If figure is sent as an electronic file, it
- must be submitted in one of the following formats: *.tif or *.eps, with file resolution of 350 dpi for grayscale. Files of lower resolution will be rejected. Please check with your institution's audiovisual or graphics department to ensure the correct file format and print. A printout of the electronic file must accompany the file.
- Letters, numbers, and symbols should be clear and of sufficient size that, when reduced for publication, each item will still be legible.
- Titles and detailed explanations belong in the legends for illustrations, not on the illustrations.
- Each figure should have a label pasted on its back indicating the number of the figure, author's name, and top of the figure.
- Do not write directly on the back of figures or scratch or mar them by using paper clips.
- Do not bend figures or mount them on cardboard.
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- If a figure has been published, acknowledge the original source and submit written permission from the copyright holder to reproduce the material. Permission is required irrespective of authorship or publisher, except for documents in the public domain.

Ethn Dis publishes only black and white illustrations/figures.

Units of Measurement

- Measurements of length, height, weight, and volume should be reported in metric units (meter, kilogram, liter, or their decimal multiples).
- Temperatures should be given in degrees Celsius, followed by Fahrenheit equivalents in parentheses. Blood pressures should be given in millimeters of mercury (mm Hg-*note the proper spacing and capitalization*).

All hematologic and clinical chemistry measurements should be

Ethnicity & Disease Submittal Guidelines - 4

reported in the metric system in terms of the International System of Units (SI).

Abbreviations and Symbols

- Use only standard abbreviations.
- Avoid abbreviations in the title and abstract.

- The full term for which an abbreviation stands should precede its first use in the text unless it is a standard unit of measurement.

Style

Writing style should follow guidelines outlined in the *American Medical Association Manual of Style*, 9th edition (1997).

Submittal Requirements

Where to submit

Manuscripts and supporting documents as described herein can be submitted:

1) Via USPS mail or courier delivery service. Include the original electronic file(s) on disk. Disk must contain the full manuscript in one file; tables in another file; and other supporting files. Files should be prepared in PC-compatible word-processing software, preferably MS Word. Name each file with the lead author's last name, followed by an abbreviation of a key word (eg, smith-cvd.doc or for tables, smith-cvd-tables.doc).

2) Via *Ethnicity & Disease* web site. Visit <http://www.ishib.org/ethndis/> and follow submittal instructions.

What else to submit

Cover letter: All manuscripts should be submitted with a cover letter that identifies the individual responsible for correspondence with the editors. Provide an exact postal address, telephone and fax numbers, and email address.

Responsibility, Contributions, and Financial Disclosure Forms: Each listed author must complete and submit an Author Responsibility, Contribution,

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and Financial Disclosure Form, which certifies the role each author has taken in the preparation of the article. It also includes a financial disclosure statement ensuring that the article is not in conflict with financial interests of the author.

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If using figures, tables, or other information directly from a previously published work, authors must submit a statement of permission from the publisher of the information, including the publisher's required citation of the material.

Reviewer Suggestions: All manuscripts must be accompanied by a list of at least two potential

reviewers with expertise in the subject matter of the paper. Please provide reviewer's email, mail and phone contact information.

Manuscript Submittal Checklist:

Authors must submit the completed checklist as the first page following the cover letter.

Guidelines: Letters to the Editor

Ethn Dis is pleased to print letters to the editor regarding issues important to health care in ethnic minority populations or letters related to manuscripts published in the journal. Please send letters submitted for possible publication to:

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- You may also submit your letter electronically to ethndis@ishib.org. Letters are subject to editing. When preparing a letter to the editor, please keep the following in mind:
- Letters discussing a recent article must be received within four weeks of the article's publication.
- Letters presenting opposing opinions to a recent article may be sent to the article's original author to request a rebuttal/comment.
- Letters must not duplicate other materials published or submitted for publication.
- Letters must not exceed 400 words of text and 5 references. Please include a word count. Figures and tables are not allowed in letters.
- Include a cover letter with a signed statement of author responsibility and financial disclosure (if applicable).

Authors will receive a brief response via e-mail or fax that the letter was received. Decisions regarding publication of letters will be made within one month of receipt. Prepublication proofs are not available for letters to the editor. Submission of a letter constitutes permission for ISHIB, its licensees, and its assignees to use it in *Ethnicity & Disease's* print publication, in collections, revisions, and any other form or medium.

Guidelines: Book and Other Media Review

Follow these specifications to prepare a book or other media review.

