CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE

by

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DECLARATION

I, Sanet van Zyl, hereby declare that this research project, submitted to the University of the Free State for the degree PhD (Community Health), titled "Chronic diseases of lifestyle: A risk assessment and health promotion framework for a rural and urban primary health care setting in the Free State province," is my original work and has not previously been submitted, in fulfilment of the requirements for the attainment of any qualification, to any other institution of higher learning. I further declare that all cited sources are indicated and acknowledged using a comprehensive list of references. I am aware that the copyright of this thesis is vested in the University of the Free State.

05/11/2021

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Sanet van Zyl Date

DEDICATION

I dedicate this thesis to my beloved sons,

Jaundré and Enrico.

Thank you for your loving support, continuous motivation, and prayers.

You are my greatest joy!

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- My Heavenly Father, my source of inspiration, for His guidance, protection, mercy, and lovingkindness.

For the Lord is good; His lovingkindness is everlasting and His faithfulness to all generations.

Psalm 100:5

Reducing Risks,
Promoting Healthy Life

- World Health Organization 2002a

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LIST OF ABBREVIATIONS

AHA-FS	Assuring Health for All in the Free State
CBE	Community Based Education
CDL	Chronic Diseases of Lifestyle
CDRI	Chronic Disease Risk Index
CHD	Coronary Heart Disease
CLS	Chroniese leefstylsiektes
CRP	C-reactive protein
CVD	Cardiovascular disease
CVDs	Cardiovascular diseases
DM	Diabetes Mellitus
DoH	Department of Health
ECG	Electrocardiogram
FHS	Faculty of Health Sciences
FS	Free State
FVPG	Fasting Venous Plasma Glucose
HSREC	Health Sciences Research Ethics Committee
HbA1c	Glycated Haemoglobin
HDL	High-Density Lipoprotein
HS-CRP	High Sensitivity C-Reactive Protein
HPA	Hypothalamus-Pituitary-Adrenal
HPCSA	Health Professions Council of South Africa

IL	Interleukin
IIS	Innate Immune System
IS	Immune System
MUCPP	Mangaung University Community Partnership Programme
NCD	Non-Communicable Disease
NCDs	Non-Communicable Diseases
NDoH	National Department of Health
PAL	Physical Activity Levels
PGS	Primêre Gesondheidsorg
PHC	Primary Health Care
PURE	Prospective Urban Rural Epidemiological
RDP	Reconstruction and Development Programme
SED	Sedimentation
SA	South Africa
SADHS	South African Demographic and Health Survey
SNS	Sympathetic Nervous System
UFS	University of the Free State
WBC	White Blood Cell
WHO	World Health Organization

SUMMARY

Keywords: Non-communicable diseases, chronic diseases of lifestyle, risk assessment, primary health care, intervention programmes, health promotion, framework

Non-communicable diseases (NCDs), also known as chronic diseases (CD), are the leading cause of death globally. The World Health Organization (WHO) projects a significant increase in CD mortality rates, especially in developing countries. Chronic diseases of lifestyle (CDL) are chronic diseases that share similar modifiable risk factors resulting in long-term disease processes. The WHO's country-specific profile for NCDs illustrates the persistent high prevalence of modifiable risk factors in South Africa (SA) relating to CDL that place a significant burden on health systems. Shifting from an expensive hospital-centred acute-care approach to an affordable and effective primary health care (PHC) approach requires knowledge of communities' risk and disease profiles. Effective community-based PHC responses can reduce morbidity and mortality caused by CDL. However, detailed information relating to CDL and risk factors that maintain the risk cycle for CDL in rural and urban Free State (FS) communities is still limited.

This study aimed to develop a framework to provide a better understanding of the CDL risk profiles and barriers and challenges experienced with regard to the effective implementation of CDL programmes in a rural and an urban PHC setting in the FS. A convergent mixed method design was applied in the study. Using the existing Assuring Health for All in the FS database, the quantitative study (PHASE I) aimed to compile a risk factor profile for the FS's rural and urban study populations. Qualitative data (PHASE II), obtained during focus group discussions, explored participants' knowledge of CDL (patients with CDL) and related training programmes (PHC team members and medical students). Participants' attitudes and experiences of the practical implementation of CDL intervention programmes in these communities were also investigated.

The quantitative part of the study found similarities and distinct differences in the CDL risk profiles between the urban and rural study communities. The qualitative part of the study provided insight into CDL-related health needs and current experiences of intervention programmes in the PHC settings. PHC team members indicated that CDL guidelines covered a range of diseases relevant to the SA context; however, several challenges and barriers to implementing the protocols and guidelines were identified. Focus group discussions with patients revealed, among others, staff shortages, high patient load leading to long waiting times, lack of supporting health care services, and transport as barriers to optimal health care at PHC facilities. Focus group discussions conducted with medical students confirmed the before-mentioned findings. In addition, medical students indicated that community-based education provided valuable opportunities to develop knowledge, skills, and attitudes relating to PHC. However, they highlighted the importance for students to have a contextualised understanding of the multi-factorial aetiology of CDL in different communities.

A combination of quantitative and qualitative data was used to construct a CDL risk assessment and health promotion framework for the urban and rural settings. In Step 1 of developing the risk assessment and health promotion framework, identified CDL risk factors in each study population were prioritised to complete the risk assessment process. Step 2 identified CDL training needs for PHC teams, patient educational needs, and MBChB CDL curriculum development needs. Step 3 revealed three main barriers: resource constraints, patient noncompliance, and the lack of supporting healthcare services to the effective implementation of CDL programmes. Step 4, the final step, used the six main focus areas identified in steps 1-3 to develop a tailor-made community-based patient-centred approach to facilitate the development of focused and effective PHC programmes for CDL in these resource-constrained areas. This thesis contains details of the research study.

Number of words: 577

OPSOMMING

Sleutelwoorde: Nie-oordraagbare siektes, chroniese leefstylsiektes, risiko-assessering, primêre gesondheidsorg, intervensieprogramme, gesondheidsbevordering, raamwerk

Nie-oordraagbare siektes, ook bekend as chroniese siektes, is die primêre oorsaak van sterftes wêreldwyd. Die Wêreldgesondheidsorganisasie (WGO) voorspel 'n beduidende toename in sterftesyfers van chroniese siektes, veral in ontwikkelende lande. Chroniese lewenstylsiektes (CLS) is 'n groep chroniese siektes wat dieselfde veranderbare risikofaktore deel, wat kan lei tot langdurige siekteprosesse. Die WGO verslag vir chroniese siektes illustreer die voortdurende hoë voorkoms van veranderbare risikofaktore vir CLS in Suid-Afrika (SA) wat ‘n aansienlike las plaas op die gesondheidstelsel. Die verandering van 'n duur hospitaalgesentreerde akute sorg benadering na 'n bekostigbare en effektiewe primêre gesondheidsorg (PGS) benadering, verg kennis van die risiko- en siekteprofiele van verskillende gemeenskappe. Doeltreffende gemeenskapsgebaseerde PGS kan morbiditeit en sterftes wat deur CLS veroorsaak word, verminder. Gedetailleerde inligting oor die risikofaktore vir CLS en faktore wat die risikosiklus vir CLS in plattelandse en stedelike Vrystaatse gemeenskappe handhaaf, is egter steeds beperk.

Die doel van die studie was om ‘n raamwerk te ontwikkel om 'n beter begrip van die risikoprofiele vir CLS te verskaf, asook die verskillende struikelblokke en uitdagings vir die effektiewe implementering van CLS-programme in landelike en stedelike PGS fasiliteite in die Vrystaat. 'n Konvergerende gemengde-metode navorsingstudieontwerp bestaande uit drie fases is in hierdie studie gebruik. Met behulp van die bestaande *Assuring Health for All in the FS* (AHA-FS) databasis, was die kwantitatiewe studie (Fase I) daarop gemik om 'n risikofaktorprofiel saam te stel vir die landelike en stedelike studiepopulasies in die Vrystaat. Kwalitatiewe data (Fase II) wat tydens fokusgroepe versamel is, het deelnemers se kennis van CLS (pasiënte met CLS) en verwante opleidingsprogramme (PGS-spanlede en mediese studente) ondersoek. Die persepsies van die deelnemers en hul ervarings van die praktiese implementering van CLS-intervensieprogramme in hierdie gemeenskappe is ook ondersoek.

Die kwantitatiewe deel van die navorsingstudie het ooreenkomste en duidelike verskille in die CLS-risikoprofiele tussen die stedelike en landelike studiegemeenskappe gevind. Die kwalitatiewe deel van die studie het meer insig gebied in die CLS-verwante gesondheidsbehoeftes en huidige ervarings van intervensieprogramme in die PGS-fasiliteite. Lede van die PGS-span het aangedui dat die riglyne en protokolle 'n reeks CLS siektes insluit wat toepaslik is vir die Suid-Afrikaanse konteks; daar is egter verskeie uitdagings en hindernisse vir die implementering van die protokolle en riglyne geïdentifiseer. Resultate van fokusgroepgesprekke met pasiënte het onder andere aangedui dat personeeltekorte, hoë pasiëntladings wat tot lang wagtye lei, gebrek aan ondersteunende gesondheidsorgdienste en vervoer struikelblokke is vir die lewering van optimale gesondheidsorg by PGS-fasiliteite. Fokusgroepbesprekings wat met mediese studente gevoer is, het die voorgaande bevindings bevestig. Daarbenewens, het mediese studente aangedui dat gemeenskapsgebaseerde onderrig waardevolle geleenthede bied om kennis en vaardighede van die PGS omgewing te ontwikkel, maar het beklemtoon dat studente ‘n duidelike gekontekstualiseerde begrip moet hê van die multifaktoriale etiologie van CLS in verskillende gemeenskappe.

Beide kwantitatiewe en kwalitatiewe data is gebruik om 'n CLS-risiko assesserings- en gesondheidsbevorderingsraamwerk vir die stedelike en landelike PGS fasiliteite op te stel. In Stap 1 van die ontwikkeling van die CLS-risiko assesserings- en gesondheidsbevorderingsraamwerk, is geïdentifiseerde CLS-risikofaktore in elke studiepopulasie geprioritiseer om die risiko-assesseringsproses te voltooi. Tydens Stap 2 is CLS-opleidingsbehoeftes vir PGS-spanne, pasiëntopvoedingsbehoeftes en MBChB CLS-kurrikulumontwikkelingsbehoeftes geidentifiseer. Stap 3 het drie belangrike struikelblokke onthul: hulpbronbeperkings, pasiënte wat nie behandelingsriglyne nakom nie en die gebrek aan ondersteunende gesondheidsorgdienste vir die effektiewe implementering van CLS-programme. In Stap 4, die laaste stap, is die ses hoof fokusareas wat in stappe 1-3 geïdentifiseer is, gebruik om 'n pasgemaakte pasiëntgesentreerde benadering op te stel wat die ontwikkeling van gefokusde en effektiewe PGS-programme kan vergemaklik vir CLS in gebiede met beperkte hulpbronne. Hierdie tesis bevat die besonderhede van die navorsingstudie.

Number of words: 586

CHAPTER 1: ORIENTATION TO THE STUDY

1.1 Introduction

Non-Communicable Diseases (NCDs) are a group of conditions, comprising mainly cardiovascular diseases (CVDs), cancers, diabetes, and chronic lung diseases, which account for millions of deaths globally each year. According to the World Health Organization (WHO), NCDs accounted for 71% of all deaths globally, a sharp increase from the 63% recorded in the 2008 figures (WHO, 2021a; WHO, 2010:1). Alarmingly, nearly 80% of NCDs premature deaths occur in low-income (e.g., Afghanistan and Bangladesh) and middle-income countries (e.g., Algeria and South Africa), with a projected 10% global increase between 2008 and 2030 (WHO, 2018a:11; WHO, 2014a:8,9; Alwan et al., 2010:1861; Abegunde et al., 2007:1929,1931,1936).

1.2 Chronic diseases of lifestyle and associated risk factors

Modifiable lifestyle-related risk factors (tobacco smoking, physical inactivity, obesity, harmful alcohol use, and unhealthy diet) are underlying causes for most NCDs (WHO, 2010:16). Chronic Diseases of Lifestyle (CDL) refers to a group of chronic diseases that share similar risk factors resulting from an unhealthy lifestyle (Steyn and Levitt, 2006:212). Lifestyle-related risk factors may lead to key physiological changes and metabolic risk factors (e.g., high blood pressure, overweight/obesity, hyperglycemia, and hyperlipidemia), causing various CDL such as CVDs, tobacco- and nutrition-induced cancers, diabetes, and chronic lung diseases resulting in high mortality and morbidity rates (WHO, 2020a; WHO, 2010:16). CVDs account for 37% of NCDs deaths, followed by cancers (27%), chronic lung diseases (8%) and diabetes (4%) (WHO, 2014a:10).

CDL are largely preventable through effective intervention programmes addressing major risk factors. Risk factors can be classified as socio-demographic/background risk factors (age, sex,

level of education, and genetic composition) and behavioural risk factors (tobacco use, unhealthy diet, alcohol dependence, and physical inactivity). Behavioural risks can lead to biological/metabolic risk factors (elevated blood lipids, raised fasting blood glucose, high blood pressure, and overweight/obesity) (WHO, 2010:16). Although background risk factors cannot be changed, behavioural and biological risk factors are modifiable.

According to the WHO (2009:11), the following behavioural and biological risk factors rank amongst the top ten leading causes of death in middle-income countries: high blood pressure, tobacco use, harmful alcohol use, overweight, high blood glucose, cholesterol, and physical inactivity. Nearly eight million deaths worldwide are attributed to hypertension, about 12.8% of annual deaths (WHO, 2009:10-11). High salt consumption remains an important factor that contributes to high blood pressure. Alarmingly, most populations still consume much higher salt levels than the WHO recommendation and thus have an increased risk for CVDs (WHO, 2020b).

Annually, more than 7 million deaths are attributed to tobacco use. The worldwide prevalence of tobacco smoking reduced between 2005 and 2015 (24.3% and 20.2%, respectively), although not in the African region (WHO, 2018b:14; WHO, 2017c:17). Globally, tobacco use is estimated to cause about 71% of lung cancer, 42% of chronic respiratory disease, and 10% of CVDs and is also an important risk factor for communicable diseases such as tuberculosis and respiratory infection (Global Burden of Disease Risk Factors Collaborators, 2015:1668; WHO, 2009:21; Lin et al., 2007:0183). Furthermore, the WHO reported that 3 million deaths annually were attributed to the harmful use of alcohol, accounting for 5.3% of all deaths worldwide (WHO, 2015a).

The worldwide prevalence of overweight (39%) and obesity (13%) has more than doubled over the past twenty years, estimated to cause 2.8 million deaths annually (WHO, 2020c; WHO, 2010:2). Obesity is linked to an increased risk for various CDL, for example, hypertension, diabetes, and CVD (Ortega et al., 2016:1765; WHO, 2002a:9).

Raised cholesterol also increases CVD risk and is the cause of approximately 2.6 million deaths each year (Ezzati et al., 2002:1349; WHO, 2019). CVD are the leading cause of death globally, with hypertensive heart disease and diabetes ranked amongst the top seven causes of death in middle-income countries (WHO, 2020a). Wild et al. (2004:1047) project that the prevalence of diabetes will increase from 2.8% in 2000 globally to 4.4% by 2030.

Globally, at least 1.6 million deaths each year are attributed to physical inactivity (Global Burden of Disease Study Risk Factors Collaborators, 2015:1696). Physical activity reduces the risk of developing diabetes and CVD. The WHO recommends at least 150-300 minutes of moderate-intensity or at least 75-150 minutes of vigorous-intensity aerobic physical activity per week or a combination of moderate and vigorous-intensity activity to reduce the risk of NCDs in adults (WHO, 2020d). Alarmingly, trends between 2001 and 2016 indicate that physical inactivity levels will not meet the global target set in 2013, of a 10% reduction by 2025 (WHO, 2018a:14,15). Although morbidity and mortality from CDL are evident mainly in adulthood, risk exposure occurs much earlier.

1.3 Adverse early environment and the risk cycle for chronic diseases of lifestyle

It is now widely accepted that an unfavourable perinatal environment (maternal and foetal factors) can predispose to the development of CDL later in life that may even affect the next generation. Early adversity has been linked to metabolic programming of glucose, lipids, protein, hormones and genes that lead to impairment of the immune system, cardiometabolic functions and increase the susceptibility to obesity and CDL later in life (Vrekoussis, Kalantaridou, Mastorakos, Zoumakis, Magrikiannakis, Syrrou, Lavasidis, Relakis and Chrousos*,* 2010:69-79; Jiang, Cowan, Moonah, and PetriJr, 2018:799*)*. Although the exact mechanism still needs elucidation, it is proposed that the adverse events can cause immune dysregulation and programming of a chronic inflammatory state in the body with the development of chronic diseases later in life (Miller, Chen and Parker, 2011:27).

Important maternal factors associated with the development of chronic diseases later in life include physical inactivity, cigarette smoking, obesity, stress, poor gestational nutrition, and low pre-pregnancy weight (Estampador and Franks, 2014:581; Kramer, 1987:663; Scientific Advisory Committee on Nutrition, 2011; WHO, 2002b:39-49, WHO 2017b:13). Figure 1.1 illustrates how maternal lifestyle factors impact the health of the offspring.

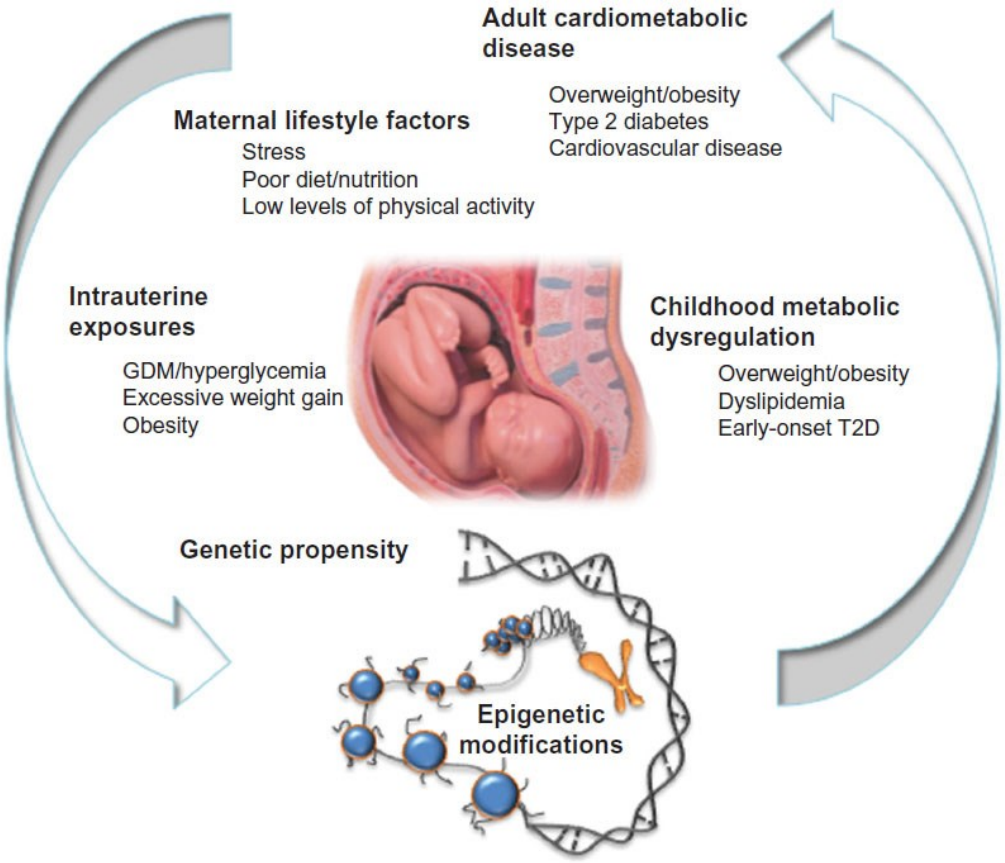


Figure 1.1: The vicious cycle of cardiometabolic disease, intergenerational aspects of maternal lifestyle factors, foetal and offspring development and predisposition to disease risk (Estampador and Franks, 2014:581)

1.4 Chronic low-grade inflammatory state and development of lifestyle diseases

Acute inflammation is a normal physiological response performed by the innate immune system (IIS). The response is regulated by the autonomic nervous system and the hypothalamus-pituitary-adrenal (HPA) axis. Inflammatory markers essential to guide the

inflammation into the resolution phase include cortisol, high sensitivity C-reactive protein (HS-CRP), sedimentation (SED) rate, fibrinogen, high-density lipoprotein (HDL), white blood cells (WBC), and blood glucose (Calder et al., 2013:S12-S16; Bosma-den Boer et al., 2012:6-7; Rhen and Cidlowski, 2005:1711-1713; Esposito and Giugliano, 2004:229,230).

According to Barbaresko et al. (2013:511), obesity and CDL, such as diabetes mellitus, CVD, and cancer, can contribute to a chronic low-grade inflammatory state with increased levels of inflammatory biomarkers. Several lifestyle risk factors (e.g., physical inactivity, smoking, increased blood pressure and obesity) have also been identified to influence the concentrations of inflammatory biomarkers (Barbaresko et al., 2013; Calder et al., 2013:S13; Pereira et al., 2004: 2482 -2490). Although the exact mechanisms responsible for the programming of the chronic inflammatory state and the development of chronic diseases still need elucidation (Rogers and Velten, 2011: 417-421), clear evidence confirms the association of adverse events, development of the adult chronic inflammatory state, and resultant CDL later in life (Miller et al., 2011:20). Figure 1.2 illustrates the immune system's response starting *in utero* and amplified by various insults during the perinatal stage and early childhood.

Chen and Lacey (2018:589) observed associations between adverse childhood events and adult inflammation markers (CRP and fibrinogen levels) in a British birth cohort. Findings from this study further suggested that socioeconomic and behavioural risk factors could explain the observed association**.**

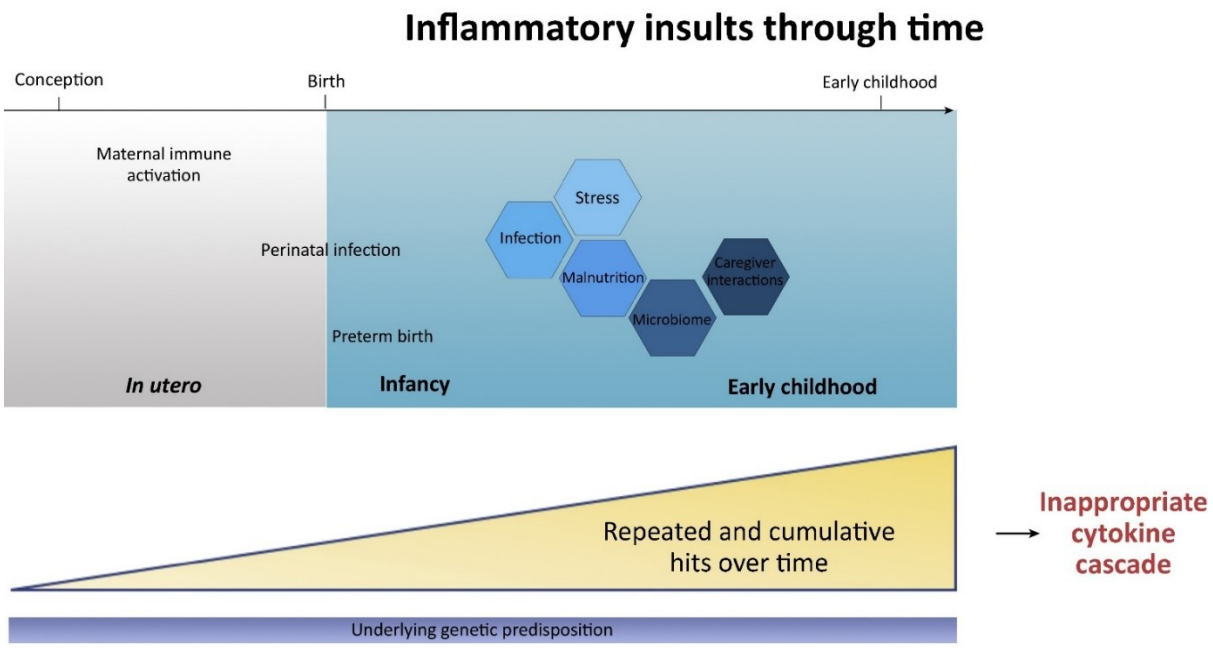


Figure 1.2: An overview of the inflammatory insults during the perinatal stage and early childhood (Jiang, Cowan, Moonah and PetriJr 2018:796)

The **prevalence of behavioural risk factors** for CDL varies significantly across different regions of the world (WHO, 2018a; WHO, 2014a). National health surveys routinely determine the prevalence of individual lifestyle risk factors. For example, a study amongst six low- and middle-income countries found that South Africa, Russia, and Mexico had the highest prevalence for three or more risk factors (Wu et al., 2015:11). Furthermore, ranking the prevalence of seven CDL risk factors (central obesity, inadequate vegetable and fruit intake, frequent drinking, smoking, obesity, low physical activity levels, and hypertension) revealed that across the six countries, the highest prevalence of physical inactivity levels (59.7%) and obesity (45.2%) were observed in South Africa (Wu et al., 2015:5,6). Table 1.1 summarised the findings of various studies reporting the prevalence of behavioural and metabolic risk factors for CDL in South African communities.

Table 1.1: Summary of the prevalence of behavioural and metabolic risk factors for CDL reported between 2011 and 2016 in South Africa

Behavioural and biological/metabolic risk factors	Prevalence %	References
Current daily tobacco smoking	30.0%	SADHS, 2016:39
	18.0%	WHO, 2014
	20.8%	Shisana *et al*., 2013
	22.0%	van Zyl *et al*., 2012
Physical inactivity	59%	Wu *et al*., 2015
	66.5 %	Van Zyl *et al*., 2012
	51.1%	WHO, 2011:174
Raised blood pressure	48% male; 54% of female	SADHS, 2016:48
	51.2% male; 46.5% female	Peer *et al*., 2015
	65.3% male; 72.4% female	Van Zyl *et al*., 2012
Raised blood glucose	15.4% male; 21.7% female	Peer *et al*., 2015
	15.6% male; 9.3% female	Van Zyl *et al*., 2012
Raised blood cholesterol	25.2% male; 23.1% female	Peer *et al.*, 2015
	36.1% male; 39.6% female	Van Zyl *et al*., 2012
	31.3 % male; 36.5% female	WHO, 2011:174

Co-occurrence of risk factors can increase the risk of a specific chronic disease and can influence mortality. Risk assessment allows for the identification of co-occurrence of risk factors in communities. Knowing the epidemiological distribution of the risk factors, the risk profile of a community, and identifying high-risk groups can motivate preventive measures and assist in designing effective public health interventions to reduce CDL. Multivariable risk prediction methods can be used to identify at-risk groups (McAloney et al., 2013:367). An Australian study found a high prevalence of risk factors for chronic diseases among older males living in rural areas from disadvantaged socioeconomic status (Australian Institute of Health and Welfare, 2012:53-55). The Chronic Disease Risk Index (CDRI) developed by Miller and Bauman (2005:24,25) accounts for the proportional impact of each behavioural risk factor on the disease. Algurén and Weitkunat (2011:147,151) developed a Lifestyle Risk Scale (LRS) derived from their study population's health risk assessments (behaviour patterns as well as clusters of risky behaviour). The LRS can be used to identify and compare groups with

different health-related risk behaviour patterns. In a South African context, multivariate logistic regression analysis revealed that older females of Coloured or Asian descent living in an urban area had a high prevalence of chronic diseases (Phaswana-Mafuya et al., 2013:5). An assessment of documented risks can form the basis of effective intervention programmes in the PHC setting.

Although a substantial body of evidence details lifestyle-related risk factors for CDL in South Africa, little is known about risk profiles (prioritised risk factors and associated risk factors for specific CDL) in different communities. Developing risk profiles for communities can facilitate the implementation of relevant intervention programmes.

From 2007 until 2009, researchers in the Faculty of Health Sciences (FHS), University of the Free State (UFS), conducted the interdisciplinary study *Assuring Health for All in the Free State* (AHA-FS). The AHA-FS study was designed as a cross-sectional epidemiological study. Data collection started in 2007 in the southern rural district of Xhariep and 2009 in an urban community in the Mangaung district of the Free State. Table 1.1 provides the results from the AHA-FS study (Van Zyl et al., 2012). It summarises behavioural and biological/metabolic risk factors of studies undertaken in South Africa and the Free State province. It further indicates that no significant variation in data has been observed since 2011; AHA-FS results correspond with other more recent studies. This study used the existing AHA-FS database to analyse clustering patterns and identify associated risk factors for CDL in rural and urban Free State communities. The WHO calls for the improved management of NCD, which should include interventions focusing on the risk factors for CDL in the most cost-effective way to prevent and control diseases in communities (WHO, 2021a).

1.5 Novel contribution

The rapid global rise in NCDs represents a significant health challenge to economic and social development. CDL risk factors are largely preventable but shifting from an expensive hospital-centred acute-care approach to an affordable and effective PHC preventative approach for CDL requires knowledge of the CDL risk profile in communities. Detailed information relating

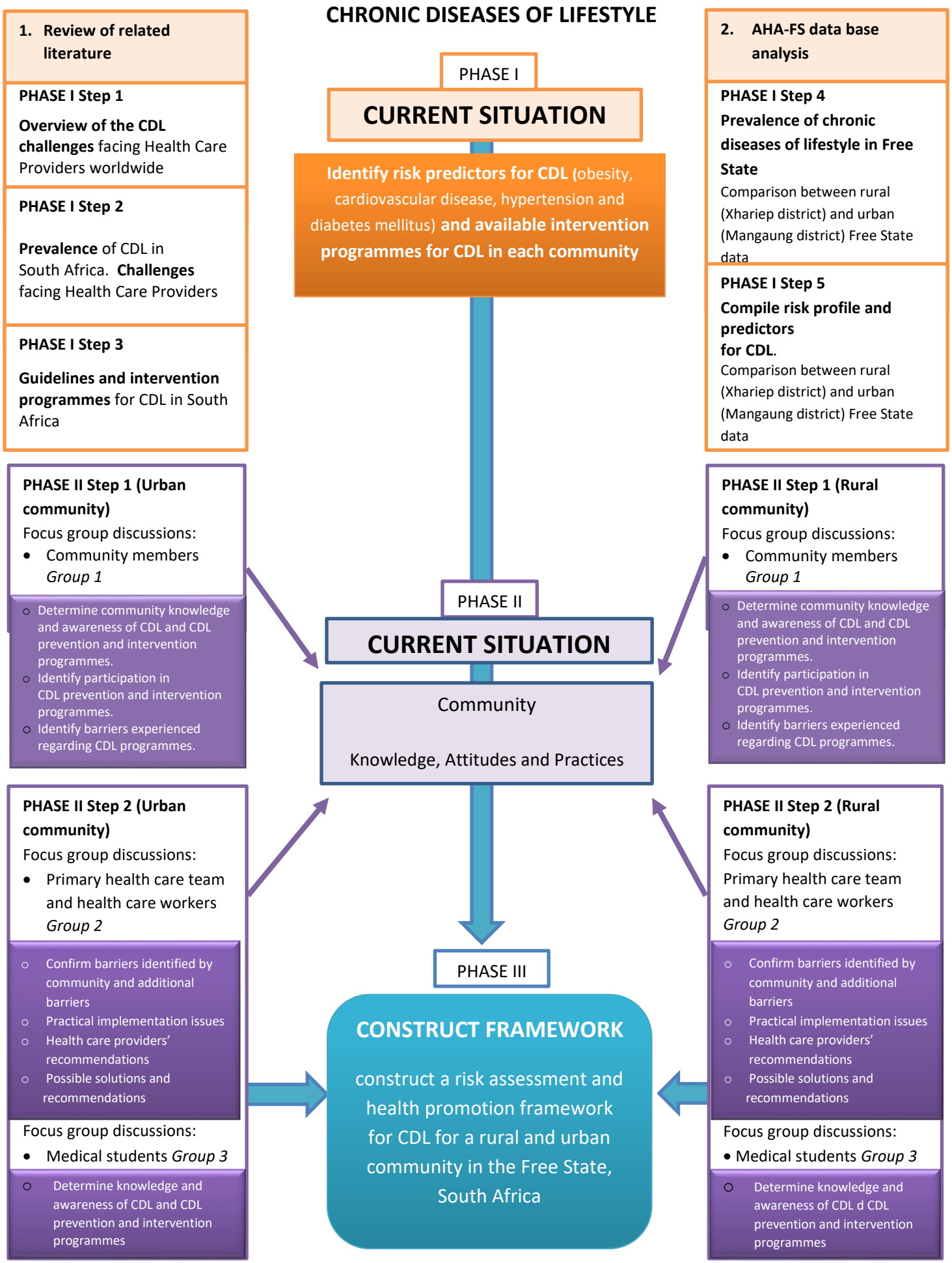
to individual risk factors that maintain the risk cycle for CDL in communities and challenges experienced during the practical implementation of CDL programmes in the Free State remain insufficient. Such information may contribute to the development of effective community-based intervention programmes that can decrease the CDL burden in the population. This study may contribute to the knowledge gap after completion of phases I, II and III.

PHASE I of the study included a literature review to contextualise the global and South African CDL response. Following this was the analysis of data provided by the AHA-FS database to determine the prevalence and associated risk factors (including markers of inflammation) for CDL in a rural and urban community in the Free State. This study focused on obesity and the following CDL: cardiovascular disease, hypertension, and diabetes mellitus.

The discrepancy between health care needs and services, particularly at PHC level, can prevent equitable health care delivery. PHASE II of the study aimed to identify regional awareness, knowledge, and attitudes towards CDL and intervention programmes in the rural and urban groups using a qualitative approach. This information was used to identify barriers/challenges for the effective implementation of CDL community-based intervention programmes.

PHASE III of the study comprised integrating the results of the theoretical base (literature review), quantitative findings (risk factor profile of CDL in the chosen communities), and qualitative findings (outcomes of focus group discussions). Understanding the risk profiles, challenges and barriers for effective implementation of CDL prevention programmes in communities can form the basis for developing a focused approach to CDL prevention in PHC settings in the Free State. The researcher developed a risk assessment and health promotion framework for CDL and formulated recommendations to optimise existing efforts to prevent and control CDL in rural and urban communities in the Free State.

1.6 Conceptual framework



1.7 Problem statement, rationale, motivation and value of the study

Obesity and NCD (i.e., CVD, cancer, and type 2 diabetes mellitus) are escalating and reaching epidemic proportions worldwide. Most NCDs are preventable and can be explained by modifiable risk factors (Abegunde et al., 2007:1936). The WHO Country Profile for NCDs in South Africa (2018a:188) illustrates the high prevalence of behavioural and metabolic risk factors resulting in various CDL and a significant burden on health systems in South Africa. Therefore, implementing relevant and effective PHC prevention and intervention programmes for CDL is vital to reduce this burden. In the Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2013-2017, the National Department of Health (NDoH) of South Africa (NDoH, 2013:49) emphasised the importance of new and innovative research to monitor CDL and introduce evidence-based innovations to improve management and control of NCDs (NDoH, 2019:76).

As mentioned earlier, the researcher formed part of the AHA-FS research team that conducted research in rural and urban communities in the Free State, South Africa (2007-2009). Subsequently, the high prevalence of modifiable risk factors observed in these communities (Van Zyl et al., 2012) gave rise to the researcher's particular interest in health promotion in these communities. Furthermore, detailed information regarding CDL and associated risk factors contributing to the risk cycle for CDL in South African communities is limited. The following overarching research questions guided this study.

1. Which risk factors are associated with obesity and CDL (CVD, hypertension, and diabetes mellitus) in rural and urban communities in the Free State?
2. What are the knowledge, awareness, attitude, and experiences of the rural and urban communities, local health teams, and medical students rotating in these communities of the current implemented CDL prevention and intervention programmes?
3. Based on evidence from this research, which CDL recommendations could inform current and future efforts for health promotion in resource-constrained areas in the Free State?

Therefore, the purpose of this study was to develop a risk assessment and health promotion framework to provide evidence-based information to facilitate the implementation of relevant and focused PHC prevention and intervention programmes for CDL in resource-constrained settings in the Free State.

A convergent parallel mixed method design was used in the current study to better understand the epidemiological distribution, co-occurrence of risk factors, and factors that maintain the risk cycle for CDL. Quantitative data from the AHA-FS database was used to identify risk factors associated with CDL in rural and urban communities in the Free State. The qualitative data explored regional knowledge, awareness, attitude, and practical implementation issues concerning CDL intervention programmes in the communities. A convergent design allowed for the integration of quantitative and qualitative data to better comprehend the current burden of CDL and to provide a complete understanding of the difficulties experienced during the implementation of prevention and treatment programmes in these communities.

1.8 Overall goal

It is of the utmost importance to curb the rising burden of CDL in developing countries such as South Africa. Therefore, the study's overall goal was to construct a framework that considers the prevalence of CDL, associated risk, existing efforts, and challenges experienced in preventing and managing CDL (CVD, hypertension, and diabetes mellitus) in a rural and urban PHC setting in the Free State. With this framework, the study aimed to optimise health promotion efforts and eventually positively impact future generations' health and well-being. The goal was achieved by compiling risk profiles for the study populations and evaluating current CDL intervention programmes in a rural and urban PHC setting in the FS, South Africa.

1.9 Aims of the study

PHASE I

PHASE I of the study aimed to **compile a risk factor profile and identify related risk factors** for obesity and CDL (CVD hypertension and diabetes mellitus) for a rural and urban community in the Free State within the context of a comprehensive literature review and existing database.

PHASE II

The aim of PHASE II of the study was to **identify regional awareness, knowledge, and attitudes** towards CDL and intervention programmes, as recommended by NDoH, and to qualitatively **describe the barriers and issues** experienced during the practical implementation of prevention and intervention programmes in a rural and urban community in the Free State.

PHASE III

Integrating results from PHASES I and II of the study, the researcher aimed to **construct a risk assessment and health promotion framework** for CDL to maximise the effectiveness of current PHC prevention and intervention programmes for CDL in resource-constrained settings in the Free State.

1.10 Objectives

In order to achieve the aims stated above, the following objectives were pursued:

PHASE I: Compile CDL risk profiles

Review of relevant literature to:

1. Report on the CDL challenges facing health care providers worldwide.
2. Report on the CDL challenges facing South Africa.

3. Compile an overview of current national CDL guidelines and intervention programmes

Analyse the AHA-FS database to:

4. Determine the **prevalence of the following CDL risk factors**; socio-demographic/background risk factors (age, sex, family history); behavioural risk factors (tobacco use, unhealthy diet, and physical inactivity); biological/metabolic risk factors (elevated blood lipids, high blood glucose, high blood pressure, overweight/obesity and markers of inflammation) in a rural and urban community in the Free State.
5. **Rank multiple behavioural and biological risk factors** in a rural and urban community in the Free State.
6. Identify the **number of modifiable (behavioural and biological) risk factors** that individuals have.
7. Use a **multivariate logistic regression** to determine associated **risk factors for obesity and CDL** (CVD, hypertension, and diabetes mellitus) in these communities using self-reported family health history and lifestyle risk factor information.

PHASE II: Gain insight into CDL interventions and programmes

Focus group discussions

Group 1: Community members

1. Evaluate participants' **knowledge of CDL** and **their awareness of and attitudes** towards **CDL intervention programmes and strategies** in rural and urban communities in the Free State.
2. Determine **participation** in CDL health promotion/intervention programmes in these communities.
3. Determine **factors that influence the access to PHC** and resources in these communities.
4. Identify factors that participants **perceive as barriers to the effectiveness of CDL intervention programmes** in these communities.

Group 2: Primary health care team and health care workers

1. Determine regional **knowledge, awareness, and attitudes** of the PHC teams relating to CDL in these communities.

2. Evaluate the effectiveness of **CDL intervention programmes and strategies** implemented in the community by confirming barriers identified by the PHC teams, identifying additional barriers and practical implementation issues in these communities.

3. Determine **good practice** and PHC teams' recommendations**/areas for improvement i**n these communities.

Group 3: Medical students

1. Determine **knowledge of CDL** and **awareness of CDL intervention programmes** amongst medical students of the FHS, University of the Free State (UFS), who have completed rotations in health care facilities as part of their community-based education (CBE).

PHASE III: Develop a risk assessment and health promotion framework for a rural and urban community:

1. **Compile CDL risk profiles for each community** and evaluate the effectiveness of available prevention and intervention programmes in each community.
2. **Confirm barriers and practical implementation issues** related to intervention programmes that are currently implemented in each community.
3. **Construct a framework and formulate recommendations** for health promotion in a rural and urban community in the FS.

1.11 Arrangement of the thesis

The following outline provides the reader with an overview of the arrangement of the thesis.

In this chapter, Chapter 1, orientation to the study, the short introduction emphasises the current global burden of NCD, followed by a description of modifiable behavioural and metabolic lifestyle risk factors that drive the chronic disease burden. The underlying pathophysiological mechanisms that contribute to CDL development throughout the lifecycle are discussed, including the possible intergenerational impact. A conceptual framework is provided, followed by the rationale, motivation, and value of the study. The chapter concludes with the overall goal, objectives, and arrangement of the thesis.

In **Chapter 2, the literature review** describes the growing global burden of CDL and challenges faced by healthcare providers. The South African response is contextualised, and current strategies, challenges and barriers related to the prevention and management of CDL on PHC level are discussed.

Chapter 3 provides an overview of the **research design and methodology** applied in the current study. The discussion of the convergent mixed method research design and selection of methods for the study is followed by a description of the quantitative and qualitative procedures, analysis, and a description of the development of the risk assessment model and health promotion framework. Essential aspects of validity, reliability, trustworthiness and ethical considerations are stated. The chapter concludes with a schematic overview of the study.

This thesis is presented in article format as specified by the requirements of the UFS (UFS 2016:19). Chapters 4 to 7 contain the results of the study presented as the following publishable/published manuscripts.

In **Chapter 4, Article 1** reveals the findings of the quantitative study in a rural and urban setting in the Free State (PHASE I of the study). The article focuses on the CDL risk factor

profile and the multivariate logistic regression models for the urban and rural settings in the Free State.

Chapter 5, Article 2 describes the findings of the qualitative phase of the study, focus group discussions with Bachelor of Medicine and Bachelor of Surgery (MBChB) students (PHASE II of the study). Results include an overview of perceptions of the current CDL curriculum content, perceived barriers, and challenges experienced during CBE rotations in the rural and urban PHC setting in the Free State. Results can inform CDL curriculum reform and the development of relevant and sustainable community-based intervention programmes.

In **Chapter 6, Article 3** describes the findings of the qualitative phase of the study related to patients with CDL and PHC staff, comparing the urban and rural settings (PHASE II of the study). Results of focus group discussions with community members and members of the PHC team include an overview of the perceived barriers and challenges experienced in PHC settings in the Free State that can inform the development of relevant community-based intervention programmes.

Integrating results obtained in PHASE I and II, **Chapter 7, Article 4** highlights the development and construction of the CDL risk assessment and health promotion framework for rural and urban PHC care settings in the FS. The chapter concludes with the recommendations and proposed strategies that could inform current health promotion and treatment efforts in these resource-constrained areas in the FS.

Lastly, **Chapter 8, the conclusion**, provides a brief overview of the study's recommendations, limitations, and novel contribution.