Word count: 750-1000 words

Title, author(s). City/State/Country of Publication. Publisher, year of publication.
ISBN#, # pp. \$\$

Introduction to book/media, could include:

- Author's intended purpose for writing the book (publishing media)

- Targeted readership
- Other books/media by the same author, if a connection can be made

Contents, could include:

- Synopsis of topics found in book/media
- Accuracy of information (Include information on references cited)
- Strengths (Highlight pertinent quotations); Weaknesses (Pertinent information omitted?)

If appropriate, compare the contents of book with a previously published book on the same topic.

Style of presentation, could include:

- Organization of topics
- ~~Literary skills~~ (Is the writing concise, to the point, clear and understandable by the target audience?)

- Point out humor or humorous episodes

Conclusion, could include:

- Has book's intended purpose been reached? Emphasize important conclusions reached.
- Recommended- why or why not?

Ethnicity & Disease Submittal Guidelines - **5Guidelines: Supplement Publication**

Ethn Dis will publish supported supplements, as both a freely bound standalone and as an add-on to regular editions, which relate to issues surrounding ethnicity and health. Below are guidelines for determining the appropriateness of material as a supplement.

1. *Content.* In order to be considered for a supplement, the papers must collectively make a contribution to the understanding of ethnicity and health. Topics might include ethnic differentials in disease rates or treatment patterns; socioeconomic factors related to healthcare access; or effects of migration and acculturation on health. The editor-in-chief, in consultation with the associate editors, will determine appropriateness.

2. *Source.* Supplements may come from a variety of sources, such as conference proceedings or manuscripts resulting from a clinical trial supported by academic or research institutions. In the interest of preserving the journal's integrity, *Ethn Dis* will not accept industry-generated content.

3. *Review.* All supplement materials will be subject to *Ethn Dis* editorial review and will be made compliant with *Ethn Dis* editorial standards and styles.

4. *Length.* The sponsor can propose to publish either as standalone (ie, as a separate, self-contained issue) or as an add-on to a regular issue of the journal. Material longer than 100 pages should be published as a standalone, and supplements longer than 150 pages may only be published as standalone.

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6. *Frequency.* *Ethn Dis* will not publish more than one standalone and one add-on supplement for any edition. Exceptions are made at the discretion of the editorial board.

7. *Copyright Transfer.* ISHIB retains the copyright for all papers published in *Ethn Dis*, including those published in supplements. Sponsoring agencies of a supplement must agree to secure copyright transfer forms from all authors of the articles intended for the supplement.

8. *Process.* To propose a supplement, the sponsor must submit a proposal outlining: topic and manuscript contents, number of papers, estimated number of pages (including introductions and summaries), anticipated number of graphs/charts, whether the supplement should be standalone or add-on, the anticipated date the materials will be available, the number of books the sponsor will order for sponsor distribution. The lead investigator/author must agree to provide an introduction to provide background as to the purpose of the program/trial. In the case of conference proceedings, the conference agenda should be included in the introduction. Supplements reporting on study findings should include all study sites, private investigators, study design and protocols.

Once accepted, it is the sponsor's responsibility to make timely payment and to submit all papers and copyright transfer forms to *Ethn Dis*.

General Information

Guidelines for Manuscript Submittal to *Ethn Dis* are based on *The Uniform Requirements for Manuscripts Submitted to Biomedical Journals*, 5th Edition, developed by the International Committee of Medical Journal Editors and appearing in *JAMA*.1997;277:927-934.

Ethn Dis is an international journal that exclusively publishes information on the causal relationships in the etiology of common illnesses through the study of ethnic patterns of disease.

Ethnicity & Disease Submittal Guidelines - 6This peer-reviewed journal publishes original reports, reviews, editorials, special articles, commentaries, brief reports, book reviews, and letters on such topics as ethnic differentials in disease rates, the impact of migration on health status, social and ethnic factors related to healthcare access, and metabolic epidemiology. A major priority of the journal is to provide a forum for exchange between the United States and the developing countries of Europe, Africa, Asia,

and Latin America.

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APPENDIX B: Author's guidelines for BMC Public Health



Instructions for preparation of manuscripts for publication in supplements to BioMed Central journals

[General information](#) | [Style and language](#) | [Manuscript preparation](#) | [Figures](#) | [Tables](#) | [Additional files](#) | [Author presubmission checklist](#)

General information

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Manuscripts accepted by the Editor-in-Chief will be published online in a BioMed Central journal in fully browseable web forms and formatted PDF files. Articles will be available through BioMed Central websites and submitted for inclusion in PubMed.