CHAPTER 2: LITERATURE REVIEW

2.1 Non-communicable diseases: The growing global epidemic

Current projections indicate that NCD will be responsible for a significant increase in the total global number of deaths, from 36 million in 2008 to 52 million by 2030 (WHO. 2014a; WHO, 2010:9,11). It is estimated that NCD such as CVD, diabetes, cancers, and chronic respiratory diseases are responsible for more than two-thirds of all deaths worldwide, with nearly 85% of premature NCD deaths occurring in low- and middle-income countries of the world (WHO, 2021). Figure 2.1 illustrates the global distribution of NCD deaths. Present projections indicate that the most significant increases in NCD mortality will arise in the African region and other low- and middle-income countries (WHO, 2017b; Alwan et al., 2010:1861).

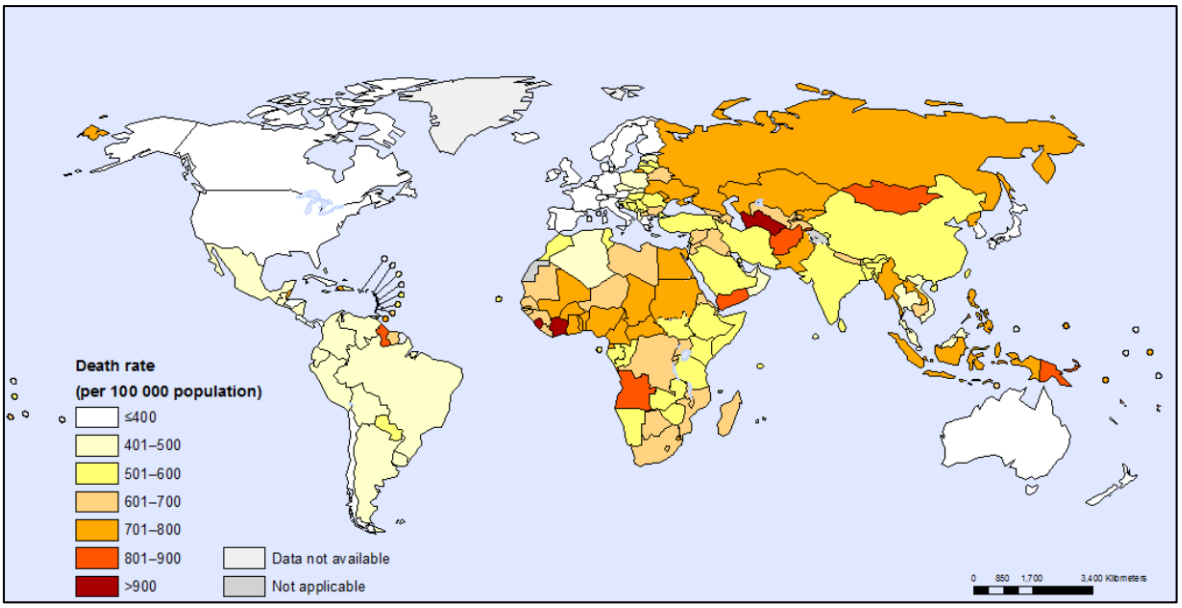


Figure 2.1: **Deaths due to non-communicable diseases: age-standardised death rate (per 100 000 population), both sexes, 2015** (WHO, 2017b)

2.2 Challenges facing health care providers in the African region

Figure 2.2 illustrates the percentage of deaths in Sub-Saharan countries in 2017 due to NCDs. It is projected that mortality due to NCDs will overtake mortality due to communicable, maternal, perinatal, and nutritional diseases in the African region (NDoH, 2013:16; Alwan et al., 2010:1861). This projection has shifted the focus from preventing and controlling

endemic diseases to the growing tide of NCDs such as CVD, cancers, and diabetes (WHO, 2008a:55).

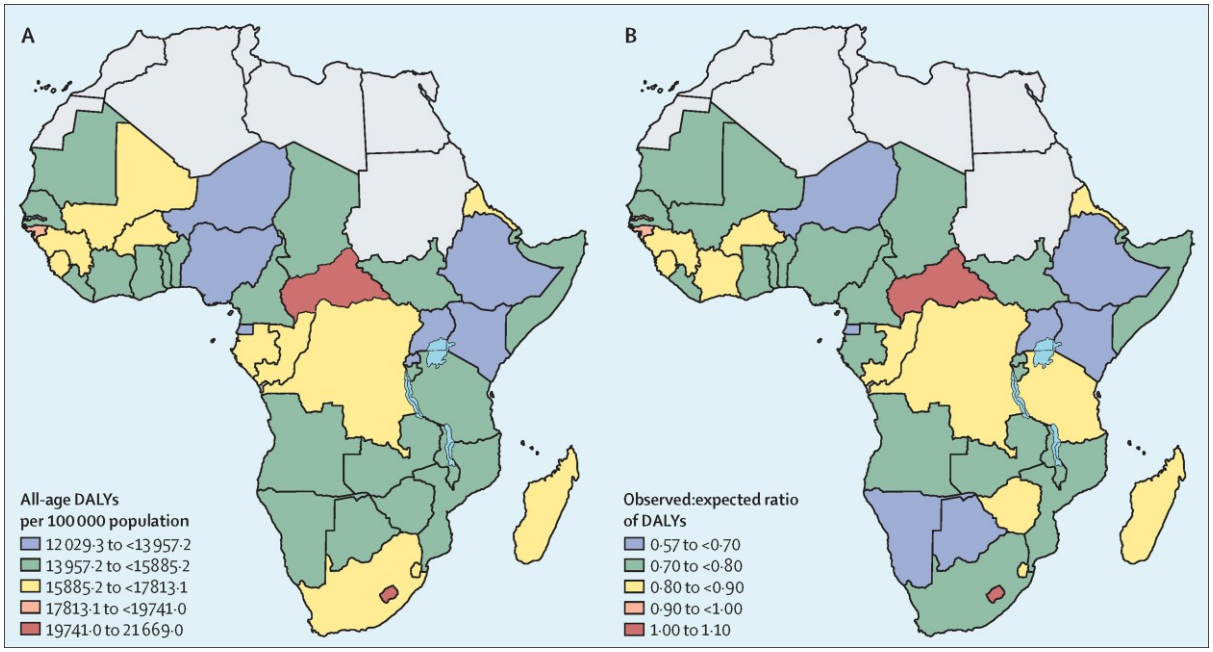


Figure 2.2: Burden of non-communicable diseases by country in Sub-Saharan Africa, 2017 (Gouda et al., 2019: e1384)

The rapid global rise in NCDs represents a significant health challenge to economic and social development. Factors contributing to the increasing burden of NCD in developing countries and Sub-Saharan African regions include population growth, population ageing, lifestyle risk factors, economic and epidemiological transitions (WHO, 2010:2; BeLue et al., 2009; Steyn et al., 2006:210).

2.3 NCDs and CDL: Challenges facing health care in South Africa

South Africa is experiencing a quadruple burden of disease (Pillay-Van Wyk et al., 2016:e642): a rising tide of NCDs, communicable (infectious) diseases and the Acquired Immune Deficiency Syndrome (AIDS) pandemic, high rates of violence and injury, and maternal, newborn and child morbidity and mortality. The South African Medical Research Council reported that approximately six million South Africans currently have hypertension, 1.8

million diabetes, seven million smoke, and five million have high blood cholesterol (Sahadew & Singaram, 2021; Pillay-Van Wyk et al., 2014). Factors contributing to the growing tide of NCDs in South Africa include increased urbanisation, the nutrition transition from traditional to more Western diets, behavioural and metabolic risk factors (Levitt et al., 2011:1691S). Common lifestyle changes that occur due to urbanisation, according to Steyn and Mchiza (2014:90), include adaptation to a more Westernised diet (high in saturated fat, sodium, and sugar), decreased physical activity, increased alcohol intake, and smoking. Table 2.1 summarises South Africa's prevalence of behavioural and metabolic risk factors that result in various CDL.

Table 2.1: **Prevalence of behavioural and metabolic risk factors for CDL in South Africa** (WHO, 2018a:188; WHO, 2014b:173; WHO, 2011a:174)

Behavioural and biological/metabolic risk factors	**2008, *2011, **2016 estimated prevalence (%)**	**Males (%)**	**Females (%)**
Current daily tobacco smoking	14 *18 **20	21 *28 **33	7 *8 **8
Physical inactivity	51 **37	46 **26	56 **48
Raised blood pressure	*34 **24	*35 **24	*32 **24
Raised blood glucose	11 **10	10 **8	11 **12
Obesity	31 **27	21 **15	41 **39
Raised blood cholesterol	34	31	37
Total alcohol per capita consumption	*11 ** 9	*18 **16	*4 **3

Figure 2.3 illustrates the proportional mortality (percentage of total deaths, all ages) in SA, as per the NCD Country Profiles. Comparing the South African NCD total deaths reported in 2006 and 2016 shows an alarming increase from 43% to 57.4% (Statistics (Stats) SA, 2019:29; WHO,

2014b:173). According to Stats SA (2019:33), NCDs continue their rise amongst the top 10 leading underlying natural causes of death, with diabetes mellitus and cerebrovascular diseases ranking amongst the three leading natural causes of death.

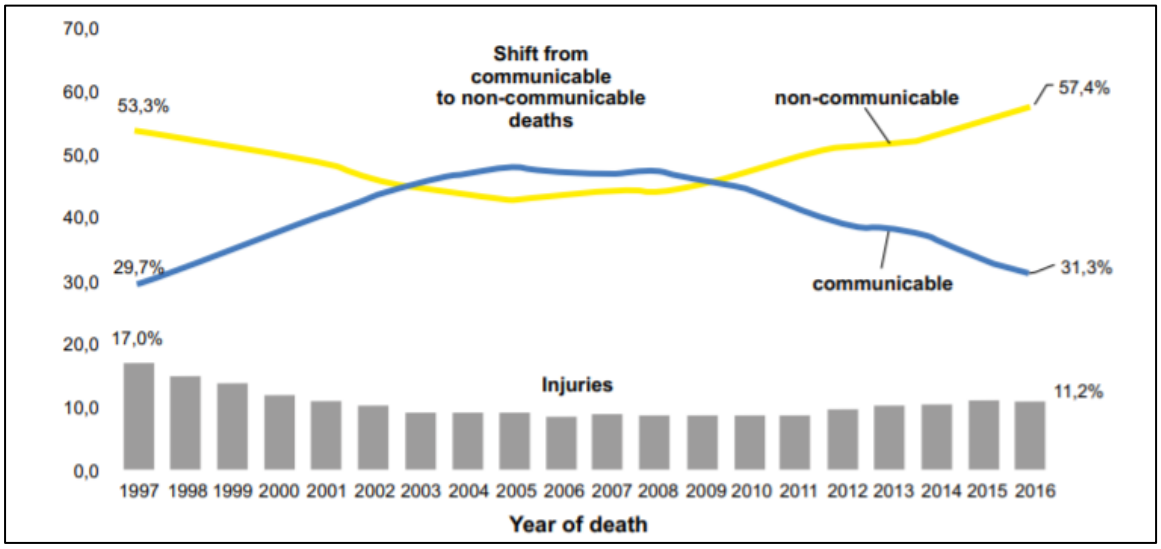


Figure 2.3: **South Africa: Percentage distribution of deaths by group type (communicable, non-communicable and injuries, 1997-2016)** (DoH, 2020:20; Stats SA, 2019:29)

Figure 2.4 illustrates that NCDs account for the highest proportion, 40.7% of deaths, followed by HIV/AIDS and tuberculosis (Msemburi et al., 2016:18) in the FS province. In the rural FS Xhariep district, the total percentages of NCD deaths for the district were 46.5% and 37.7% amongst females and males, respectively, reported for the period 2008-2013 (Massyn et al., 2015:341). This increased to 58% and 46% amongst females and males, respectively, for the 2012-2017 period (Massyn et al., 2020:330). Similar figures were reported for the urban FS Mangaung district with total percentages of NCDs deaths of 46.7% and 39.9% amongst females and males respectively reported for the period 2008-2013 (Massyn et al., 2015:373) with significant increases, 59% and 49% amongst females and males for the period 2012-2017 (Massyn et al., 2020:330).

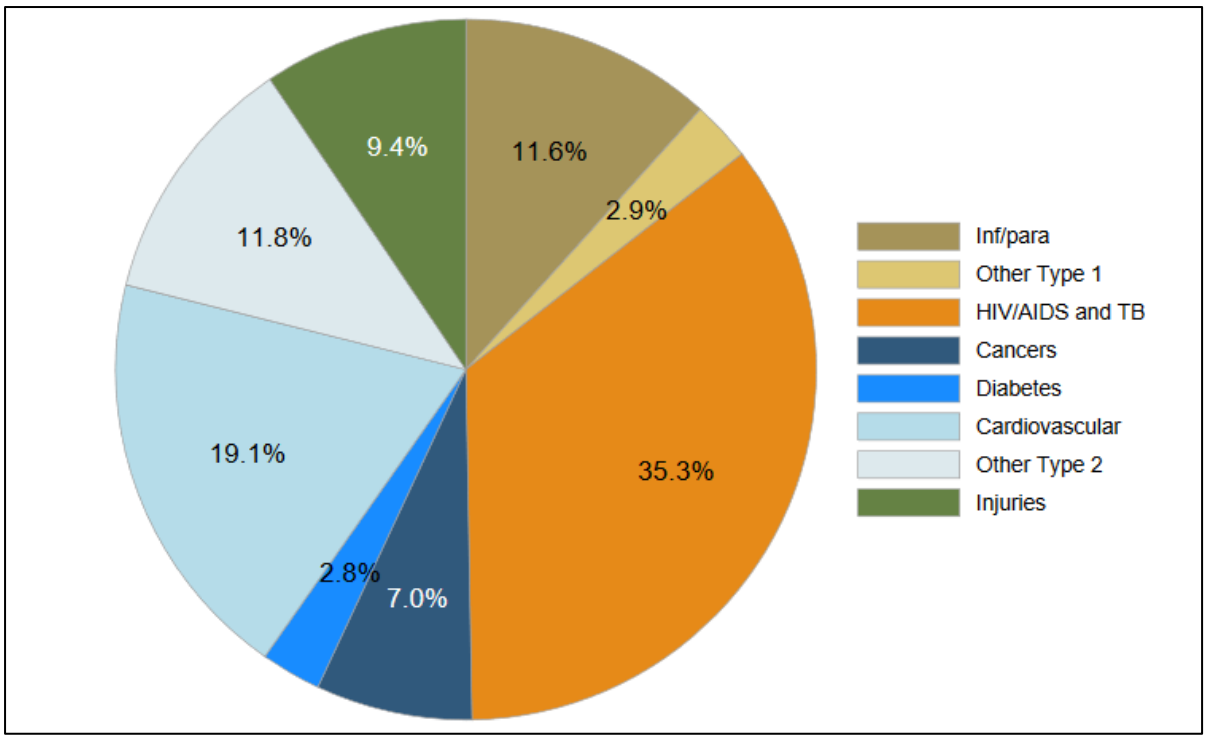


Figure 2.4: **Free State proportional mortality (percentage of total deaths, all ages)** (Msemburi *et al*., 2016:5)

Furthermore, mortality trends for NCDs between 2008-2013 and 2012-2017 revealed increases in almost all the age groups in the Xhariep district in the FS. According to the *District Health Barometer 2014/2015* (Massyn et al., 2015:341), mortality rates due to NCDs in the Xhariep district for the period 2008-2013 in the under five year age group, among females and males, were 9.6% and 9.2%, respectively. This increased to 16% for both females and males for the 2012-2017 period (Massyn et al., 2020:330). In the 5-14 year age group, NCD mortality rates were much higher at 20.5% among females versus 19.4% in males and showed increases for females (25%) and males (23%) for 2012-2017. In the 15-24 years, age group NCD mortality rates were 17.6% for females versus 12.5% for males, with no significant increases for this group reported for the 2012-2017 period. However, in the 25-64 years age group, NCD mortality rates accounted for 36.4% of female and 31.7% of male deaths for the period 2008-2013, with significant increases to 48% and 39% amongst females and males respectively for the 2012-2017 period. In the 65-year and older age group, NCDs accounted for the highest proportion of deaths for 2008-2013 (77.9% among females and 71.9% among males) and the 2012-2017 period (82% among females and 78% among males).

Similar NCD mortality patterns were observed for the urban Mangaung district between 2008-2013 and 2012-2017, with increases in all the age groups. According to the *District Health Barometer 2014/2015* (Massyn et al., 2015:341), NCD mortality rates in the Mangaung district from 2008-2013 in the under five year age group, among females and males, were 12.6% and 13%, respectively. Mortality rates increased to 24% for females and 22% for males for the 2012-2017 period (Massyn et al., 2020:346). In the 5-14 year age group, NCD mortality rates were 26.9% among females versus 21.5% in males and showed increases for females (35%) and males (28%) for 2012-2017. In the 15-24 years age group, NCD mortality rates were 19.1% for females versus 11.8% for males (period 2008-2013), with 23% female versus 15% males reported for the 2012-2017 period. In the 25-64 years age group, NCD mortality rates stood at 37.2% for females and 33.4% for males for the period 2008-2013, with increases to 49% and 41% amongst females and males respectively for the 2012-2017 period. In the 65-year and older age group, NCDs also accounted (as in the rural district) for the highest proportion of deaths for 2008-2013 (79% among females and 75.7% among males) and the 2012-2017 period (81% among females and 79% among males).

The increase in mortality trends for NCDs observed between 2008-2017 reveal the need of implementing CDL programmes that **optimise health and well-being through the life course to address CDL effectively** (this will further be elaborated on in the sections to follow).

2.4 Overview of current national CDL guidelines and intervention programmes

As early as 1940, South Africa explored an initiative to develop a Community-Orientated Primary Care (COPC) approach. At the end of the decade, this initiative was expanded from rural Natal to 40 similar health centres in other rural South African areas. The COPC programmes focused on identifying the specific population health needs, aligning them with effective intervention strategies, and evaluating the implemented plan's strategic success. This approach was the forerunner of the PHC approach introduced at Alma-Ata in 1978 (Mash et al., 2019:9; Denill and Rendall-Mkosi, 2012:2,3; Kautzkyi and Tollman, 2008:18).

The concept of PHC was derived from the Alma-Ata Declaration of the World Health Organization in the 1970s. The Alma-Ata Declaration (WHO 1978:3,4) described PHC as "*…essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain… It forms an integral part of the country's health system, of which it is the central function and main focus, and of the social and economic development of the community. It is the first level of contact on individuals, the family, and community, bringing health care as close as possible to where people live and work and constitutes the first element of a continuing health care process".*

Different approaches to PHC include comprehensive PHC, primary care, and selective PHC. Comprehensive PHC offers universal access to health care and resources. Primary care, commonly delivered at a primary health clinic or medical practitioner's surgery, focuses on individual health care and typically includes continuing (therapeutic, preventive, and rehabilitative) health care. Selective PHC entails high-impact interventions focusing on the most prevalent health challenges (e.g., immunisation) in developing countries (Puoane et al., 2008:4; Pan American Health Organization and World Health Organization and WHO, 2007:4).

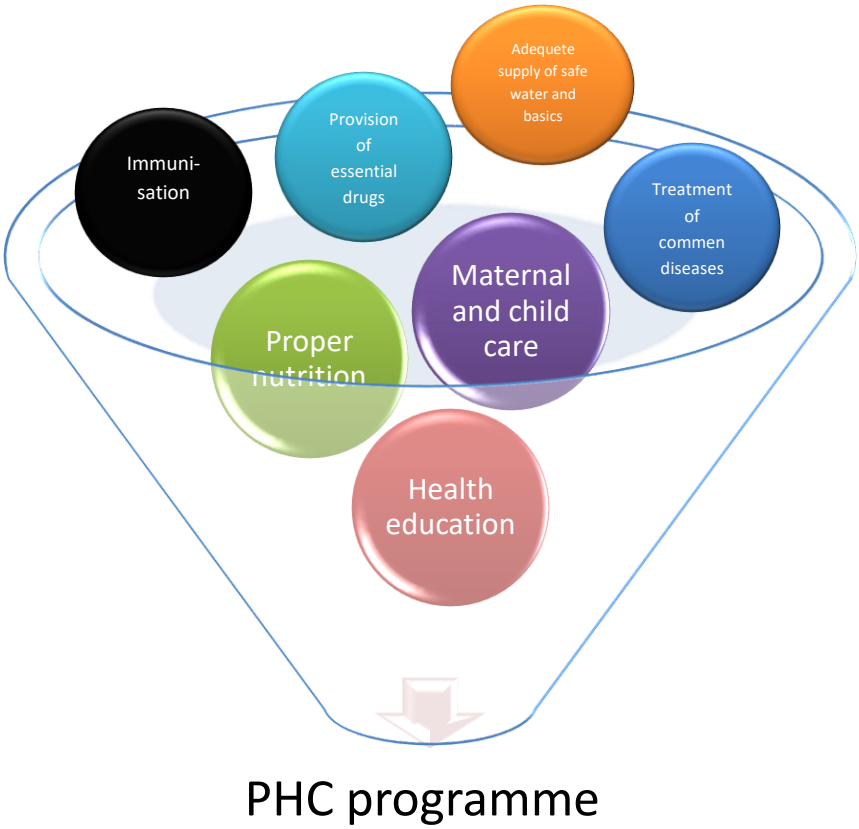


Figure 2.5: **Basic components of PHC programmes** (Denill and Rendall-Mkosi, 2012:5; WHO, 1978:24,25)

Figure 2.5 illustrates the basic components proposed for PHC programmes. The Academy of Nutrition and Dietetics position statement reiterated that "*primary prevention is the most effective and affordable method to prevent chronic disease*" (Slawson et al., 2013:972). Experiences over the last 40 years advocate for a comprehensive, preventative (addressing the broader determinants) and people-centred approach for NCD prevention and control instead of an expensive hospital-centred acute-care approach (WHO and the United Nations Children's Fund (UNICEF) 2018:2; WHO 2010:5,7,67). The NCD roadmap started with the Global Strategy for the Prevention and Control of NCD presented at the 53rd session of the WHO assembly in 2000, followed by the 2008-2013 and 2013-2020 global action plan for the prevention and control of NCDs (WHO, 2013b; WHO 2010, 163). Global goals include a 25% reduction in premature deaths due to the main NCD by 2025 (WHO, 2013b:5).