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Authors are required to ensure that no material submitted as part of a manuscript infringes existing copyrights, or the rights of a third party. The article should not already have been published in another journal or other citeable publication and should not be under consideration by any other journal, but it can already have been deposited on a preprint server. If articles have been published previously as extended abstracts then they must be significantly expanded, include novel methods, results, analysis or interpretation and cite the original abstract. For further guidance, please see BioMed Central's Duplicate Publication Policy <http://www.biomedcentral.com/about/duplicatepublication>.

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included in the Methods section of your manuscript. Experimental methods must be in compliance with the Helsinki Declaration (www.wma.net/en/30publications/10policies/b3/). Where appropriate, a statement to this effect must be included in the Methods section of the manuscript.

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Authors of manuscripts submitted for publication in supplements to BioMed Central journals must complete a declaration of competing interests (see "[Competing interests](#)"). Where an author has no competing interests, they should state this. See <http://www.nlm.nih.gov/pubs/factsheets/supplements.html>. Authors should also include a Declaration stating who has provided the funding for publication of the article.

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BioMed Central supports prospective registration and numbering of randomized controlled trials (RCTs). Authors of reports of controlled trials of health care interventions must register their trial in a suitable publicly accessible registry prior to submission. The trial registers that currently meet all of the ICMJE guidelines can be found at <http://www.icmje.org/faq.html>.

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APPENDIX B will also be asked to refer to these checklists when evaluating these studies. Checklists are available for a number of study designs, including randomized controlled trials ([CONSORT](#)), systematic reviews ([PRISMA](#)), observational studies ([STROBE](#)), meta-analyses of observational studies ([MOOSE](#)), diagnostic accuracy studies ([STARD](#)) and qualitative studies ([RATS](#)). For authors of systematic reviews, a supplementary file, linked from the Methods section, should reproduce all details concerning the search strategy. For an example of how a search strategy should be presented, see the [Cochrane Reviewers' Handbook](#).

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Currently, BioMed Central can only accept manuscripts written in English. Spelling should be US English or British English, but not a mixture. Full stops rather than commas should be used to indicate decimal points.

BioMed Central will not edit submitted manuscripts for style or language, so please ensure that inconsistencies in style, and incorrect grammar, spelling and punctuation have been addressed prior to submission.

Gene names should be in italic, but protein products should be in plain type.

Generic drug names should generally be used. When proprietary brands are used, include the brand names in parentheses.

There is no explicit limit on the length of articles submitted for publication in a supplement, unless otherwise instructed by the supplement organizers, but authors are encouraged to be concise. There is also no restriction on the number of figures or tables, but note that these should be limited to a reasonable number for the length of the article. Authors should include all relevant supporting data with each article.

Typography

- 4) Please use double line spacing.
- 5) Type the text unjustified, without hyphenating words at line breaks.
- 6) Use hard returns only to end headings and paragraphs, not to rearrange lines.
- 7) Capitalise only the first word and proper nouns in the title and headings.
- 8) All pages should be numbered.
- 9) Use the BioMed Central reference format (see [References](#) section in [Manuscript preparation](#)).
- 10) Greek and other special characters may be included. If you are unable to reproduce a particular special character, please type out the name of the symbol in full. Please ensure that all special characters used are embedded in the text, otherwise they may be lost during

conversion to PDF.

- 11) Genes, mutations, genotypes and alleles should be indicated in italics and authors are required to use approved gene symbols, names and formatting. Protein products should be in plain type.

Units

SI units should be used throughout (litre and molar are permitted, however).

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Manuscript preparation: text and sections

Preparing text

File formats

The following file formats are acceptable for the main text document:

- 11) Microsoft Word (version 2 and above) – see below for template
- 12) Rich text format (RTF)
- 13) Portable document format (PDF)

TeX/LaTeX - please use BioMed Central's TeX template: <http://www.biomedcentral.com/ifora/tex> and submit your file as a PDF file.

Microsoft Word template

We have designed a MS Word template that can be used to generate a standard style and format for your article. It can be used if you have not yet started to write your article, or if it is already written and needs to be put into BioMed Central journal style.