The 2030 vision of the National Development Plan (NDP) sets out nine long-term health goals for SA that focus on improving the health and well-being of the population and strengthening the health systems. One of the goals is to significantly reduce the prevalence of non-communicable diseases in SA by 2030 (National Planning Commission. 2012:333).

The **proposed model for the prevention and management of NCD** in South Africa includes:

- Development of effective PHC programmes
- Promotion of healthy lifestyles
- Early diagnosis and cost-effective management of risk factors and disease (Steyn and Levitt, 2006: 257).

2.4.1 Perspective on primary health care in South Africa

With the dawn of the new democracy in South Africa in 1994, health policies and programmes were substantially changed to improve access to health care. The Reconstruction and Development Programme (RDP) included building accessible PHC facilities for all, delivered via the public health sector. The White Paper on the Transformation of the Health System, which was formally supported by Parliament in 1997, was based on a policy for developing the district health system in South Africa.

Over the last decade, COPC has once again been commended as a PHC approach addressing specific health care needs of a community and has been introduced as part of medical education in various countries (Denill and Rendall-Mkosi, 2012:3).

In the 2008 report "*Primary Health Care – Now More Than Ever,"* the WHO emphasised the importance of countries implementing PHC. This commitment to PHC was reaffirmed at the Birchwood National Consultative Health Forum on Primary Health Care, held in Gauteng, South Africa. Although significant policy development has taken place over the last two decades, the implementation of the national strategy has not yet been fully achieved. Barriers

experienced include the following: health worker shortages, unequal resource distribution, inadequate training of health personnel in a comprehensive approach to chronic diseases, awareness campaigns not reaching their target audience, lack of patient knowledge and effective lifestyle modification, complex health transitions and lack of data, especially in disadvantage areas in South Africa (Steyn and McHiza, 2014; Puoane et al., 2008:80; Steyn and Levitt, 2006:246; Daniels et al., 2000:210).

Daniels et al. (2000:208,210) reported on the attitudes of health professionals in PHC settings regarding the implementation of CDL guidelines. Barriers to the application of the guidelines include limited consultation with staff during the implementation phase. Furthermore, limited local resources, high patient load, and the lack of appropriate educational material for patients were mentioned. Parker et al. (2012:5,8) indicated that most patients with CDL attending PHC facilities were not opposed to receiving lifestyle modification education but advised that the patient's preference for health promotion materials and methods must be considered. On the other hand, healthcare providers identified lack of resources, time, staff shortages and patient load as barriers that consistently hinder effective education and counselling.

2.4.2 Prevention and management of CDL in SA

Aligned with the WHO's global strategy of reorientation and strengthening health care towards high quality, effective primary and community-based care (WHO, 2015b) and improving the health profile of all, as set out in the DoH Strategic plan, implementation of the PHC programme in South Africa and the strategy for prevention and control of CDL depends on the PHC re-engineering process. Decentralisation of health services and the delivery of health services by local health care facilities aim to align health system planning and the country's needs (DoH, 2016; NDoH, 2013:39-43). In supporting the re-engineering of primary health, SA universities now focus on community-oriented educational approaches to PHC. Such an approach aims to create a relevant training platform aligned with health care needs in the SA context.

PHC re-engineering and the outreach team

The NDoH embarked on re-engineering PHC in South Africa in 2010 to enhance health promotion and offer accessible and high-quality health care on community level (NDoH, 2010:20,21). An essential component of the re-engineering of PHC in SA entails establishing effective community ward PHC outreach teams. It is proposed that the PHC outreach team should include a community health worker, health promoter, and environmental health officer. The responsibilities of community health workers will consist of visiting community households to provide information regarding healthy lifestyle choices and identifying and referring people at high risk to health care centres. Since health promotion and wellness are critical in managing and preventing CDL, especially among poor communities, health promoters are tasked with health promotion activities within communities (NDoH, 2013:42). In support of the re-engineering of primary health, SA universities now also focus on community-orientated educational approaches to PHC.

According to the SA African Declaration for Prevention and Control of Non-Communicable Diseases (NDoH, 2013:5,27), ten goals/targets have been set for 2020 and 2030.

These include **reductions** in:

- premature mortality due to NCDs (under 60 years of age) by at least 25%;
- tobacco use by 20%;
- alcohol consumption (per capita) by 20%;
- salt intake to < 5 grams per day;
- percentage of obese and overweight people by 10%;
- prevalence of people with hypertension by 20%; and

and **increases** in the:

- prevalence of physical activity (defined as 150 minutes of moderate-intensity physical activity per week, or equivalent) by 10%;
- screening for cervical cancer every five years/three screens in a lifetime of every woman with sexually transmitted diseases;
- control of patients with hypertension and diabetes by 30%;

- screening for and treatment of patients with mental health disorders by 30%.

As previously discussed, health systems analysis shows gaps in the health system, particularly at the PHC level, that prevent equitable health care. The NDoH (2013:49) strategic plan highlighted the importance of new and innovative research to monitor NCDs, their main risk factors and identify barriers to effective implementation in resource-constrained settings.

Factors contributing to the increased prevalence of NCD in developing countries, such as South Africa, include population growth, ageing, economic and epidemiological transition (urbanisation), and adaptation to a more westernised lifestyle (Steyn et al., 2006:2). Modifiable behavioural risk factors, such as insufficient physical activity, harmful use of alcohol, tobacco use, and an unhealthy diet, lead to an unhealthy lifestyle predisposing to chronic diseases. Steyn and Levitt (2006) defined CDL as a group of diseases that share similar risk factors: smoking, lack of regular exercise, unhealthy diet, and stress that can result in long-term disease processes (Steyn and Levitt, 2006). Calder et al. (2013) referred to the pathophysiology process underlying CDL development over the lifespan. Figure 2.6 provides an overview of the development of CDL by illustrating the interrelationship of unhealthy lifestyles, risk factors, and the development of CDL over the lifespan.

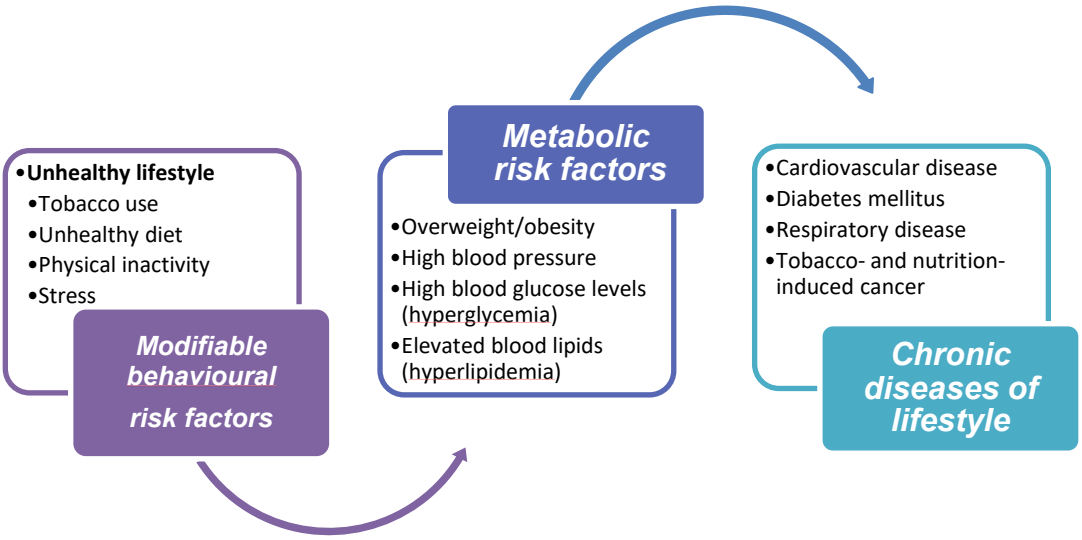


Figure 2.6: **The lifetime perspective on the development of CDL** (Adapted from Steyn and Levitt, 2006:4)

2.4.3 Chronic low-grade inflammatory state and development of lifestyle diseases

Serhan and Chiang (2004:69) used the term "*resoleomics*" to describe the acute self-limiting inflammatory response to an injury or illness. Acute inflammation is a normal physiological response executed by the IIS and regulated by the sympathetic nervous system (SNS) and the HPA axis. The resolution phase depends on the sensitivity of glucocorticoid receptors (GR) and catecholamine receptors in the IIS. Cortisol is a known regulator of the IIS response and is essential to guide the inflammation into the resolution phase. Other common inflammatory markers include HS-CRP, SED rate, fibrinogen, HDL, WBC, and blood glucose (Calder et al., 2013:S12-S16; Bosma-den Boer et al., 2012:6-7; Rhen and Cidlowski, 2005:1711-1713; Esposito and Giugliano, 2004:229,230).

In contrast with the acute inflammatory response that represents a normal physiological process, chronic inflammation contributes to the pathophysiology of a range of chronic diseases. Metaflammation is the chronic low-grade, systemic inflammatory process first attributed to obesity (Hotamisligil, 1993). However, research has found that metaflammation is associated with obesity and other CDL, such as CVD, type 2 diabetes, and cancer (Medzhitov, 2008; Libby, 2007; Hotamisligil, 2006). According to Gregor and Hotamisligil (2011), metaflammation forms part of a metabolic cascade, that includes cellular oxidative stress and insulin resistance leading to dysmetabolism and the development of chronic disease.

Certain modifiers that can influence the concentrations of inflammatory markers have been identified (Calder et al., 2013:S13). Dietary factors, for example, the intake of high glycaemic foods, affect inflammatory markers such as postprandial HS-CRP and increase the risk for chronic diseases such as diabetes and coronary heart disease (CHD) (Pereira et al., 2004: 2482-2490; Liu et al., 2000:1460). Lifestyle factors (e.g., physical inactivity, smoking, and even hypertension) are considered triggers that cause chronic activation of the IS and consequently the central stress axes, leading to obesity and chronic diseases such as CVD, diabetes, and respiratory diseases (Barbaresko et al., 2013; Pickup, 2004). Barbaresko et al. (2013:511) illustrated the association between increased inflammatory biomarkers and chronic low-

grade systemic inflammation. It has been shown that elevated white blood cell (WBC) count is a strong independent risk factor for CHD morbidity and mortality. In a sample of overweight/obese women, Johanssen et al. (2012:7,8) discovered that aerobic exercise lowered total WBC and neutrophil count, which was especially advantageous for those with low-grade systemic inflammation. The exact mechanisms responsible for the programming of the chronic inflammatory state and developing lifestyle diseases such as CVD in adulthood still need elucidation (Rogers and Velten, 2011: 417-421).

Research supports the link between an unfavourable early environment and the associated programming of a chronic low-grade inflammatory state and predisposition to chronic diseases later in life. Important maternal factors associated with chronic diseases later in life, identified in developing countries, were cigarette smoking followed by poor gestational nutrition and low pre-pregnancy weight (Scientific Advisory Committee on Nutrition, 2011; WHO, 2002b:39-49; Kramer, 1987:663). Intrauterine exposure to maternal tobacco smoking is closely associated with decreased birth weight. Positive associations have been found between birth weight and lung function test after adjustment for age, smoking, and height (Aagaard-Tillery et al., 2008:66e6; Lawlor et al., 2003:857).

Barker et al. (1989:567) found an inverse association between birth weight and cardiovascular risk. They concluded that an adverse intrauterine environment might lead to low birth weight with long-term effects and the risk of developing CDL (i.e., type 2 diabetes mellitus, CVD and hypertension) later in life (Li et al., 2015:175; Barker et al., 1993:66). In a low birth weight South African population, Levitt et al. (2000:4615-4616) confirmed reduced glucose tolerance and increased blood pressure.

Leary, Fal, and Osmond (2006:6) emphasised the association between poor maternal nutrition and intrauterine foetal growth. Maternal iron deficiency and anaemia can impair oxygen delivery to the foetus and, therefore, intrauterine growth (Roberts et al., 2020:R74). Maternal health and diet may play an important role in programming the offspring's short- and long-term health (Brenseke et al., 2013). Maternal malnutrition, including both

undernutrition and overnutrition, holds important consequences for the offspring, specifically survival, acute and chronic conditions including heart disease, diabetes, and elevated blood pressure (Edelstein, 2015). Furthermore, Victora et al. (2008:340-351) reported that maternal malnutrition has a long-term impact on the offspring, including shorter adult height, lower educational attainment, and lower economic productivity. Lower birth weight and undernutrition in childhood were risk factors for high glucose levels, blood pressure, and abnormal lipid profiles, implying that rapid postnatal weight gain (particularly after infancy) could be linked to these conditions. Increased birth weight was positively associated with the adult body mass index (BMI) and blood pressure values, but not with blood glucose levels. Other factors associated with chronic diseases later in life include maternal parity, physical inactivity, and stress (Lawlor et al., 2003:1260-1264). Figure 2.7 illustrates the most important maternal factors associated with CDL later in life, identified in developing countries.

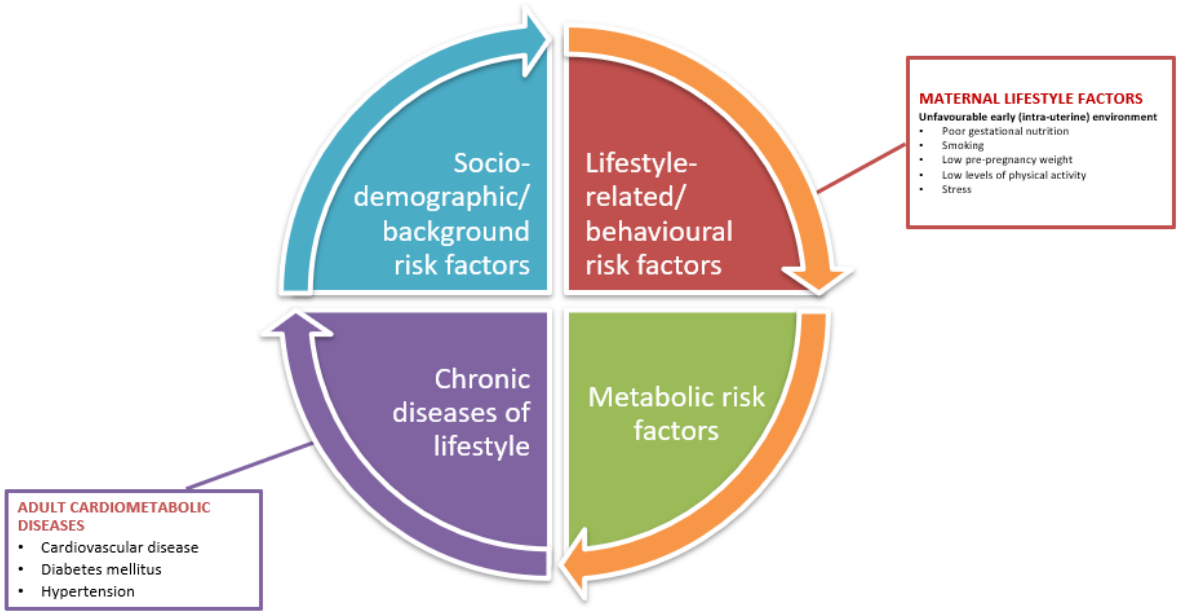


Figure 2.7: **Important maternal factors associated with CDL later in life** (Adapted from WHO, 2017b:13; Steyn & Levitt, 2006:4; Bruce and Hanson, 2010: 648–652)

This evidence has led to the theory that prenatal events can cause a chronic low-grade inflammatory state. Postulated mechanisms responsible for the chronic inflammatory condition include programming of various neuroendocrine axes, which affect sympathetic activation and cortisol metabolism. Later in life, resultant physiological and metabolic

changes can lead to cardiovascular and metabolic disorders (Bennett et al., 2018:2,28; Vrekoussis et al., 2010: 69-79*)*.

It is postulated that hypothalamic–pituitary–adrenal (HPA) axis and cortisol activation in stressful intrauterine conditions (e.g., maternal malnutrition) are likely to be involved in the programming of adult cardiovascular and metabolic disease (Maccari and Morley-Fletcher, 2007:S15; WHO, 2002b:34-35). Chen and Lacey (2018) reported on the association between adverse childhood events and adult inflammation in a British birth cohort. They illustrated that maternal factors (poor gestational nutrition, smoking, low levels of physical activity, and stress) and adverse events during the developmental period and childhood play an important role in exacerbating adult disease onset in the offspring. Furthermore, it is also becoming clear that continuation of poor nutrition in adulthood may increase the disease risk across generations.

Given the relationship between certain CDL (CVD, hypertension, and diabetes) and maternal health, greater emphasis must be placed on the health and well-being of young women and men of reproductive age and early childhood development of the offspring (WHO and UNICEF, 2018a:5). The WHO and UNICEF (2018:12,18,24) emphasise the importance of **optimising health and well-being across the life course to prevent NCDs effectively**. The resultant health, social and economic benefits will benefit current and future generations. These goals can be achieved and sustained through shared action and accountability at all levels. Mothupi et al. (2018:7) focused on maternal health and indicated the importance of an integrated continuum care approach that provides effective and quality care throughout the lifespan. To improve and broaden access to CDL services, Maina (2011:S36) advised including CDL prevention within mother and child health programs. The importance of addressing maternal health through CDL intervention programmes can influence foetal development and prevent the vicious cycle illustrated in Figure 2.8 with multigenerational benefits.

2.4.4 Current CDL intervention programmes

Current prevention and treatment efforts for CDL (e.g., CVS, the leading NCD) are based on the knowledge of specific risk factors (family history, increased age, low socioeconomic or educational status, psychosocial stress) and modifiable risk factors (tobacco use, diabetes mellitus, dyslipidemia/hypercholesterolemia, overweight/obesity, physical inactivity, and unhealthy diet) (WHO, 2021a). Primary prevention interventions focus on weight loss in the overweight/obese patient, consuming a healthy diet, and public awareness campaigns promoting physical activity and emphasising the dangers of smoking and increased alcohol consumption (WHO 2021b, WHO, 2011c:27,28).

Many developed countries have implemented the beforementioned interventions. However, the prevalence of CDL is still rising due to several factors, including ageing populations and increased urbanisation. Furthermore, the burden of other health priorities, for example, infectious disease, and barriers to effective implementation of intervention programmes contribute to the rising tide of CDL. Lopez and Mathers (2013) emphasise that assessing and understanding the health needs of populations can inform health policy and the planning process to address health development and needs.

Effective community-orientated primary care responses depend on identifying cluster patterns of multiple risk factors and risk predictors in different communities. The current study used a mixed method approach to investigate multiple behavioural risk factor profiles for urban and rural communities in the Free State and identified perceived barriers for primary prevention programmes (for diabetes, hypertension, obesity, and CVD) in these communities. The methodology applied for this investigation is discussed in Chapter 3.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

Chapter 3 presents the research design and methodology applied in this research study. The discussion will elaborate on the specific mixed method research design, study population, procedures and methods used in the study. The chapter concludes with a discussion of the methods of statistical analysis followed and the value of the study.

3.1 Description of the research design

The research design reflects the structured approach followed to answer a research question. Due to the complexity of public health challenges, researchers recognize the need for a variety of research methodologies to better understand problems and develop effective public health solutions (Ulin et al., 2005). Health care needs of populations are often assessed by cross-sectional studies that can be exploratory, explanatory, or descriptive (Brink et al., 2012:101-115). This study applied a cross-sectional observational design comprising of a convergent mixed method research approach. This approach entailed that the investigator collected, analysed, and integrated qualitative and qualitative data in a single study to provide an in-depth understanding of the research problem (Creswell and Plano Clark, 2011:5; Tashakkori and Cresswell, 2007:3).

3.2 Description of the mixed method design

Different types of mixed method designs are based on decisions of timing (the time at which the data sets are collected), weighting (the relative importance of each data set), and mixing (the stage of integration of data sets). Quantitative and qualitative data are collected and analysed concurrently in a convergent parallel mixed method design; combining qualitative and quantitative data occurs after the respective data analysis, during the data interpretation phase. In a sequential mixed method design, results from one phase of the study relate to the data collection of the other phase. An exploratory sequential design starts with a qualitative exploration followed by quantitative data collection. A popular approach used in health

sciences is an explanatory sequential approach where qualitative data explore the quantitative results from the initial phase. Data can also be embedded, referring to a secondary priority dataset set within a larger, primary design (Creswell and Plano Clark, 2011:70-76). The researcher used a convergent parallel mixed method design for this study.

This study consisted of three phases in which a CDL risk assessment and health promotion framework for PHC settings in the Free State was developed. The purpose of the convergent parallel design was to obtain multiple perspective views and a comprehensive understanding of the research topic. This was achieved through a comprehensive literature review and complementary quantitative data phase (PHASE I), followed by qualitative data analysis (PHASE II). Integration involved merging results from the quantitative and qualitative data and interpreting these results. An in-depth understanding of the research topic emerged, which led to constructing a risk assessment and health promotion framework (PHASE III) (Creswell and Plano Clark, 2011:77, 166,167). Figure 3.1 illustrates the decision tree for the convergent mixed method design (colour-coded in red) implemented in the study.