The template (<http://www.biomedcentral.com/download/templates/BMC154d.dot>) consists of a standard set of headings that make up an article manuscript, along with dummy fragments of body text. Follow these steps to create your manuscript in the standard format:

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- y If there are sections that you do not need, delete them (but check the rest of the Instructions for Authors to see which sections are compulsory).
- y Please include a [Competing interests](#) section, as these are compulsory for all Supplement articles.
- y If you need an additional copy of a heading (e.g. for additional figure legends), just copy and paste.
- y Please note you can put the Methods section after the Conclusion if you prefer.

y Enter the references using the reference style given, see [References](#) section.

Sections of the manuscript

All manuscripts must be structured and include a title page and abstract. Manuscripts should be divided into sections as appropriate to the article - please do not number the sections or any subheadings. The following sections are required:

Title page

Abstract

Background or Introduction

Main body of text

- Research articles must include **Methods, Results** and **Conclusion** sections in the main text, with an optional **Discussion** section
- Review articles – please include appropriate headings and subheadings

Conclusions

List of abbreviations used (if any)

Competing interests

Authors' contributions (research articles only)

Acknowledgements

Declarations

References

Figure legends (if any)

Tables and captions (if any)

Description of additional data files (if any)

Please note: footnotes and text boxes are not allowed

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Title page

This should include the title of the article, the full author names (with no titles or qualifications), institutional addresses (Department, Institute, City, Post/Zip code, Country), and email addresses for all authors. Authors and affiliations must be linked using superscript numerals. The corresponding author should also be indicated. The title should be in bold, sentence case with no full stop at the end and no underlining. Please note, abbreviations in the title should be avoided.

Abstract

This should not exceed 350 words and, for research articles, should be structured into separate sections headed Background, Methods (if applicable), Results and Conclusions. (Background: the context and purpose of the study; Methods: how the study was performed and statistical tests used; Results: the main findings; Conclusions: brief summary and potential implications.) Please do not cite references, figures or tables in the abstract, and minimise the use of abbreviations.

Background or Introduction

The Background section should be written in a way that is accessible to researchers without specialist knowledge in that area and must clearly state – and, if helpful, illustrate – the background to the research and its aims. Reports of clinical research should, where appropriate, include a summary of a search of the literature to indicate why this study was necessary and what it aimed to contribute to the field. The section should end with a brief statement of what is being reported in the article.

Main body of text

The main text should be arranged under appropriate subheadings *typed in sentence case*. Research articles should include the following sections: ('Methods' may be placed before 'Results' or after 'Conclusions'):

Methods

The Methods section should include the design of the study, the setting, the type of participants or materials involved, a clear description of all interventions and comparisons, and the type of analysis used, including a power calculation if appropriate. Generic drug names should generally be used. When proprietary brands are used in research, include the brand names in parentheses. The section should be divided into subsections if several methods are described.

The accession numbers of any nucleic acid sequences, protein sequences or atomic coordinates cited in the manuscript should be provided in square brackets with the corresponding database name; for example, [EMBL:AB026295, EMBL:AC137000, DDBJ:AE000812, GenBank:U49845, PDB:1BFM, Swiss-Prot:Q96KQ7, PIR:S66116].

The databases for which we can provide direct links are: EMBL Nucleotide Sequence Database (EMBL, <http://www.ebi.ac.uk/embl/>), DNA Data Bank of Japan (DDBJ, <http://www.ddbj.nig.ac.jp/>), GenBank at the NCBI (GenBank, <http://www.ncbi.nlm.nih.gov/genbank/>), Protein Data Bank (PDB, <http://www.pdb.org/pdb/home/home.do>), Protein Information Resource (PIR, <http://pir.georgetown.edu>) and the Swiss-Prot Protein Database (Swiss-Prot, <http://us.expasy.org/sprot/>).

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Results

The Results and Discussion may be combined into a single section or presented separately. Results of statistical analysis should include, where appropriate, relative and absolute risks or risk reductions, and confidence intervals. The Results and Discussion sections may also be broken into subsections with short, informative headings, typed in sentence case.

Conclusions

This should state clearly the main conclusions and give a clear explanation of their importance and relevance. Summary illustrations may be included.

List of abbreviations used

If abbreviations are used in the text they should be defined in the text where first used and a list

of abbreviations provided.

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A competing interest exists when your interpretation of data or presentation of information may be influenced by your personal or financial relationship with other people or organizations. Authors should disclose any financial competing interests but also any non-financial competing interests that may cause them embarrassment were they to become public after the publication of the article.

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- Do you hold any stocks or shares in an organization that may in any way gain or lose financially from the publication of this manuscript, either now or in the future? If so, please specify.
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An "author" is generally considered to be someone who has made substantive intellectual contributions to a published study. To qualify as an author one should 1) have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) have been involved in drafting the manuscript or revising it critically for important

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We suggest the following kind of format (please use initials to refer to each author's contribution): AB carried out the molecular genetic studies, participated in the sequence alignment and drafted the manuscript. JY carried out the immunoassays. MT participated in the sequence alignment. ES participated in the design of the study and performed the statistical analysis. FG conceived of the study, and participated in its design and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

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Acknowledgements

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Declarations

The publisher will include a declaration in this section stating that the article is published as part of a supplement. The

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All references must be cited consecutively (in square brackets) in the text, followed by any in the tables or figure legends, and accompanied by a correspondingly numbered list of references. Reference citations should not appear in abstract, titles or headings. Each reference must have an individual reference number. Please avoid excessive referencing.

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Article within a journal

1. Koonin EV, Altschul SF, Bork P: **BRCA1 protein products: functional motifs.** *Nat Genet* 1996, **13**:266-267.

Article within a journal supplement

2. Orengo CA, Bray JE, Hubbard T, LoConte L, Sillitoe I: **Analysis and assessment of ab initio three-dimensional prediction, secondary structure, and contacts prediction.** *Proteins* 1999, **43**(Suppl 3):149-170.

In press article

3. Kharitonov SA, Barnes PJ: **Clinical aspects of exhaled nitric oxide.** *Eur Respir J*, in press.

Published abstract

4. Zvaifler NJ, Burger JA, Marinova-Mutafchieva L, Taylor P, Maini RN: **Mesenchymal cells, stromal derived factor-1 and rheumatoid arthritis [abstract].** *Arthritis Rheum* 1999, **42**:s250.

Article within conference proceedings

5. Jones X: **Zeolites and synthetic mechanisms.** In *Proceedings of the First National Conference on Porous Sieves: 27-30 June 1996; Baltimore.* Edited by Smith Y. Stoneham: Butterworth-Heinemann; 1996:16-27.

Book chapter, or article within a book

6. Schnepf E: **From prey via endosymbiont to plastids: comparative studies in dinoflagellates.** In *Origins of Plastids. Volume 2.* 2nd edition. Edited by Lewin RA. New York:

Chapman and Hall; 1993:53-76.

Whole issue of journal

7 Ponder B, Johnston S, Chodosh L (Eds): **Innovative oncology**. In *Breast Cancer Res* 1998, **10**:1-72.

Whole conference proceedings

8 Smith Y (Ed): *Proceedings of the First National Conference on Porous Sieves: 27-30 June 1996*; Baltimore. Stoneham: Butterworth-Heinemann; 1996.

Complete book

9

. Margulis L: *Origin of Eukaryotic Cells*. New Haven: Yale University Press; 1970.

Monograph or book in a series

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10. Hunninghake GW, Gadek JE: **The alveolar macrophage**. In *Cultured Human Cells and Tissues*. Edited by Harris TJR. New York: Academic Press; 1995:54-56. [Stoner G (Series Editor): *Methods and Perspectives in Cell Biology*, vol 1.]

Book with institutional author

11. Advisory Committee on Genetic Modification: *Annual Report*. London; 1999.

PhD thesis

12. Kohavi R: **Wrappers for performance enhancement and oblivious decision graphs**. *PhD thesis*. Stanford University, Computer Science Department; 1995.

Link / URL

13. **Mouse Tumor Biology Database** [http://tumor.informatics.jax.org/cancer_links.html]

Dataset with persistent identifier

Zheng, L-Y; Guo, X-S; He, B; Sun, L-J; Peng, Y; Dong, S-S; Liu, T-F; Jiang, S; Ramachandran, S; Liu, C-M; Jing, H-C (2011): Genome data from sweet and grain sorghum (*Sorghum bicolor*). *GigaScience*. <http://dx.doi.org/10.5524/100012>.

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Figures should be provided as separate files, not embedded in the text file. Please note, BioMed Central does not redraw figures submitted for publication, so please ensure that the versions you submit are as high quality as possible. Figures should be sequentially referenced in the text. If a figure consists of separate parts, it is important that a single composite illustration file should be submitted which contains all parts of the figure. Photographs should be provided with a scale bar if appropriate. Figure files should not include the figure number, title or legend, these should be included in the manuscript file.