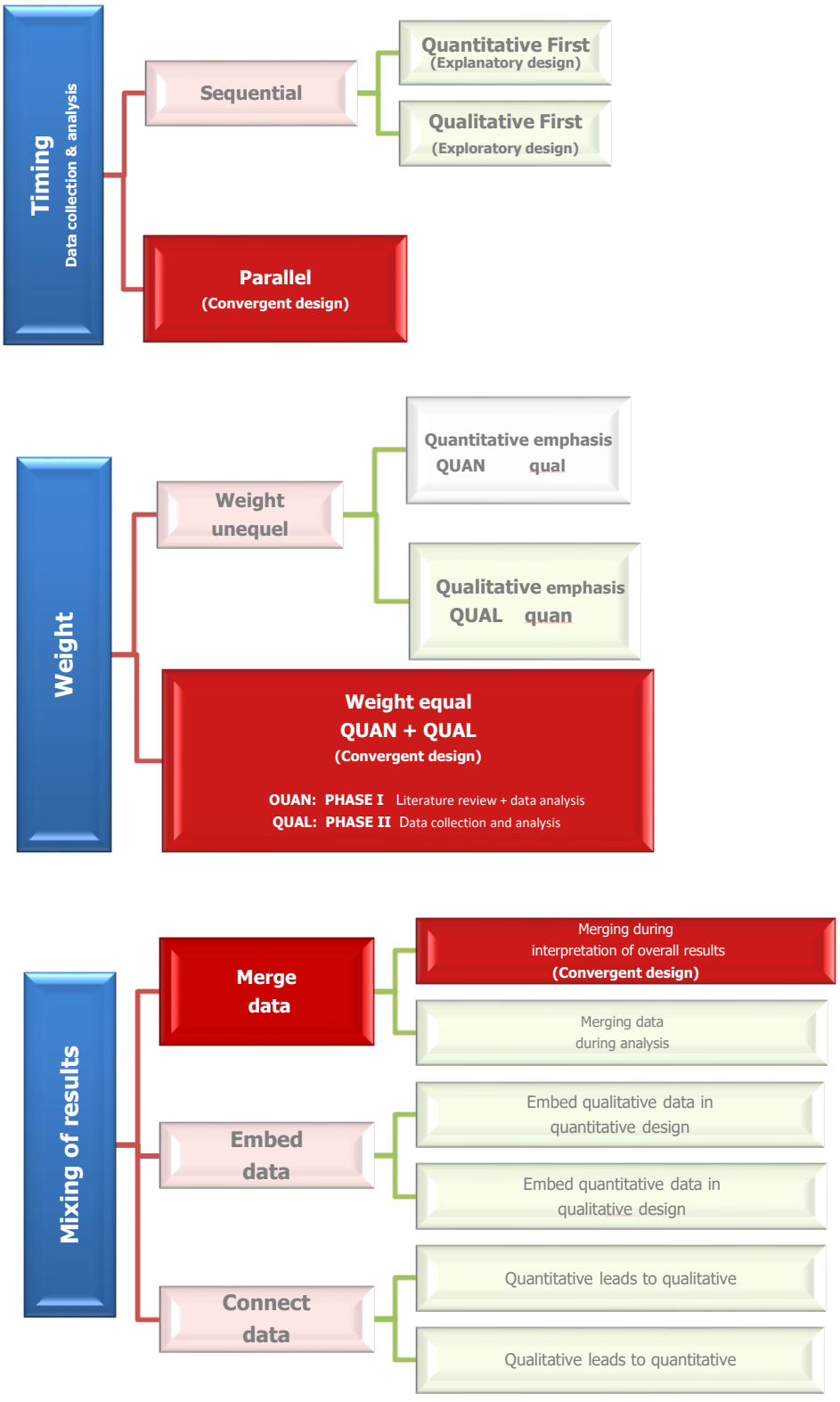


Figure 3.1: **Visual diagram of the mixed method design decision tree used in this study, based on Creswell and Plano Clark, 2011** (compiled by the researcher, S van Zyl)

3.2.1 Scholarly review

A comprehensive literature review commenced in PHASE I of the study to:

1. Contextualise CDL and related risk factors in terms of a global and South African perspective.
2. Contextualise and provide a deeper understanding of the current CDL challenges globally facing health care providers.
3. Obtain an overview of current national CDL guidelines and intervention programmes and challenges facing health care providers during the implementation of CDL intervention programmes in SA.
4. Provide a theoretical basis for the development of the focus group agenda.

3.2.2 Quantitative research

The purpose of the quantitative study (part of PHASE I) was to compile the CDL risk factor profiles for a rural and urban community in the FS. This phase of the study utilised the existing AHA-FS database. As indicated earlier, the AHA-FS database was established during cross-sectional epidemiological studies conducted in rural and urban FS communities during 2007 and 2009. The quantitative data analysis occurred concurrently with the collection and analysis of qualitative data (PHASE II).

3.2.3 Qualitative research

A qualitative research approach/strategy refers to the variety of research designs and methods to explore social phenomena. Philosophical frameworks frequently used to inform health sciences research as described in the literature include phenomenology, grounded theory, ethnography, and philosophical inquiry (Brink et al., 2012:121-125; Hansen et al., 2011:376). An interpretivist approach relies on the study of the meaning of experience (phenomenology), the study of culture (ethnography), and the building of theory (grounded theory) as approaches to study social phenomena (Botma et al., 2010:43). This study followed a qualitative phenomenological design to provide an in-depth understanding of stakeholders' knowledge of CDL and awareness of, as well as attitudes towards CDL and to describe

complexities experienced regarding the implementation of current CDL intervention programmes in rural and urban settings in the FS (Hansen et al., 2011:376). The qualitative research study provided a better understanding of CDL and the implementation of current intervention programmes in a rural and urban setting in the FS.

Participant observation, in-depth interviews, and focus group discussions are all common qualitative data collection approaches (Mack et al., 2005:2). Based on the aim of the current study, the researcher selected focus group discussions as a qualitative data collection method. One of the advantages of focus group discussions is that large amounts of information for a specific research topic are collected over a relatively short period, using group discussion and interaction (Stalmeijer et al., 2014:5,9). In this study, focus group discussions proved an effective qualitative data gathering method for presenting different views and experiences and exploring issues of concern regarding CDL intervention programmes (Kritzinger, 1995:299). After completing the literature review, focus group discussion guides (question roots) were compiled for the focus group discussions. A focus group discussion guide contains carefully selected open-ended questions that allow participants to respond in more detail than is normally provided with quantitative methods, where closed questions (single phrase or "yes /no" answers) are used (Mack et al., 2005:2-4, 52). It is suggested that no more than ten open-ended questions should be included in the interview guide (Botma et al., 2010:211). Brink et al. (2012:158) and Stalmeijer et al. (2014:15) suggest an optimum number of eight to 10 participants, with a maximum of 12 to 15 participants per focus group. Focus group discussions can last from 60 to 120 minutes (Mack et al., 2005:56); however, Botma et al. (2010:212) advise a maximum of one and a half hours (90 minutes). A realistic time frame schedule was considered when compiling the focus group discussion guide for each group.

3.3 Study population and sampling

A discussion of the study population and sampling methods used for PHASE I and II follows in the section below.

3.3.1 Quantitative research

AHA-FS database

As indicated earlier, the interdisciplinary AHA-FS study was conducted by researchers in the FHS, UFS, from 2007 to 2009. Data collection for the baseline survey started in 2007 in the Southern FS rural district of Xhariep (this area has been identified as the rural service learning platform of the FHS and was included for practical reasons). Adult members of households in the Black and Coloured communities of Trompsburg, Springfontein, and Philippolis, who met the following inclusion criteria, were eligible to participate in the rural leg of the study: male and female volunteers, age 25 - 65 years, written informed consent provided. Data collection for the baseline survey in the urban Mangaung district started in 2009, after selecting a stratified proportional cluster sample of Black and Coloured communities in the service area of the Mangaung University Community Partnership Programme (MUCPP) clinic. Data generated during these data collection phases was stored in the AHA-FS database and utilised in PHASE I of the current study.

3.3.2 Qualitative research

For the qualitative component of the study, purposive sampling was applied. Recruitment criteria focused on selecting participants for each focus group who had knowledge, experience, and insight into the research topic under investigation (Leedy and Ormrod, 2013:152).

Target population refers to a population of interest best suited to provide insight into the research topic (Asiamah et al., 2017:1614). For this study, the target population at each site comprised of three groups:

<u>Focus group 1: Community members</u>

Inclusion criteria:

- Community members (urban Mangaung district) or
- Community members (rural town of Trompsburg, Xhariep district)
- Male and female individuals

- Aged 25 to 65 years
- Individuals who visited PHC facilities as part of a treatment programme for obesity and the following CDL (CVD and/or hypertension and/or type 2 diabetes mellitus)

Exclusion criteria:

- Individuals who were not currently participating in a treatment plan or had never visited a PHC facility
- Individuals participating in treatment programmes for CDL that did not include obesity and/or CVD and/or hypertension and/or type 2 diabetes mellitus

The aim was to recruit 10 to 15 participants for Focus group 1.

Focus group 2: PHC team

Inclusion criteria:

- Community health workers, health promoters, environmental health officers, and staff members at the MUCPP clinic in the urban Mangaung district or
- Community health workers, health promoters, environmental health officers, and staff members at the PHC clinic in Trompsburg, in the Southern Free State district of Xhariep
- Male and female individuals
- Knowledge and/or experiences of CDL and CDL intervention programmes

Exclusion criteria:

- Individuals who had no experience of CDL intervention programmes

The aim was to recruit 8 to 10 participants for Focus group 2.

Focus group 3: Medical students

Inclusion criteria:

- Registered students in the MBChB programme offered in the FHS, UFS

- Semester 7 and 8 MBChB students who had completed rotations in the rural town of Trompsburg, Xhariep district as part of community-based education (CBE) training or
- Semester 9 and 10 MBChB students who had completed rotations in the urban Mangaung district as part of training in the Department Family Medicine
- Male and female students

The aim was to recruit 8 to 10 participants for Focus group 3.

The focus group discussions were conducted at two PHC facilities, namely the MUCPP clinic in the urban Mangaung district and the PHC clinic in Trompsburg, in the Southern FS district of Xhariep and the FHS for medical students.

3.4 Procedures and techniques

This section will provide an overview, followed by a detailed description of the study's procedures and techniques implemented during PHASE I and PHASE II.

3.4.1 PHASE I

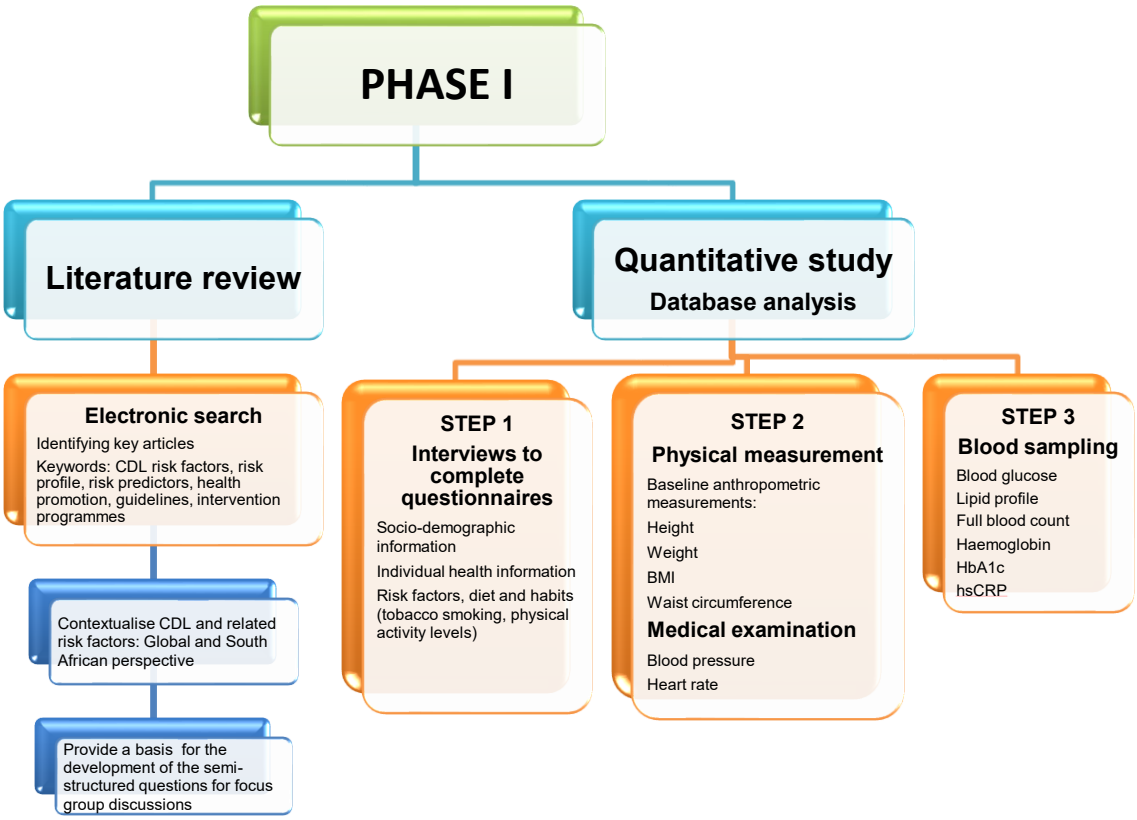


Figure 3.2: Overview PHASE I (compiled by the researcher, S van Zyl)

3.4.1.1 Literature review

The researcher identified relevant articles using an electronic search via PubMed, Medline, and Google Scholar with keywords such as CDL risk factors, risk profile, risk predictors, health promotion, guidelines, and intervention programmes.

3.4.1.2 Quantitative study: Procedures, techniques and cut-off points

The researcher formed part of the AHA-FS research team that conducted research in rural and urban communities in the FS. The researcher was involved in the protocol development phase, data collection phase (the researcher and a co-researcher performed the medical examinations), data interpretation phase, and publications related to the study.

Interviews with individuals were conducted as part of Step 1 of the AHA-FS study, which comprised questionnaires about household socio-demographic information, individual health, physical activity, and food intake. The urban leg of the interviews was conducted in the MUCPP clinic, whereas the rural leg took place in community halls in Trompsburg, Philippolis, and Springfontein. Risk factors (including a history of hypertension and diabetes) and habits such as tobacco smoking and physical activity levels were also determined. Trained students, under the supervision of lecturers from the Department of Nutrition and Dietetics, UFS, conducted the interviews. Sesotho, Setswana, and isiXhosa interpreters were available to assist during the data collection process.

Physical measurements (Step 2) included a baseline anthropometric evaluation. This was established by determining the following anthropometric measurements: Height (cm), weight (kg) (to determine BMI). A Seca® (Germany) digital electronic foot scale was used to determine participants' weight. BMI was calculated as [weight in kilograms divided by height in meters squared (kg/m2)] (WHO, 2006a). In addition to anthropometric measurements, participants underwent a medical examination conducted by the researcher. A DS-175, an auto-inflate electronic blood pressure monitor, was used during the clinical examination to measure participants' blood pressure in the supine position. Hypertension was defined as a systolic blood pressure of 140 mmHg or higher and/or a diastolic pressure of 90 mmHg or higher (WHO, 2015b; Weber et al., 2014). Participants with urgent medical conditions were referred on the day of the medical examination by the researcher. The researcher reviewed blood sample results for referral. During follow-up visits to the communities, participants could obtain results of biochemical tests and referral letters.

All questionnaires (socio-demographic status, diet, and physical activity) were completed during structured interviews with each participant. A 24-hour recollection of all physical activities performed the day before was included in the physical activity assessment. The survey included questions on the time spent doing vigorous physical activity, moderate physical activity, walking, and sedentary (sitting) activities. The intensity and impact of various activities on physical activity levels were calculated. The frequency of non-daily activities (such as gardening) was also determined. Each participant's physical activity level (PAL) was calculated and classified as follows: sedentary 1–1.39 PAL, low activity 1.4–1.59 PAL, active 1.6–1.89 PAL, and very active 1.9–2.5 PAL (Frary and Johnson, 2004:33).

In Step 3, blood specimens were obtained to determine biological risk factors (elevated blood lipids and raised fasting blood glucose (FVPG)). Serum and plasma samples were prepared in the laboratory and maintained at -80°C until analyses were performed, according to routine laboratory procedures. Blood samples were collected into fluoride tubes and centrifuged within four hours to determine FVPG levels. FVPG was measured using the glucose oxidase method on a Beckman LX20® auto-analyzer (Beckman Coulter, Fullerton, CA). Fasting blood lipid levels were analyzed using a Beckman LX20® auto-analyzer (Beckman Coulter, Fullerton, CA) (Friedewald et al., 1972). Blood analyses were performed by an accredited laboratory in Bloemfontein, South Africa. The following tables indicate the cut-off points used for operational definitions.

Table 3.1: Anthropometric measurement

3.1a Body Mass Index: International classification of adult underweight, overweight, and obesity (WHO, 2006a)

CLASSIFICATION	CUT-OFF POINT/RANGE
Underweight	< 18.50
Severe thinness	< 16.00
Moderate thinness	16.00 - 16.99
Mild thinness	17.00 - 18.49
Normal range	18.50 - 24.99
Overweight	≥ 25.00
Pre-obese	25.00 - 29.99
Obese	≥ 30.00
Obese class I	30.00 - 34.99
Obese class II	35.00 - 39.99
Obese class III	≥ 40.00

3.1b Waist circumference (WHO, 2008b; Kiernan and Winkleby, 2000)

MEASUREMENT	CUT-OFF POINT
Waist circumference	Men < 102 cm Women < 88 cm

Table 3.2: Classification of Hypertension (Weber et al., 2014)

BLOOD PRESSURE	Systolic blood pressure (mm Hg)		Diastolic blood pressure (mm Hg)
Normal	less than 120	and	less than 80
Prehypertension	120 – 139	or	80 – 89
High Blood Pressure (Hypertension) Stage 1	140 – 159	or	90 – 99
High Blood Pressure (Hypertension) Stage 2	160 or higher	or	100 or higher
Hypertensive Crisis	Higher than 180	or	Higher than 110

Table 3.3: Diagnostic criteria for diabetes (WHO, 2013a)

DIAGNOSIS	CRITERIA
Diabetes	Fasting plasma glucose ≥ 7.0 mmol/l (126 mg/dl) OR 2 - h plasma glucose* ≥ 11.1 mmol/l (200 mg/dl)

Table 3.4: Lipid profile (available at: http://www.globalrph.com/labs.htm (Accessed 2 March 2017)

MARKER	CUT-OFF POINT/RANGE (PRIMARY PREVENTION)
Cholesterol, total	Normal: <200 mg/dL (<5.2 mmol/L) Borderline: 200–239 mg/dL (5.2–6.2 mmol/L) High risk: ≥ 240 mg/dL (≥ 6.2 mmol/L)
***HDL cholesterol**	≥35 mg/dL
****LDL cholesterol**	< 100 mg/dL (2.59 mmol/L)
Triglycerides	Normal: < 150 mg/dL (1.70 mmol/L) Borderline high: 150 to 199 mg/dL High: 200 to 499 mg/dL Very high: >499 mg/dL

* High-density lipoprotein

**Low-density lipoprotein

Table 3.5: Other biochemical parameters

PARAMETER	CUT-OFF POINT/RANGE	REFERENCE
HbA1c	Normal ≤ 6.0% (42 mmol/mol) Prediabetes: 6-6.4% (42 – 47 mmol/mol) Diabetes: 6,5% or higher (48 mmol/mol or higher)	Ampath, 2010 WHO, 2011b
CRP **hsCRP**	0.0 - 4.9mg/L Low risk:< 1.0 mg/L Average risk: 1.0 to 3.0 mg/L High risk: > 3.0 mg/L	Ampath,2010 Pearson *et al*., 2003
Transferrin	2.2 - 3.7 g/L (M) 2.5 - 3.8 g/L (F)	Ampath, 2010
Ferritin	20 - 250 ug/L (M) 10 - 120 ug/L (F)	Ampath, 2010

* glycated haemoglobin

Table 3.6: Full blood count (Ampath, 2010)

MARKER	RANGE	
	Male	Female
Haemoglobin (g/dl)	Inland: 14.5 - 18.5 Sea level 13.0 - 17. 0	Inland: 12.1 - 16.3 Sea level: 12.0 - 15.0
Red cell count (x 10^{12}/ml)	Inland: 4.89 - 6.11 Sea level: 4.5 - 5.5	Inland: 4.13 - 5.67 Sea level: 3.8 - 4.8
Mean corpuscular volume (fl)	79.1 - 89	
Total leucocytes (x 10^9/l)	3.92 - 9.88	
Neutrophils (x 10^9/l)	2.0 -7.5	
Lymphocytes (x 10^9/l)	1.0 - 4.0	
Monocytes (x 10^9/l)	0.1 - 0.8	

3.4.2 PHASE II

PHASE II aimed to determine participants' knowledge, awareness, and attitudes towards CDL and CDL intervention programmes during focus group discussions.