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Illustrations should be designed such that all information is legible when scaled to a horizontal width of 600 pixels, since this is the default size for a BioMed Central journal (and PubMed Central) illustration on the web. Therefore, image files should be submitted at a resolution of 300 dpi or greater. Note that lower resolution files might not reproduce clearly.

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If the large size of a figure is an obstacle to submission, authors may find that conversion to JPEG format results in significantly reduced file size, while retaining acceptable quality. JPEG is a 'lossy' format, however. In order to maintain acceptable image quality, it is recommended that JPEG files be saved at High or Maximum quality.

Files should not be compressed with tools such as Zipit or Stuffit prior to submission. These tools will produce negligible file-size savings for JPEGs and TIFFs that are already compressed.

Figure legends

The figure legends should be included in the manuscript file, immediately following the references, rather than being a part of the figure file. The following information should be provided for each figure: figure number (in sequence, using Arabic numerals – i.e. Figure 1, 2, 3 etc); short title of figure (maximum 15 words); detailed legend of to 300 words.

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General

Tables should be sequentially referenced in the text. Each table should be numbered in sequence using Arabic numerals (i.e. Table 1, 2, 3 etc.). Tables should have a title that summarizes the whole table, maximum 15 words. Detailed legends may then follow, but should be concise.

Formatting

Small tables [less than one side of A4 (210mm x 297mm)] that are integral to the manuscript should be pasted into the end of the document text file in portrait form, and will be displayed in the final published form of the article. Tables may be subdivided into labelled parts, but each table should form a single unit. Such tables should be formatted using the 'Table object' in a word processing program to ensure that columns of data are kept aligned – do not use tabs to separate the columns. The title and legend should not be inside table cells, but appear outside the table.

Tables should not include shading or colour as this won't be reproduced in the online version. Tables should not include vertical rules, and horizontal rules should only be used within the body of the table if essential for clarity (horizontal rules under main headings/subheadings and at the end of the table should be included). Full stops rather than commas should be used to indicate decimal points.

Larger tables should be submitted separately as additional files. [Additional files](#) will not be displayed in the final, published form of the article, but a link will be provided to the files as supplied by the author.

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General

The maximum file size for additional files is 20MB each. Additional files will be linked to the final published article in the form supplied by the author, but will not be displayed within the article. If additional files are provided (e.g. movie files, original datafiles), each should be described in this section of the manuscript, providing the following information:

- file name: Additional file 1, Additional file 2 etc.
- file format (including name and URL link of appropriate viewer if format is unusual)
- title of data
- description of data

Additional data files must be referenced within the body of the article thus, e.g. "See Additional file 1 for the original data used to perform this analysis". Additional files are considered integral to articles published by BioMed Central journals; there is no distinction between the main article and 'supplementary material'. Files will be virus-scanned on submission.

File formats

Ideally, files should not be platform-specific, and should be viewable using free or widely available tools. The following are examples of suitable formats:

- additional documentation - PDF (Adobe Acrobat) or TXT (plain text)
- animations - SWF (Shockwave Flash)
- movies - MOV (Quicktime) and MPG (MPEG)
- tabular data - XLS (Excel spreadsheet) and CSV (Comma Separated Values)

File extensions

It is recommended that files be given the appropriate standard three-letter file extension for their file type (e.g. spreadsheet.xls or table.csv). This is especially important for Macintosh users, since the Macintosh operating system does not enforce the use of standard extensions. APPENDIX B

Author presubmission checklist for manuscripts for publication in supplements to BioMed Central journals

Before submitting the manuscript to your supplement organizer, please go through the list of points below, and refer back to the main instructions if necessary. You should be aware that we are not charging for access to your article and therefore require you to submit your files in the correct format to allow for efficient production. If we have to make any changes in proof due to incorrect formatting of the original files, these will be at the discretion of the Editors, and may incur a charge.

When you have checked each of the points, please make the required changes to your files.

Wrongly formatted manuscripts cause problems and delays during the production process.

Title page of manuscript

1. Authors' affiliations should be in the following format: Department, Institute, City, Post/Zip code, Country.
2. Each affiliation must be linked to an author.
3. All authors must be linked to their corresponding affiliation(s) using superscript numerals.
4. Authors should not list their qualifications on the title page.
5. One corresponding author should be indicated.
6. A contact email address should be listed for each author.
7. The title should be in bold, sentence case with no full stop at the end and no underlining.