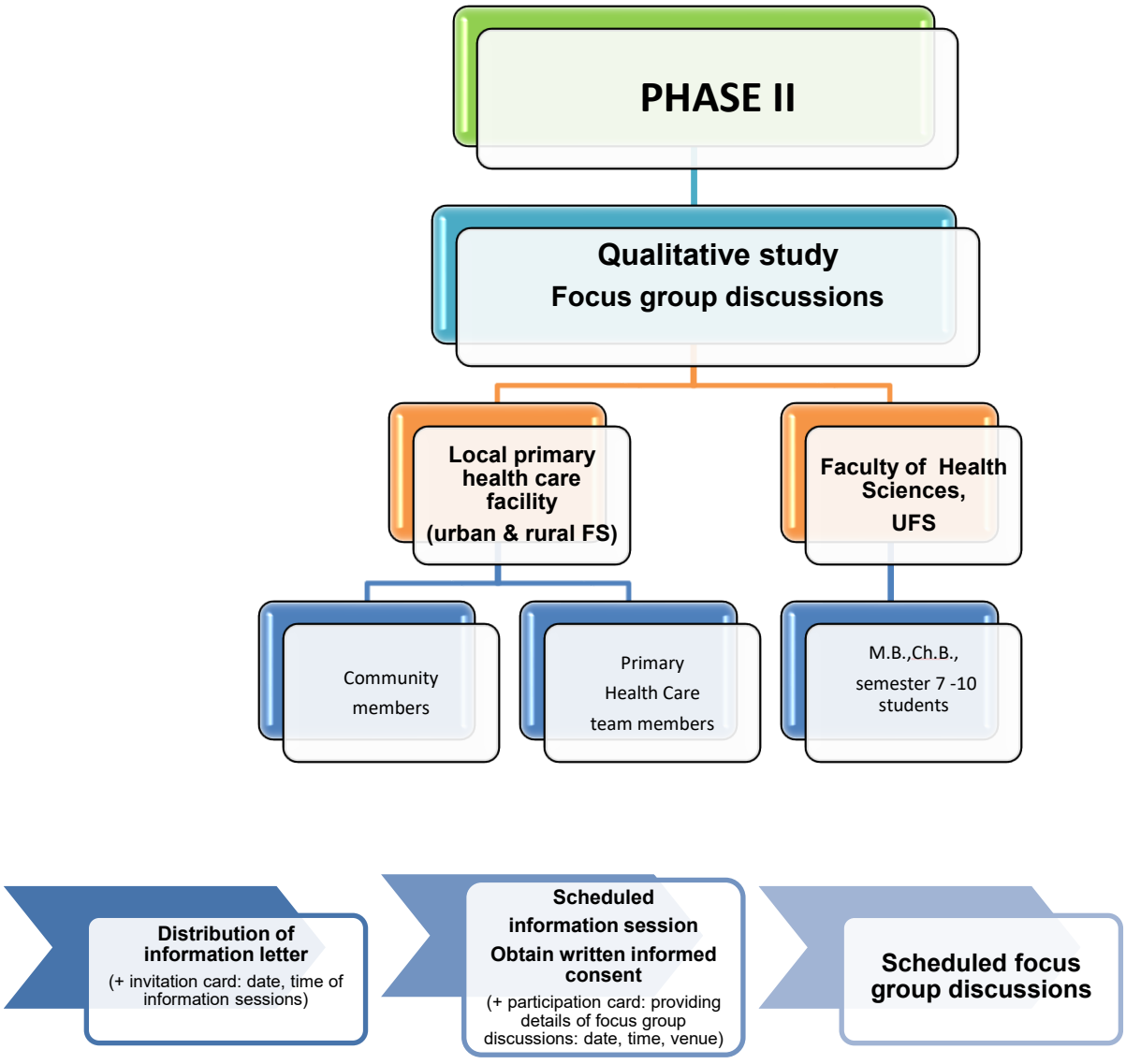


Figure 3.3: **Overview PHASE II** (compiled by the researcher, S van Zyl)

3.4.2.1 Qualitative study: Procedure and technique

Purposive sampling guaranteed the identification of participants who met the inclusion criteria and had knowledge and experience, and could provide perspective and insight relating to the research topic (Mack et al., 2005:5). Permission was obtained from FS DOH and

relevant authorities of the local PHC facility in each community to recruit potential participants and conduct focus group discussions at the local PHC facility (Appendix E). Community members and PHC team members were recruited to participate in the focus group discussions. Recruitment strategies included distributing information letters (Appendix F, G and H) at the local PHC facility. The Programme Director of the MBChB programme, FHS were informed about the study. Recruitment strategies for medical students included distributing information letters amongst MBChB, students in semesters 7-10 who already completed rotations in PHC areas (Appendix G), requesting them to participate in focus group discussions conducted in Room 133, Block B, FHS, UFS.

The information letters (Appendix I-J) contained the following information: an explanation of the purpose of the study, inclusion criteria, what is expected of participants during the focus group discussions, and the voluntary nature of participation in the research study (Botma et al., 2010: 203,204). Following a recruitment period at each site, the researcher scheduled an information session with prospective participants. During this session, the information was verbally communicated to prospective participants, and they received the opportunity to raise questions. After the researcher explained the voluntary nature of participation in the study (participants could withdraw at any time), written consent was obtained (Appendix H, I). The form was read to illiterate participants, and instead of signing, a mark was placed, with a witness signature confirming authenticity (Mack et al., 2005:11, 54, 59). After completing the aforementioned process, consenting participants were given all the details (date, time, venue, and expected duration) for the scheduled focus group discussions.

3.4.2.2 Qualitative study: Focus group discussions

Pilot study

After compiling the focus group discussion guides, a pilot study was undertaken on a sample of two clinical staff members of the Department of Basic Medical Sciences and two medical students in semesters 7-10 of the MB ChB programme in the FHS. The pilot study aimed to determine whether questions were easily understood and establish a realistic time schedule

for each question. Minor changes, for example, including additional probing questions, were incorporated to improve the understanding of some of the questions after the pilot study.

Two focus group discussions were conducted at the MUCPP clinic in the urban Mangaung district, two focus group discussions at the PHC clinic in Trompsburg, and two focus group discussions with medical students at the FHS, UFS. In the following sections, the mentioned focus group discussions are discussed/explained.

Group 1:

Focus group discussions were conducted with community members (who regularly visit the clinic for follow-up of CDL) to explore participants' knowledge of CDL, awareness, and attitudes towards CDL intervention programmes in rural and urban communities in the FS. Furthermore, participation in CDL intervention programmes and factors that influence access to these programmes were explored.

Group 2:

Focus group discussions were also conducted with PHC outreach teams (community health workers, health promoters, and environmental health officers), including staff members from local health care facilities. These focus groups aimed to investigate regional knowledge, awareness, and attitudes of the PHC teams and health care workers relating to CDL in these rural and urban communities in the FS. The effectiveness of CDL intervention programmes and strategies implemented in the community were evaluated. Barriers identified by community members, additional barriers and practical implementation issues experienced by PHC teams and health workers were also ascertained. Areas of good practice and health care providers' recommendations for areas of improvement were also determined.

Group 3:

Focus group discussions were conducted with registered MBChB students from the FHS, UFS in semesters 7-10 of the programme, who already completed rotations in rural and urban health care facilities to determine their knowledge, awareness, and attitudes towards CDL.

After completing the literature review, the researcher compiled a focus group discussion guide (Appendix L) for each focus group discussion to achieve the study's objectives. Developing a focus group discussion guide entailed compiling open-ended questions based on the literature review, prioritising questions, and allocating a realistic time frame to each question. This process included consulting the promoters and an expert in conducting focus group discussions who was invited to facilitate the discussions.

Focus group discussions were conducted in English, and interpreter services were available. Ground rules were established following the focus group discussion schedule (agenda) (Appendix K) before focus group discussions commenced. Participants were requested not to reveal the content of the discussions or the identity of other participants outside the focus group site. Confidentiality and respect for privacy were emphasised at the beginning and end of each focus group discussion (Mack et al., 2005:54). Respect for each other's contributions was illustrated by the willingness to listen to everyone's contributions and refrain from criticising or making derogatory comments about others' contributions (Mack et al., 2005: 61). In order to protect participants' confidentiality, coded numbers were used to identify participants during the interview. Participants were assigned a number (identifier) displayed on a number tag, and a seating chart was drawn to indicate the participants and their corresponding number. The seating chart was used for note-taking purposes (Mack et al., 2005:53, 70).

Data collection took place during the focus group discussions attended by the researcher as note-taker, the facilitator, and the participants. Documenting of focus group discussions comprised of MP3 audiotape recordings and written field notes. The responsibility of the note-taker included, among others, facilitation of logistics and compiling detailed notes

during the discussion. The facilitator led the group discussions by asking participants to respond to open-ended questions. Furthermore, the facilitator was responsible for the progression of the discussion and ensuring that it was in keeping with the topic. Back-up copies of the recorded tapes were made and stored separately from the original recordings in a secure location (Mack et al., 2005:55). Immediately after each focus group discussion, the note-taker/researcher conducted a debriefing session with the moderator. The purpose of the debriefing session was to note: important nonverbal communication, group dynamics observed during the discussion, ineffective questions, information that contradicts or confirms data collected in previous sessions, and new topics that emerged from the focus group discussion (Mack et al., 2005:75, 76). A saturated sampling technique was followed until no new information was obtained to ensure adequate and quality data was collected to support the study.

3.5 Analysis

In the next section, the statistical data analysis methods followed for the quantitative and qualitative part of the study will be discussed. This section will conclude with a description of the development of the risk assessment and health promotion framework.

3.5.1 Quantitative study

The Department of Biostatistics, FHS, UFS, statistically analysed the data. Data were analysed descriptively using frequencies and percentages for categorical variables and medians and ranges for numerical/continuous variables. Comparisons between rural and urban participants were made using contingency tables with chi-squared or Fisher's exact tests as appropriate. A level of significance was accepted as a two-tailed p value < 0.05. Using the AHA-FS database, the following variables were analysed during PHASE I:

- Behavioural risk factors (tobacco use, physical inactivity, and unhealthy diet – insufficient intake of fruit and vegetables);
- Intermediate biological/biomedical risk factors (elevated blood lipids, raised fasting blood glucose, high blood pressure, overweight/obesity and markers of inflammation: hsCRP, total leucocytes, neutrophils, lymphocytes, monocytes);

- Socio-demographic variables (age, sex, level of education).

As an extension of uni- and bivariate analysis, a multivariate logistic regression model was used to identify clusters of related variables for obesity and following CDL: CVD, hypertension, and type 2 diabetes mellitus. The following variables were used for the analysis:

- Behavioural risk factors (tobacco use, unhealthy diet, and physical inactivity):
    - low/insufficiently physically active (defined as less than 60 minutes of moderate to vigorous-intensity activity daily, less than 150 minutes of moderate-intensity activity per week)
    - consumption of five total servings (400 grams) of fruit and vegetables per day
    - current daily smoking
- Biological risk factors (elevated blood lipids, raised fasting blood glucose, high blood pressure and overweight/obesity) with categorical cut points (or indicate that references for cut-off points are indicated in previous tables):
    - raised blood glucose (defined as fasting plasma glucose value ≥ 7.1 mmol/L or on medication for raised blood glucose)
    - raised blood pressure (defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure 90 mmHg); and on hypertension treatment
    - overweight and obesity (defined as body mass index ≥25 kg/m² for overweight and body mass index ≥30 kg/m² for obesity
    - raised total cholesterol (defined as total cholesterol ≥ 200 mg/dL; borderline: 200–239 mg/dL and high risk: ≥ 240 mg/dL), HDL cholesterol (negative risk factor: ≥ 60 mg/dL) and LDL cholesterol < 100 mg/dL (2.59 mmol/L)
- Markers of inflammation:
    - hsCRP low risk (<1.0 mg/L), average risk (1.0 to 3.0 mg/L), high risk (>3.0 mg/L)
    - total leucocytes (>9.88x 10^9/l), neutrophils (>7.5x 10^9/l), lymphocytes (>4.0x 10^9/l), monocytes (>0.8 x 10^9/l)

- Socio-demographic variables (age, sex, level of education)

3.5.2 Qualitative study

The researcher transcribed the audio-recorded data verbatim in a Microsoft Word document. Nonverbal sounds and field notes were noted on the transcript in the right margin. After transcribing the audio recordings, the researcher again listened to them while reading the transcript to ensure it was accurately transcribed. The data was then sent to the facilitator for verification (Botma et al., 2010:214, 224).

The researcher analysed and interpreted the recorded qualitative data using an inductive strategy. The content analysis included data coding, identifying categories, and recognising emerging themes (Stalmeijer et al., 2014:21). The researcher followed the following steps to organise and interpret qualitative data systematically:

1. Read the transcript to obtain a general overview of the data.
2. Identified statements relevant to the research topic by separating relevant from irrelevant information.
3. Reviewed the transcript notes, breaking data into words/phrases/sections of text that reflect participants' specific thoughts.
4. Searched for recurring topics for individuals, within a group, and amongst different focus groups.
5. Grouped emerging topics into categories and labelled the various categories.
6. Followed a process of convergence to group related categories together.
7. Integrated categories into themes (themes referred to significant findings and reflected the participants' different experiences).
8. Connected emerging themes to develop an overall description of CDL and CDL intervention programmes as seen through the participants' eyes (Stalmeijer et al., 2014:22; Leedy and Ormrod, 2013:148, 160; Creswell and Plano Clark, 2011:208; Botma et al., 2010:222-225).

3.5.3 Development of a risk assessment and health promotion framework

Triangulation refers to the use of different sources (data triangulation) or different methods (methodological triangulation) to understand a social phenomenon (Botma *et al*., 2010:87, 88). In this study, the researcher used method triangulation (triangulation of quantitative methods, qualitative methods, and the literature review) to explain and provide a comprehensive understanding of CDL health challenges experienced in PHC settings in the FS (Creswell, 2003:16). Integration of quantitative and qualitative data during the interpretative phase enabled the researcher to construct a framework and recommendations to facilitate health promotion in these communities.

3.6 Validity, Reliability and Trustworthiness

Validity and reliability generally refer to quantitative data collection and trustworthiness to qualitative data.

3.6.1 Validity

According to Creswell and Plano Clark (2013:239), validity entails employing strategies in the different stages (data collection, data analysis, and interpretation) of the methods design process to ensure each stage's integrity and drawing a conclusion from the combined data sets. In order to ensure internal validity in this study, all research methods were developed to measure what they intended to measure, achieve the study's objectives, and draw accurate conclusions (Leedy and Ormrod, 2013: 91,103). Furthermore, quantitative and qualitative data were obtained from the same rural and urban populations (real-life setting – external validity) (Creswell and Plano Clark, 2013:249). The standardised questionnaires used to compile the AHA–FS database were tested for content and face validity to confirm the importance of the item covering the research topic and ensure that questions were reasonable for the overall group. Trained fieldworkers interviewed participants during the completion of the questionnaires, and where necessary, interpreters assisted the

fieldworkers and researcher in ensuring accuracy and truthfulness of the data obtained (Brink et al., 2012:127, 166). Sections 3.6.3.1 and 3.6.3.2 provide a detailed discussion about the validity as applicable to the qualitative part of this research study.

3.6.2 Reliability

Reliability is confirmed by consistent results if used repeatedly (Brink et al., 2012:169). To adhere to test-retest reliability (Leedy and Ormrod, 2013:93), 10% of all interviews were repeated during the quantitative phase. Questions were considered unreliable and omitted from the database if the percentage of given responses to questions differed by more than 20%. Appropriate standardised measurement procedures for measuring weight, height, and waist circumference were used, and trained students took all measurements. Medical examinations were performed in rural and urban settings by the researcher and a co-researcher who are qualified clinicians registered with the HPCSA. To ensure reliability all blood samples were analysed in accredited laboratories, using standard laboratory techniques (Brink et al., 2012:169). Section 3.6.3.3 entails a detailed discussion about the reliability as applicable to the qualitative part of this research study.

3.6.3 Trustworthiness

The following quality criteria were pursued to ensure trustworthiness in this study: credibility, transferability, dependability, and conformability.

3.6.3.1 Credibility (corresponds to internal validity)

Credibility indicates the extent to which the study results are accurate, believable, and authentic (Brink et al., 2012:127). To ensure credibility, the researcher used the most appropriate methods for data collection. Choosing participants for focus group discussions with appropriate experience (community members, health workers, and medical students) at different sites (rural and urban) also increased the opportunity of revealing experiences related to CDL intervention programmes.

Rigorous data analysis methods were also included (e.g., translation and back-translation). To ensure that categories and themes covered the data and that relevant data have not been accidentally excluded or irrelevant data included, an independent, experienced researcher separately conducted a thematic exploration to ensure completeness, uniformity, and validity of results (Leedy and Ormrod, 2013:106; Brink et al., 2012:122, 127, 172; Graneheim and Lundman, 2004:110). Furthermore, the researcher addressed bias by applying data and method triangulation (literature review, quantitative methods, and qualitative methods) (Stalmeijer et al., 2014:23).

3.6.3.2 Transferability (corresponds to external validity)

To demonstrate the scientific rigour of fieldwork, the researcher used a "thick" description to indicate that the research findings were applicable and transferable to similar populations and settings (Leedy and Ormrod, 2013:106; Brink et al., 2012:127, 173). This process included comprehensive documentation, providing a detailed chronology of the methodological process through which the findings were derived to ensure that findings were consistent and could be repeated by other researchers.

3.6.3.3 Dependability (corresponds to reliability)

Stringent data analysis methods entailed using an independent and experienced facilitator to conduct the interviews and an experienced researcher to review analytical procedures to ensure consistency in data coding and cross-check emerging themes (Brink et al., 2012:127).

3.6.3.4 Confirmability

Confirmability addresses the researcher's neutrality, ensuring that findings are accurately supported by the data rather than the researcher's bias. To reduce the effect of investigator bias, the researcher consciously identified and "bracketed out" preconceived ideas. Confirmability was further accomplished by an audit trail highlighting the different steps followed during the data analysis process and included analytical memos noting any influences on the data collection (Stalmeijer et al., 2014:23).

3.7 Ethical considerations

3.7.1 Approval

Approval to conduct the study was obtained from the Health Sciences Research Ethics Committee (HSREC) of UFS (UFS-HSD2017/1435), the FS DoH and relevant authorities of local PHC facilities in each community to recruit potential participants and conduct focus group discussions at the local community PHC facility. PHASE I of the study used the existing AHA-FS database to analyse risk factors and compile CDL risk profiles for the rural and urban study communities. The Ethics Committee of the FHS granted permission to conduct the AHA-FS study (UFS-ETOVS number 21/07). The researcher compiled an interview guide for the focus groups after completing PHASE I of the research study (the literature review). As a result, the three interview guides were submitted as an amendment to the Health Sciences Research Ethics Committee of the UFS for approval.

3.7.2 Informed consent

During a participant information session in PHASE II of the research study, the researcher explained the purpose, inclusion criteria, the format of focus group discussions, and the voluntary nature of participation in the research study. Participants had the opportunity to raise questions. All participants were requested to sign a consent form before the focus group discussions commenced (Appendix H, I) to document that they understood and had consciously decided to participate in the study. Participants were informed that they might withdraw from the study at any time. Illiterate participants and patients with chronic disease at PHC centres had the form read to them and a mark obtained in place of a signature. A witness's signature confirmed authenticity.

3.7.3 Confidentiality

To ensure participant confidentiality, the following precautionary measures were taken:

- no personal identifiers appeared on data sheets; instead, a number coding system was used;
- the master list containing essential personal information and the corresponding number coding; original consent forms and audio recordings were securely locked away;
- access to those mentioned above was limited to the researcher and facilitator only;
- confidentiality and respect for privacy were also emphasised at the beginning and end of focus group discussions. Participants were requested not to disclose the identity of other participants or the content of the focus group discussions.

3.8 Value of the study

Most CDL are preventable and can be explained by modifiable risk factors (Abegunde *et al*., 2007). Detailed information relating to factors influencing CDL mortality in rural and urban communities in the Free State is still inadequate. The construction of a CDL risk profile for each study population can contribute to the knowledge base and provide a better understanding of the epidemiological distribution, the co-occurrence of risk factors, and factors that maintain the risk cycle for CDL. This study identified barriers and challenges experienced to the implementation of CDL prevention programmes. Using this evidence-based data, a risk assessment and health promotion framework was compiled to facilitate the development of focused and effective CDL prevention and intervention programmes in PHC facilities in resource-constrained settings. Research results will be communicated through scientific platforms and disseminated to relevant stakeholders to maximise the value of the study.