Manuscript sections

8. Abstracts should be no longer than 350 words.
9. Abstracts should not cite references, figures or tables, and the use of abbreviations should be minimized.
10. Abstracts must be structured into sections for research articles.
11. All articles should include the following sections (in order): Abstract; Background; Main text with appropriate subheadings (for research articles these should include Methods, Results, Discussion, Conclusions); List of abbreviations used (if any); Competing interests; Funding; Acknowledgements; References; Figure legends (if any); Tables (if any); Additional data files (if any). Do not number the sections. For more information, see [Manuscript preparation](#).
12. **Please use sentence case for titles, headings and subheadings, with no unnecessary initial capital letters.**
13. Figures must be supplied as separate files (see below).
14. Do not include footnotes or text boxes.
15. Avoid including long URLs in the main body of the text, put them in the reference

section with the name of the website (see [References](#) section in [Manuscript preparation](#)).

References

16. References must be cited in the text using consecutive numbers in square brackets.
17. References to other articles from within the same Supplement as your article must be highlighted in red.
18. The reference list should be provided in the correct format so that the links to the article's abstract on PubMed (and/or the full text on the publisher's website if applicable) can be created (see [References](#) section in [Manuscript preparation](#)).

Figures

19. **Each figure must be provided as a separate file, not embedded in the main manuscript file.**
20. If a figure consists of separate parts e.g. A and B, it is important that these parts are submitted in a single figure file and not as individual figure files.
21. The image file should not include the figure number, title or legend; these should be included in the manuscript file after the references. Sub-labelling (e.g. A, B, C) may be included in the figure file.
22. Figures must be closely cropped so that only a small white border appears around the image.
23. Figures should be of adequate resolution to ensure good reproduction online (see [Scaling/resolution](#)).
24. Please name figure files so it is easy to identify which manuscript they belong to and which figure number they are.

Tables

25. Tables smaller than one side of A4 (210mm x 297mm) can appear within the main article and should be included at the end of the manuscript file, in the order that they are referred to in the text.
26. Tables must be divided into cells/fields - tables generated with tabbed text are not acceptable.
27. Tables should not include colour or shading
28. Horizontal rules should only be used under main headings and the end of the table and not between rows, unless essential for clarity.

Additional files

29. These may consist of larger tables or other files, such as movies, PDF files, etc, that are not intended to appear within the body of the article.
30. If authors have included additional files, they must include a separate section in the manuscript that lists: file name(s), file format(s), title(s) of data and short description(s) of data.

Additional files **must** have the appropriate three-letter file extension for the programme you have used to generate them (e.g. .xls for Excel; .pdf for Acrobat files etc). Additional files must be cited in the text in the following way, eg: "see Additional file 1"

APPENDIX C: Informed consent



Private Bag X6001, Potchefstroom
South Africa 2520

Tel: (018) 299-1111/2222
Web: <http://www.nwu.ac.za>

Informed consent

Physical Activity, Sport and Recreation
In the School for Biokinetics, Recreation and Sport
Science

Tel: (018) 2991821
Fax: 087 231 5480
E-Mail: hanlie.moss@nwu.ac.za

Knowledge and perceptions for heart disease and physical activity

Part 1

You are invited to participate in the above study conducted by the North West University with the purpose to understand the role of the knowledge and perception of heart disease and physical activity in a South African population in order to develop appropriated physical activity interventions in the future.

Measurements will be conducted once off. You will be requested to complete a questionnaire on risk factors for heart disease and physical activity. This will be followed by the determination of risk factors that you may have. This will entail the determination of your stature; body mass and three skin fold measurements. Once this has been completed you will be requested to perform a finger prick to present the researcher with a blood drop from which the glucose and cholesterol will be determined. A physical activity questionnaire will then be completed.

The duration of the test will be approximately one hour and 30 minutes. The test protocol will be explained during the evaluation. You will be requested to remove your upper body clothes for accurate anthropometric and body composition measurements. Your habitual physical activity will be explained during the evaluation measured by Actiheart® heart rate monitor with

integrated accelerometer (CamNtech Ltd., UK), which will require you to wear this instrument for 7 consecutive days and return it in original state. A group interview will be following all the measurements in which you will be asked to give your perception on physical activity and risk factors for heart disease.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed with your permission or as required by the law. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty. Ethical approval has been obtained from the North-West University (NWU – 00028-12-A1).