3.9 Schematic overview of the study

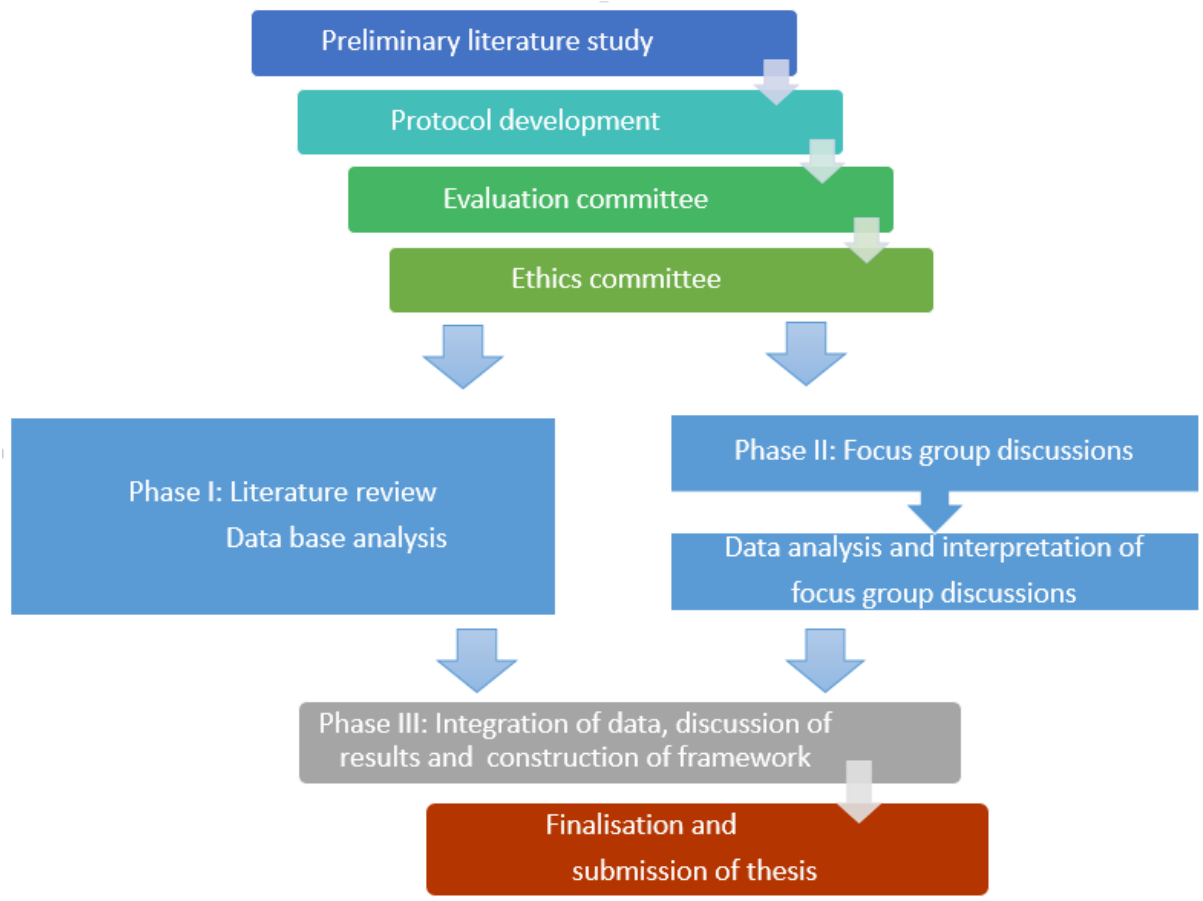


Figure 3.4: **Schematic overview of the study** (compiled by the researcher, S van Zyl)

CHAPTER 4: ARTICLE 1: A comparison of the socio-behavioural-metabolic risk profiles and risk predictors for chronic diseases of lifestyle in urban and rural communities in central South Africa

This article was prepared according to the journal submission guidelines of the *Frontiers Public Health Journal.* Published: 16 October 2020 (Appendix P-4)

A comparison of the socio-behavioural-metabolic risk profiles and risk predictors for chronic diseases of lifestyle in urban and rural communities in central South Africa

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Keywords: Non-communicable diseases (NCDs), Chronic diseases of lifestyle (CDL), socio-behavioural-metabolic risk profiles, obesity, cardiovascular disease (CVD), hypertension, type 2 diabetes mellitus, community-based primary health care prevention

Abstract

Background*:* The escalating global prevalence of lifestyle-related non-communicable diseases places a significant burden on health systems. Chronic diseases of lifestyle (CDL) are a group of diseases that share similar modifiable risk factors that can result in long-term disease processes. Considering the socio-behavioural-metabolic risk profiles of communities and risk factors predictive of the presence of CDL can assist in the development of focused and effective community-based prevention, intervention, and treatment programmes for CDL.

Aim: To determine the socio-behavioural-metabolic risk profiles and identify associated factors for the following CDL: obesity, cardiovascular disease, hypertension, and type 2 diabetes mellitus in rural and urban communities in central South Africa.

Methodology*:* This cross-sectional study included adults aged 25-65 years in the rural Southern Free State and urban Mangaung. Social determinants, behavioural and metabolic risk factors and inflammatory biomarkers for CDL were determined.

Results*:* In total, 575 rural (mean age: 42 years; 71% female) and 429 urban (mean age: 44 years; 76% female) participants were included in the study. More than 20% of participants in both communities reported being previously diagnosed with cardiovascular diseases, with reported hypertension and diabetes mellitus more prevalent among rural participants. Insufficient intake of fruit and vegetables, alcohol use and high blood pressure were among the top five risk factors in both communities. Physical inactivity ranked among the urban community's top two risk factors, while alcohol and tobacco use was significantly higher in the rural community. Fibrinogen was the most prevalent inflammatory marker in both communities (32.9% rural vs 48.3% urban). High sensitivity C-reactive protein (Hs-CRP), only available for rural participants, was high with increased levels in more than 80% of participants. Being female, having high blood pressure and increased fibrinogen levels were associated with obesity in both communities.

Conclusion*:* This study illustrated the high prevalence of socio-behavioural-metabolic risk factors for CDL and identified similarities and distinct differences in the risk profiles of rural and urban communities. Considering the CDL risk profiles of communities can assist in

prioritising health needs and contribute to the development of tailor-made community-based primary health care prevention, intervention, and health promotion programmes.

Number of words: 346

Number of figures: 1

Number of tables: 5

4.1 Introduction

Non-communicable diseases (NCDs), also known as chronic diseases, are a group of conditions that account for millions of deaths globally each year (1). Current projections indicate a significant rise in NCDs among the ranks of the top 10 leading global causes of death by 2040, with NCDs mortality projected to be the leading cause of death in the African region by 2030 (2,3). The World Health Organization's (WHO) country-specific profiles for NCDs (3) illustrate the escalating prevalence of modifiable lifestyle/behavioural risk factors in South Africa. These can lead to physiological and metabolic changes (obesity, high blood pressure, hyperglycemia and hyperlipidemia), resulting in chronic diseases of lifestyle (CDL), including hypertension, chronic lung diseases, cancer, and diabetes.

An increasing number of studies show strong evidence of the integral role that socio-demographic or background risk factors play in the multifactorial etiology of CDL, especially in developing countries. Moving from the conventional biomedical approach to a holistic biopsychosocial approach that considers socio-demographic determinants (i.e., population ageing and growth, low levels of education, poverty, inequitable access to health care, rapid urbanisation and adoption of a more westernised lifestyle) is required to address the escalating burden of CDL (1,4,5,6).

In recent years, attention has also shifted from focusing only on adult lifestyle-related risk factors as a cause for maintaining the risk cycle for CDL to adopting a life-course approach that acknowledges the influence of early life experiences on adult health and mortality. Chronic low-grade systemic inflammation is the root cause of many chronic diseases, with evidence proposing links between early adversity (e.g., an unfavourable early environment), impairment of immune status and susceptibility to CDL later in life (7,8). The chronic low-grade inflammatory state is characterised by increased levels of inflammatory biomarkers that reflect inflammatory load: high sensitivity C-reactive protein (Hs-CRP), fibrinogen, high-density lipoprotein (HDL), white blood cells (WBC) and cortisol (9,10,11,12). Lifestyle interventions (e.g., exercise, healthy diet, and sleep patterns, managing stress, and focusing on overall well-being) may have multiple anti-inflammatory effects, including favourable long-term changes in biomarkers of inflammation that may lower the risk of CDL (4,13). Health care professionals are encouraged to advocate for an anti-inflammatory lifestyle and

purposefully address it at patient, community, and national levels to improve the health and well-being of populations (4).

The National Development Plan (NDP) 2015-2020 of the South African Department of Health focuses on nine long-term health goals to improve the South African population's health and well-being and strengthen health systems (14). One of the envisioned goals is a significant reduction in the prevalence of chronic diseases in South Africa by 2030. Primary health care facilities are the first point of contact with health services. In South Africa, these facilities are dominated by lifestyle-related chronic diseases that create a significant burden on health systems. Hypertension and type 2 diabetes mellitus ranked first and fourth, respectively, on the list of the top 25 diagnoses made at primary health care facilities (15). Mayosi et al. (5) highlighted the escalating burden and emerging differences in CDL profiles in rural and urban communities in South Africa and the need for improved community-based health promotion and care.

Assessing and understanding the health needs of different communities can contribute to focused, targeted primary health care prevention, intervention, and treatment programmes for CDL in resource-constrained settings, and support the vision of the NDP to reduce the prevalence of chronic diseases in South Africa. Detailed information relating to the multifactorial risk profile and factors maintaining the risk cycle for CDL in rural and urban communities in the Free State, South Africa, is still limited, and therefore this study was envisioned. The study aimed to determine the socio-behavioural-metabolic risk profiles and inflammatory markers and identify clusters of associated risk factors for the following CDLs: obesity, cardiovascular disease (CVD), hypertension, and type 2 diabetes mellitus with CDL in rural and urban communities in the Free State.

4.2 Methods

4.2.1 Study design, population, and sampling

This cross-sectional epidemiological study formed part of the ‘Assuring Health for All’ in the Free State (AHA FS) research study that investigated how living in rural and urban areas affects

a person's lifestyle, health, and wellbeing. The study was conducted in two community service delivery sites of the University of the Free State. The rural part of the study was conducted in the southern Free State district of Xhariep in the rural towns of Springfontein, Trompsburg and Phillippolis that form part of the service area of the Free State Rural Development Partnership Programme (FSRDPP). Adult members, aged 25 to 64 years, from households (formal plots and squatter households) in surrounding township areas of the three rural towns were eligible to participate in the study. Trained fieldworkers visited all eligible households in these areas to explain the purpose of the study and recruit participants for the study. The urban part of the study was conducted in the service area of the Mangaung University Community Partnership Programme (MUCPP) clinic, and a stratified proportional cluster sample of the communities in this service area was selected for the study. After determining the number of plots in the MUCPP service area using a municipal map, a stratified proportional cluster sample, stratified by area and formal plots and squatter households in open areas, were done. After selecting X and Y coordinates randomly, 100 starting points were selected, and from each starting point, five adjacent households were approached by fieldworkers and informed about the study. In each household, all adult household members (25-64 years) were eligible to participate in the study. Trained fieldworkers visited all eligible households to explain the purpose of the study and recruit participants for the study.

4.2.2 Data collection procedures and laboratory analysis

Data collection took place in community halls in the three rural towns of the Free State for the rural part of the study and the MUCPP clinic for the urban part of the study. All participants were interviewed to complete questionnaires related to household socio-demographic, individual health, physical activity, and diet information. Language interpreters for Sesotho, Setswana and isiXhosa-speaking participants assisted the researcher where necessary. Senior dietetic students, under the supervision of lecturers from the Department of Nutrition and Dietetics at the University of the Free State (UFS), interviewed the participants and completed the questionnaires that focused on household socio-demographic information (e.g., age, gender, level of education, employment status, experienced stress)

and health information that included lifestyle-related risk factors, family and medication history.

Physical activity assessment included a 24-hour recall of all physical activities performed during the previous day, including information on the time spent doing vigorous physical activity, moderate physical activity, walking activity and sedentary periods. The frequency of activities that were not undertaken every day (e.g., gardening) was also determined. Using this information, the researchers calculated each participant's physical activity level (PAL), classified as sedentary 1–1.39 PAL, low activity 1.4–1.59 PAL, active 1.6–1.89 PAL, and very active 1.9–2.5 PAL (16).

Anthropometric measurements were taken according to standard WHO procedures and included weight in kilograms (kg), height in centimetres (cm) and waist circumference (cm). Weight was determined using a Seca® (Germany) digital electronic foot scale, with participants in examination gowns, without shoes. Anthropometric indices included body mass index (BMI) [weight in kilogram (kg) divided by the square of the standing height (m^2)], with overweight classified as a BMI ≥ 25 kg/m² and obesity a BMI of ≥ 30 kg/m² (17). The cut-off point for central obesity was a waist circumference of ≥ 88 cm in women and ≥ 102 cm in men (18).

In addition to anthropometric assessment, medical examinations were conducted by qualified medical professionals from the Department of Basic Medical Sciences of the Faculty of Health Sciences, UFS. Participants with urgent medical conditions were referred on the day of the medical examination. Participants could obtain biochemical tests and referral letters (where necessary) during follow-up visits. Blood pressure was measured during the clinical examination in the supine position with a DS-175, auto-inflate electronic blood pressure monitor (Nissei, Japan). Hypertension was defined as a systolic blood pressure of 140 mmHg or higher and/or a diastolic pressure of 90 mmHg or higher (19).

Fasting blood samples were obtained to determine biomedical risk factors as well as inflammatory markers. An accredited laboratory performed all analyses. Serum and plasma samples were prepared in the laboratory according to standard methods and stored at -80°C until analyses were performed. Complete full blood counts were performed using the Roche Sysmex XT 2000i analyzer® (Sysmex Sverige, Kungsbacka, Telefon). Blood specimens for the

measurement of fasting venous plasma glucose were drawn into fluoride tubes. Samples were centrifuged within four hours, and fasting venous plasma glucose was measured using the glucose oxidase method on a Beckman LX20® auto-analyzer (Beckman Coulter, Fullerton, CA. Diabetes mellitus was defined as fasting plasma glucose value ≥ 7.0 mmol/L (126 mg/dL) and HbA1c levels were defined as prediabetes: 5.7–6.4% (39–47 mmol/mol) and diabetes: 6.5% or higher (48 mmol/mol or higher) (20,21).

Fasting serum lipid levels were measured using enzymatic assay kits on a Beckman LX20® auto-analyzer (Beckman Coulter, Fullerton, CA). Raised blood lipids were defined as total cholesterol ≥ 200 mg/dL (5.2 mmol/l); low-density lipoprotein (LDL) cholesterol ≥ 100 mg/dL (2.59 mmol/L); triglycerides ≥ 150 mg/dL (1.7 mmol/L). Hs-CRP results were categorised as low risk: < 1.0 mg/L, average risk (1.0–3.0 mg/L) or high risk (>3.0 mg/L) levels, as indicated by the American Heart Association and US Centers for Disease Control and Prevention recommendations (22). Raised total leucocytes were defined as ≥ 9.88 x 10^9/L; fibrinogen ≥ 290 mg/dL. The ratio of NLR was determined with a normal value ranging between 0.78 and 3.53 (23,24).

4.2.3 Statistical analysis

Data were statistically analysed by the Department of Biostatistics, UFS, using frequencies and percentages for categorical variables and means for numerical variables. Comparisons between rural and urban participants were made using contingency tables with chi-squared or Fisher's exact tests as appropriate. A level of significance was accepted as a two-tailed p value < 0.05.

To identify factors for CDL, logistic regression models with each potential risk factor, age, and gender were fitted. Risk factors with p value < 0.15 were included in the stepwise logistic regression models to identify significant associated risk factors. Stepwise logistic regression starting with all variables included in the model (i.e., backward elimination) was performed, using p=0.05 as the threshold for entry and exit. If a variable with multiple missings was not significant in the model, the model was rerun excluding that variable. Odds ratios (OR) and 95% confidence intervals (95% CI) were used to present risk factors identified through this process for the following: CDL, obesity, hypertension, diabetes, and CVDs. Obesity was defined as a BMI of ≥ 30 kg/m²; hypertension as systolic blood pressure ≥ 140 mmHg and/or

diastolic blood pressure ≥ 90 mmHg) or on medication to lower blood pressure; and diabetes mellitus as fasting plasma glucose value ≥ 7.0 mmol/L or with a history of diagnosis of diabetes. Reported history of CVDs included stroke, heart disease, angina, heart attack, and heart failure.

The socio-behavioural-metabolic risk factors and inflammatory biomarkers categorised and defined below were considered for inclusion in the univariate logistic regression models. Significant variables in the different models were selected and considered for the final multivariate logistic regression models.

Behavioural risk factors were defined as:

Physical inactivity (level 1: sedentary - less than 60 minutes of moderate to vigorous-intensity activity daily, and level 2: low activity - less than 150 minutes of moderate-intensity activity per week); unhealthy diet (insufficient intake of fruit and vegetables/low consumption of fruits and vegetables defined as consumption of less than five total servings (400 grams) of fruit and vegetables per day); tobacco use (currently smoke and formerly smoked), alcohol use (currently and formerly used).

Metabolic risk factors with categorical cut points were defined as follows:

Raised blood glucose (fasting plasma glucose value ≥ 7.0 mmol/L (126 mg/dl); HbA1c (diabetic: 6.5% or higher (48 mmol/mol or higher)); high blood pressure (elevated systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg); overweight (BMI ≥ 25 kg/m²) and obesity (≥ 30 kg/m²); increased waist circumference (men ≥ 102 cm (high risk); women ≥ 88 cm (high risk)); raised blood lipids (total cholesterol ≥ 200 mg/dL (5.2 mmol/L); LDL cholesterol ≥ 100 mg/dL (2.59 mmol/L); triglycerides ≥ 150 mg/dL (1.7 mmol/L).

Inflammatory biomarkers with categorical cut points were defined as follows**:**

Hs-CRP: average risk (1.0–3.0 mg/L) or high risk (> 3.0 mg/L); total leucocytes (> 9.88 x 10^9/L); NLR ≥ 3.35; fibrinogen ≥ 290 mg/dL.

4.2.4 Ethical considerations

Ethics approval to conduct the AHA-FS study was obtained from the Ethics Committee of the Faculty of Health Sciences (UFS-ETOVS number 21/07), the Health Sciences Research Ethics

Committee (HSREC) of UFS (UFS-HSD2017/1435), the Free State Department of Health and local municipalities before the commencement of the study. In all communities, trained fieldworkers recruited participants during home visits, and the research team explained the project to participants before obtaining written informed consent from each participant.

4.3 Results

4.3.1 Study population

A total number of 1 004 (575 rural and 429 urban) participants, between 25 and 65 years, adhered to the study criteria and were included in the study. The mean age of the rural and urban participants was 47.2 years (71% females) and 44.4 years (76% females), respectively.

4.3.2 Socio-demographic characteristics and background risk factors of study participants

Results obtained through socio-demographic questionnaires, summarised in **Table 4.1**, revealed that more urban (19.9%) than rural (15.4%) participants completed grades 11-12 at school level. Reported unemployment status was higher in the urban community (54.8%) than in the rural community (24.2%). While 31.0% of urban participants reported that they experienced permanent stress, only 9.0% of rural participants reported similar stress levels. Results obtained through individual health questionnaires (see **Table 4.1**) indicate a high prevalence of hypertension, diabetes mellitus and CDVs among rural and urban participants and their family members.

A large percentage of rural and urban participants (63.1% and 48.2%, respectively) reported having hypertension themselves, with just over 60% of participants in both study groups reporting a family history of hypertension. Self-reported diabetes mellitus was higher in the rural than urban (11.0% vs 7.4%) participants, with more than a quarter of participants (26.0% rural and 33.1% urban) reporting a family history of diabetes mellitus. A total of 24% of rural participants and 26.7% of urban participants reported being previously diagnosed with CVDs (stroke, heart disease, angina, heart attack and heart failure), and a high reported family history was also observed among both study populations (rural 41.3% and urban 52.1%).

Table 4.2 illustrates the high prevalence of behavioural and metabolic risk factors among the rural and urban study populations. Significant differences between rural and urban participants were observed in tobacco use ($p < 0.01$), alcohol use ($p < 0.01$), PAL ($p < 0.01$), total cholesterol levels ($p < 0.01$) and high blood pressure ($p < 0.01$). The different behavioural and metabolic risk factors were ranked, and **Table 4.3** illustrates distinct differences between the risk profiles of rural and urban communities. Insufficient intake of fruit and vegetables was the leading risk factor in both communities. Tobacco and alcohol use ranked higher in the rural community. Physical inactivity ranked among the top two risk factors in the urban community, followed by high blood pressure. More than half of the participants in both communities were either overweight or obese.

Table 4.1: Reported socio-demographic/background risk factors of rural and urban participants

Risk factor	Rural			Urban			*p* value for % difference
	N	n	%	N	n	%	
Age	**575**			**429**			< 0.01
25 - 29 years		34	5.9		51	11.9	
30 - 34 years		52	9.0		37	8.6	
35 - 39 years		67	11.7		64	14.9	
40 - 44 years		80	13.9		58	13.5	
45 - 54 years		158	27.5		125	29.2	
55 - 65 years		184	32.0		94	21.9	
Gender	**575**			**429**			0.08
Men		167	29.0		103	24.0	
Women		408	71.0		326	76.0	
Marital status	**546**			**403**			< 0.01
Never married		110	20.1		137	34.0	
Married/Traditional marriage		182	33.3		120	29.8	
Living with a partner		73	13.4		40	9.9	
Widowed		104	19.1		58	14.4	
Separated		55	10.1		18	4.5	
Divorced		21	3.8		29	7.2	
Other		1	0.2		1	0.3	
Medical history							
Previously diagnosed with diabetes mellites	**547**	60	11.0	**405**	30	7.4	0.06
Previously diagnosed with hypertension	**548**	346	63.1	**405**	195	48.2	< 0.01
Previously diagnosed with the following CDVs:							
Stroke	**549**	36	6.6	**405**	21	5.2	0.33
Heart disease, angina, heart attack	**545**	88	16.2	**405**	68	16.8	0.79
Heart failure	**549**	6	1.1	**405**	19	4.7	< 0.01
Family history							
Member previously diagnosed with diabetes mellites	**548**	145	26.6	**405**	134	33.1	0.03
Member previously diagnosed with hypertension	**544**	333	61.2	**405**	251	62.0	0.81
Member previously diagnosed with the following CDVs:							
Stroke	**543**	84	15.5	**405**	78	19.3	0.12
Heart disease, angina, heart attack	**542**	107	19.8	**405**	107	26.4	0.01
Heart failure	**546**	33	6.0	**405**	26	6.4	0.81
Level of education	**550**			**416**			< 0.01
None		144	26.2		76	18.3	
Primary school education		173	31.5		153	36.8	
Secondary school education:							
Grade 8—10		145	26.4		100	24.0	
Grade 11–12		85	15.5		84	20.2	
Tertiary education		3	0.6		3	0.7	
Employment status	**575**			**429**			< 0.01
Housewife by choice		14	2.4		3	0.7	
Unemployed		139	24.2		235	54.8	
Self-employed		9	1.6		4	0.9	
Full-time wage earner (receive a salary)		42	7.3		21	4.9	
Other (part-time job, piece job)		371	64.5		166	38.7	
Experienced stress	**539**			**405**			< 0.01
Never		173	32.1		54	13.3	
Few periods of stress		173	32.1		129	31.9	
Several periods of stress		145	26.9		96	23.7	
Permanent stress		48	8.9		126	31.1	

CDV = cardiovascular disease; N = number of participants

Table 4.2: Summary of behavioural, metabolic and inflammatory risk factors of rural and urban participants