1. Department performing the research: Physical activity. Sport and Recreation (PhASRec)
2. Title of the project: Perception and knowledge of black Africans on physical activity and non-communicable diseases
3. Full names, surname and qualifications of the researcher/project leader: Sarah Johanna Moss (PhD., MBA. Registered Biokineticist)
4. Job title of the project leader/ researcher: Associate Professor, Focus are Director: PhASRec
5. Full names, surname and qualifications of the persons performing the tests: Sweetness Makamu, BSc (Hon), Registered Biokineticist
6. Precautions taken to protect the participants: all measurements will be performed by a registered biokineticist who is trained to identify risk factors.

Signature: Project Leader

Date:

Part 2

To the under signed part 3 of this document:

It is important that you read and understand the following general principles that are applicable to all and participants in research projects:

1. Participation in this is completely voluntarily no pressure however subtle may be placed on you to participate.
2. It is possible that you may personally not obtain any personal advantage from participating. The knowledge that is however generated by your participation may be to the advantage of others.
3. By consenting to participate in this project, you also consent to the data obtained by the researchers to be used as they see fit for scientific purposes with the prerequisite that

the identity of the participant will be kept confidential and the participant will not be connected to the data without consent,

4. You are free to withdraw from the project at any time without any explanation and without receiving any penalty as a consequence. You are however requested to consider that your withdrawal can influence the statistical reliability of the project negatively.
5. A summary of the project, the risks associated and any discomfort that might be experienced during the project, as well as the advantages of the project is explained in Part 1 on this document.
6. You are encouraged to direct any questions with regards to the project and the measurements to be taken to the project leader and staff involved. They will be happy to answer you and discuss the research with you
7. If you under the age of 18 years, you are not permitted to participate in this study.
8. You are informed that it is requested of you to state that you will not hold the University accountable for any damages, injuries or death unless there were neglect from the University or any of it's employees or staff.
9. If you are married, your spouse id requested to distance himself from any claims against the university in the event of damages or death with regards to the project as explained in Part 1 unless it is due to negligence from the University, the employees or the students.

Part 3

Consent

Title of the project: **Perception and knowledge of black Africans on physical activity and non-communicable diseases** I the undersigned

------(full names) have read the information with regards to the project as explained in Part 1 and Part 2. I have also heard the oral version thereof and declare that I understand. I was given the chance to discuss relevant aspects of the project with the leader and here with declare that I voluntarily participate in the project. I here with give consent to participate in the project.

I will not hold the University or any of its employees or students accountable for any damages incurred by me during participation in the project except in the case of negligence from the University. I further agree not to process any legal action against the University due to damages of good of personally as a result of participation in the project, unless it was due to negligence of the University, its employees or students.

(Signature of the participant)

Signed at Potchefstroom on the -----

WITNESSES

1. -----

2. -----

Signed at Potchefstroom on the -----

Research on married participants the following consent is requested:

I,------(full names), the spouse of the participant in this project, here with declare that I will not place any legal complaints against the University for any treatment of injuries, damages or death of the person participating in this project unless it was as the result of negligence form the university, its staff or students

Signature: -----Date: -----

APPENDIX D: Language editor's certificate

Certificate of Editing

To Whom It May Concern

I, Henry Hubert Pinkham, a South African citizen, am a Translator and Language Practitioner by profession. My South African Identification Document Number is 450803-5106-002. I am a member of the South African Translators' Institute.

On December 2, 2014, I proofread and edited a Masters' degree thesis for Ms Sweetness Makamu titled "Perceptions and knowledge of non-communicable diseases and physical activity of black Africans."

I herewith certify that I have endeavoured to ensure that the text is linguistically correct and conforms to the usages of the APA writing style, and that all reasonable care has been taken to ensure that it conforms to international and academic standards. It is nevertheless possible that some imperfections may not have been detected in the text.

I have checked all necessary dictionaries and other authoritative sources on the subjects involved, and am convinced that the content of the various documents is correct and satisfactory. In the case of any enquiries, I can be contacted at *1217B, Walter Ave, Waverley, Pretoria, 0001, Transvaal, South Africa, Tel. +27-12-332-4500* or on my cell phone (mobile phone) at *+27-83-762-6708*, or by e-mail at copywriter@juno.com



HENRY H. PINKHAM TRANSLATOR / EDITOR / LANGUAGE PRACTITIONER
at Professional Language Services



Members of the South African Translators' Institute are subject to an ethical code. If you have received unethical treatment, please contact the Institute: [www.translators.org.za].