Risk factor	Parameter	Rural			Urban			*p* value for % difference
		N	n	%	N	n	%	
		575			**429**			
Behavioural risk factors								
Tobacco use	Currently smoke & formerly smoked	548	322	58.8	405	130	32.1	< 0.01
Insufficient intake of fruit and vegetables	Consumption less than five servings (400 grams) of fruit and vegetables per day	550	530	96.4	418	410	98.1	0.11
Alcohol use	Currently intake and formerly used	546	437	80.0	404	219	54.2	< 0.01
Physical inactivity	Level 1 (i.e., sedentary: less than 60 minutes of moderate to vigorous-intensity activity daily) and Level 2 (i.e., low activity: less than 150 minutes of moderate-intensity activity per week)	550	150	27.3	415	276	66.5	< 0.01
Metabolic risk factors								
Elevated blood lipids (total cholesterol)	High risk: ≥ 240 mg/dL (≥ 6.22 mmol/L)	552	75	14.2	415	17	4.1	< 0.01
High blood glucose	≥ 7.0 mmol/L (126 mg/dL)	544	43	7.9	411	18	4.4	0.03
HbA1c	Diabetes: 6.5% or higher (48 mmol/mol or higher)	548	53	9.7	415	25	6.0	0.04
High blood pressure	Systolic blood pressure of 140 mmHg or higher and/or a diastolic pressure of 90 mmHg or higher	563	382	67.9	413	235	56.9	< 0.01
Body mass index	Overweight and obese BMI ≥ 25.00	555	295	53.2	419	227	54.2	0.75
Waist circumference	Men ≥ 102 cm (high risk) / Women ≥ 88 cm (high risk)	547	323	59.1	418	223	53.4	0.08

Inflammatory risk factors								
Total leucocytes	(> 9.88 x 10^9/L)	543	71	13.1	417	18	4.3	< 0.01
Neutrophils	(> 7.5x 10^9/L)	544	25	4.6	417	6	1.4	0.01
Lymphocytes	(> 4.0 x 10^9/L)	544	4	7.7	417	7	1.7	< 0.01
Monocytes	(> 1.8 x 10^9/L)	543	35	6.5	417	25	6.0	0.78
Neutrophil:lymphocyte ratio	≥ 3.53	543	29	5.3	417	17	4.1	0.36
Fibrinogen	≥ 290 mg/dL	520	171	32.9	389	188	48.3	< 0.01

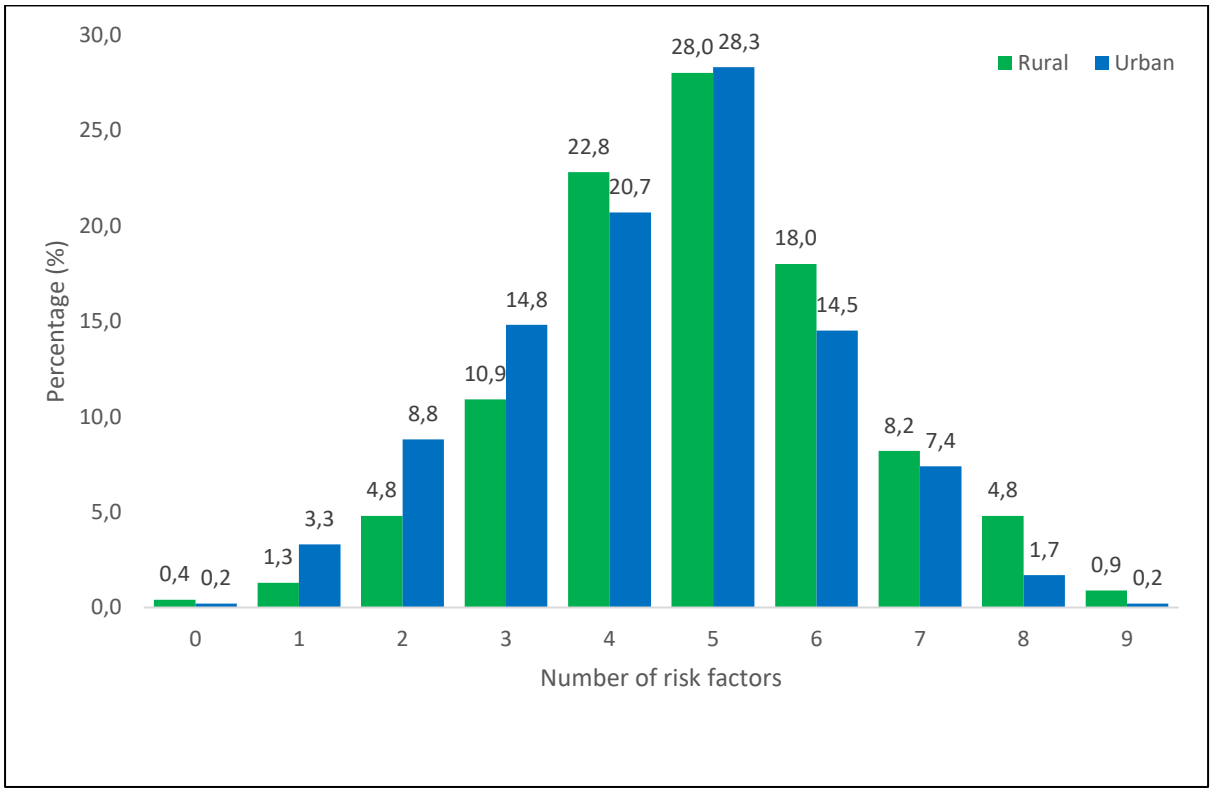
Table 4. 3: Ranked behavioural and metabolic risk factors of rural and urban participants

Rural	Percentage (%)	Ranking	Percentage (%)	Urban
Insufficient intake of fruit and vegetables	96.4	**1**	98.1	Insufficient intake of fruit and vegetables
Alcohol use	80.0	**2**	66.5	Physical inactivity
High blood pressure	67.9	**3**	56.9	High blood pressure
Increased waist circumference	59.1	**4**	54.2	Alcohol use
Tobacco use	58.8	**5**	54.2	Body mass index
Body mass index	53.2	**6**	53.4	Increased waist circumference
Physical inactivity	27.3	**7**	32.1	Tobacco use
Elevated blood lipid levels	14.2	**8**	6.0	Elevated HbA1c levels
Elevated HbA1c levels	9.7	**9**	4.4	Elevated blood glucose levels
Elevated blood glucose levels	7.9	**10**	4.1	Elevated blood lipid levels

Figure 4.1 illustrates the number of risk factors in the two populations**.** Due to missing information, it was decided to include all participants with information for seven or more of the ten behavioural and metabolic risk factors in the calculations. Of the 575 rural participants, the data of 561 were included, and of the 429 urban participants, the data of 420 were included (**Table 4.3**). For participants with information for seven, eight or nine of the risk factors, the number of risk factors present were calculated proportional to the number of risk factors with known information and rounded down to a value between zero

and 10. For example, one risk factor present out of seven with known information was calculated as 1/7*10=1.4 and reported as one.

Figure 4.1: Total number of behavioural and metabolic risk factors for rural (N = 561) and urban (N = 420) participants



Markers of inflammation are summarised in **Table 4.2**. Hs-CRP results (average risk: 1.0–3.0 mg/L and high risk: > 3.0 mg/L) were only available for rural participants, with average and high levels observed in 88.5% of rural participants. Fibrinogen was the most prevalent inflammatory marker in both communities, with 32.9% rural participants and 48.3% urban participants having elevated levels. Significant differences for total leucocytes ($p < 0.01$), lymphocytes ($p < 0.01$), and fibrinogen ($p < 0.01$) were observed between rural and urban participants, with more rural participants presenting with elevated leucocytes (13.1% rural vs 4.3% urban) and lymphocytes (7.7% rural vs 1.7% urban) and more urban participants with elevated fibrinogen. The least prevalent inflammatory marker in both communities was elevated neutrophils (4.6% rural vs 1.4% urban).

In addition to comparing the socio-behavioural-metabolic risk factors and inflammatory biomarkers for CDL in rural and urban participants, univariate analysis was performed to identify risk factors associated with obesity, hypertension, diabetes, and CVDs (see **Table 4.4**). The number of participants excluded due to missing values includes 20 rural and 17 urban participants for obesity, nine rural and seven urban participants for hypertension, 29 rural and 17 urban for diabetes, 26 rural and 24 urban participants for cardiovascular disease.

Table 4.5 illustrates the results of the multivariate logistic regression models**.** Multivariate logistic regression analysis showed that being female, having high blood pressure, increased triglycerides, and increased levels of the inflammatory biomarkers Hs-CRP and fibrinogen were positively associated with obesity in the rural sample. In the urban sample, being female, having high blood pressure, high blood glucose and fibrinogen levels were positively associated with being obese. As expected, smoking was negatively associated with obesity in rural (OR 0.25; $p < 0.01$) and urban (OR 0.42; $p < 0.01$) participants. Age advancement was associated with the presence of **hypertension** in both rural and urban areas. The probability of having hypertension in the rural area was higher with increased reported stress levels, while high HbA1c levels increased the odds of having hypertension 10.40 (95% CI 1.37;78.98) times. In this sample, residing in an urban area, being overweight and obese were positively associated with hypertension.

In this study, adults living in an urban area had increased odds of **diabetes mellitus** with increased age, while increased waist circumference was positively associated with diabetes mellitus in rural (OR 4.10; $p < 0.01$) areas. Based on the OR, adults living in a rural area with a sedentary/low activity lifestyle, increased triglycerides, and leucocytes had increased odds of having diabetes. Adults residing in a rural area with no education were almost three times (OR 2.9, 95% CI 1.34;6.30) more likely to have **CVD**s; in terms of the association between CVD and levels of stress, results were unexpected. Possible reasons for this will be included in the discussion. Urban participants with hypertension (OR 2.84, 95% CI 1.39;5.78), elevated glucose (OR 2.24, 95% CI 1.03;4.88), and leucocytes (OR 3.17, 95% CI 1.09;9.21) were more likely to have CVDs.

Table 4.4: Significance of individual risk factors for chronic diseases of lifestyle (CDL)

	Obesity		Hypertension		Diabetes		Cardiovascular diseases	
	Rural	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**
Socio-demographic/background risk factors								
Age	0.56	**0.04**	**< 0.01**	**< 0.01**	**0.03**	**0.01**	**0.06**	**0.03**
Gender	**0.01**	**< 0.01**	0.15	**0.02**	0.86	0.64	0.40	0.64
Level of education	**< 0.01**	**0.06**	0.38	0.99	0.55	0.32	**0.09**	0.76
Experienced stress	0.23	0.26	**0.02**	0.42	0.53	0.32	**< 0.01**	**< 0.01**
Behavioural risk factors								
Physically inactivity	0.66	0.80	0.54	**0.07**	**0.03**	0.95	0.19	0.43
Unhealthy diet	0.56	0.86	0.30	0.92	**0.01**	**0.06**	0.24	0.55
Tobacco use	**< 0.01**	**< 0.01**	0.97	0.84	**0.01**	**< 0.01**	**0.07**	0.62
Alcohol use	**0.01**	0.25	0.90	0.66	**0.06**	**0.08**	0.58	**0.12**
Metabolic risk factors								
Raised fasting blood glucose	**< 0.01**	**< 0.01**	**0.13**	**0.03**	-	-	0.78	**0.04**
HbA1c	**< 0.01**	0.98	**0.03**	0.17	**< 0.01**	**< 0.01**	**0.14**	**0.27**
High blood pressure	**0.01**	**< 0.01**	-	-	0.15	**0.03**	0.26	**< 0.01**
Overweight and obesity	-	-	**0.01**	**< 0.01**	**< 0.01**	**< 0.01**	0.41	0.34
Increased waist circumference	**< 0.01**	**< 0.01**	**< 0.01**	**< 0.01**	**< 0.01**	**0.01**	0.26	0.21
Raised total cholesterol	0.92	0.45	**0.04**	0.16	0.23	0.97	0.19	0.64
LDL cholesterol	**0.09**	**0.07**	0.29	0.25	0.48	0.73	0.21	0.61
Triglycerides	**< 0.01**	0.57	**0.14**	**0.04**	**0.01**	0.62	0.91	0.17
Inflammatory biomarkers								
Hs-CRP	**< 0.01**	ND	0.47	ND	0.23	ND	0.65	ND
Leucocytes	0.52	0.17	0.45	0.61	**0.06**	0.77	0.41	**0.04**
Neutrophil	0.58	0.19	0.83	0.39	0.42	0.48	0.25	**0.09**
Neutrophil:lymphocyte ratio	**< 0.01**	0.71	0.89	0.57	0.17	0.80	0.43	0.97
Fibrinogen	**< 0.01**	**< 0.01**	0.94	0.78	0.26	0.16	0.21	0.27

Note: Risk factors with p value < 0.15 were included in the stepwise logistic regression models to identify significant (p value < 0.05) associated risk factors as displayed in Table 7.

ND = not done

Table 4.5: Significant socio-behavioural-metabolic risk factors, inflammatory biomarkers associated with the presence of obesity, cardiovascular disease, hypertension, and diabetes mellitus in a rural and urban sample

		Rural		Urban	
	Variables	Odds ratio [95% confidence interval]	**p*-value	Odds ratio [95% confidence interval]	**p*-value
					Obesity
Sex	Female vs male	3.90 [2.35;6.48]	< 0.01	8.64 [4.14;18.04]	< 0.01
Smoke	Yes vs No	0.25 [0.16;0.40]	< 0.01	0.41 [0.23;0.72]	< 0.01
High blood pressure	Yes vs No	1.72 (1.01;2.94]	0.05	4.54 [2.60;7.93]	< 0.01
High blood glucose levels	Yes vs No			3.41 [1.27;9.13]	0.02
Elevated triglycerides	Yes vs No	2.95 [1.86;4.66]	< 0.01		
Average/high-risk Hs-CRP	Yes vs No	2.59 [1.20;5.60]	0.02		
Elevated fibrinogen	Yes vs No	2.04 [1.28;3.24]	< 0.01	2.11[1.27;3.49]	<0.01
					Hypertension
Age(years)	55–65 vs 25–34	11.82 [5.40;25.84]	< 0.01	19.16 [7.86;46.74]	< 0.01
Age (years)	45–54 vs 25–34	6.20 [3.05;12.60]	< 0.01	7.74 [3.96;15.14]	0.04
Age (years)	35–44 vs 25–34	1.93 [1.04;3.56]	0.01	3.03 [1.61;5.68]	0.02
Stress	never vs permanent stress	0.27 [0.08;0.95]	< 0.01		
Stress	few periods of stress vs permanent stress	0.40 [0.11;1.44]	0.21		
Stress	several periods of stress vs permanent stress	0.77 [0.21;2.88]	0.18		
BMI				2.19 [1.08;4.41]	0.03
Waist circumference				2.44 [1.22;4.90]	0.01
HbA1c	Diabetes (Yes vs. No)	10.40 [1.37;78.98]	0.02		
					Diabetes
Age(years)	55–65 vs 25–34			8.84 [1.92;40.66]	< 0.01
Age (years)	45–54 vs 25–34			7.32 [1.61;33.30]	0.02
Age (years)	35–44 vs 25–34			2.23 [0.44;11.41]	0.25
Smoke	Yes vs No			0.23 [0.08;0.60]	< 0.01
Physical inactivity	1 vs 2	1.84 [1.01;3.38]	0.05		
Increased waist circumference	Yes vsNo	4.10 [1.91;8.77]	< 0.01		
Elevated triglycerides	Yes vs No	2.14 [1.19;3.82]	0.01		
Elevated leucocytes	Yes vs No	2.33 [1.15;4.67]	0.02		
					Cardiovascular diseases
Stress	never vs permanent stress	1.90 [0.88;4.11]	0.05	0.75 [0.31;1.82]	0.86
Stress	few periods of stress vs permanent stress	2.14 [0.98;4.67]	0.01	0.30 [0.13;0.66]	< 0.01
Stress	several periods of stress vs permanent stress	0.74 [0.35;1.56]	< 0.01	1.75 [0.93;3.30]	< 0.01
Education	none vs tertiary education	2.91 [1.34;6.30]	0.04		
Education	primary school vs tertiary education	2.03 [1.12;3.67]	0.31		
Education	grade 8-12 vs tertiary education	1.24 [0.73;2.11]	0.12		
High blood pressure				2.84 [1.39;5.78]	< 0.01
Glucose levels	Diabetes (Yes vs No)			2.24 [1.03;4.88]	0.04
Elevated leucocytes	Yes vs No			3.17 [1.09;9.21]	0.03

* $p < 0.05$

4.4 Discussion

Statistics South Africa (Stats SA) has reported an increase in deaths due to cardiovascular diseases since 2009 in South Africa, with the highest percentage of these deaths (57.4%) observed in 2016 (25). At that time, hypertension (ranked third), cerebrovascular disease (fourth), and diabetes mellitus (fifth) were among the 10 leading underlying natural causes of death in the Free State province. The social determinants of health and diseases cannot be ignored when looking at the mentioned deaths, as studies concluded that the risk factors included several societal factors (26,27). Identifying and addressing the major social determinants of health forms an integral part of the South African National Department of Health's Primary Health Care Re-engineering Strategy (28). This study observed distinct differences between social determinants of CDL in rural and urban communities in the Free State. Although a higher percentage of urban participants had completed secondary school education, reported unemployment status was higher in the urban study population (54.8%) than in the rural group (24.2%). Almost a third of urban participants versus 9% of rural participants reported that they experienced permanent stress, which may be related to unemployment status.

The high prevalence of reported cardio-metabolic diseases among rural and urban participants and their family members in this study illustrated the intra- and intergenerational burden of CDL in these communities. Although the prevalence of chronic diseases was high in both groups, a higher percentage of rural participants reported being diagnosed with hypertension and diabetes. The present study's findings are supported by those reported in the South African National Health and Nutrition Examination Survey (SANHANES) by Shisana et al. (29). The study showed that at that time, the Free State province had the highest prevalence of self-reported high blood pressure (45.8%), high blood sugar (26.7%), heart disease (28.7%) and stroke (14.5%), with an increase in self-reported high blood pressure and stroke observed between 2003 and 2012. The findings of the current study further highlight important urban and rural differences.

A study conducted among older adults from 2007 to 2010 in six low- and middle-income countries (China, Ghana, India, Mexico, Russian Federation and South Africa) by Wu et al. (30) ranked seven risk factors for CDL (inadequate vegetable and fruit intake, low PALs, smoking,

frequent alcohol use, high blood pressure, obesity, central obesity). It revealed that South Africa had the highest prevalence for low PALs (59.7%) and obesity (45.2%) across the six countries. Similarly, the present study revealed that insufficient intake of fruit and vegetables was the leading risk factor for CDL in urban and rural study populations. The high prevalence of food insecurity in the study population may have been responsible for this, with 73.2% and 87.4% of the current rural and urban families, respectively, classified as having a high risk of food insecurity (31). Low intake of fruits and vegetables has been reported in other South African studies, such as in a rural Limpopo community, where Maimela et al. (32) reported that 88.6% of participants had a low daily intake of fruit and vegetables. A contributing factor for this observation in our rural study population could be the distances these participants need to travel on foot to purchase fruit and vegetables (83% rural vs 54% urban) (31). In addition, the transition to an unhealthier "Westernised" diet in South Africa is often characterised by a low intake of fresh fruit and vegetables (33,34).

As confirmed in the current study, urban dwellers are more likely to experience a sedentary lifestyle with decreased PALs (35). Physical inactivity was ranked among the top two risk factors for CDL in our urban community (66.5%) and ranked seventh (27.3%) in the rural community. Several studies have illustrated an inverse relationship between physical activity and the prevalence of CDL, such as hypertension and diabetes mellitus (29), while regular physical activity has been shown to strengthen resilience to stress.

The SANHANES (29) found that 50.4% of Free State participants smoked tobacco in 2012, much higher than the national average of 32.8%. In the current study, significant differences were observed between tobacco use of urban and rural participants (58.8% vs 32.1%; $p < 0.01$). Tobacco use ranked among the top five risk factors in the rural community but ranked much lower (seventh) in the urban community. In addition to the high prevalence of smoking reported in the rural study population, reported alcohol use ranked second in the rural study population (80.0% rural vs 54.2% urban, $p < 0.01$). The recent South African Demographic and Health Survey (36) revealed a slight increase in the national prevalence of men consuming alcohol from 58% (1998) to 61% (2016), while the prevalence among women remained unchanged (26%).

In the present study, high blood pressure ranked among the top three risk factors in both communities, with prevalence levels of 67.9% and 56.9% among rural and urban participants, respectively. High prevalence of hypertension was also observed in the South African leg of the Prospective Urban Rural Epidemiological (PURE) Study (37), where a slightly higher prevalence of hypertension was seen in their urban (74.0%) versus rural (71.8%) study population. Concerning results of the South Africa Demographic and Health Survey (SADHS) (36,38) indicated that of the 46% South African women and 44% men who had hypertension, more than 80% of women and 87% of men presented with uncontrolled hypertension. Although 11.0% and 7.4% (rural and urban participants, respectively) in the current study reported being diagnosed with diabetes, elevated HbA1c levels that provide a longer-term view of glycemic status, was observed in 9.7% rural versus 6.0% urban participants. These results reflect poorly controlled or undiagnosed diabetes.

A high prevalence of overweight/obesity and waist circumference is linked to the high prevalence of metabolic disorders such as hypertension and type 2 diabetes mellitus (29). In both the study populations of the current study, overweight/obesity ranked fourth and sixth among the 10 behavioural and biological/metabolic risk factors observed in this study. More than half of rural and urban participants (53.2% and 54.2%) were either overweight or obese, and 59.1% of rural participants (20.3% men vs 75.5% women) and 53.4% of urban participants (6.0% men vs 68.0% women) had waist circumference levels above the cut-off values. The prevalence of overweight or obesity among females living in urban and rural settings (66.1% and 65.6%, respectively) in this study corresponds with findings of the SADHS (36) that reported that 68.4% and 66.1% of females living in urban and rural settings respectively, were either overweight or obese. In the current study, as in other South African surveys (29,36), the prevalence of overweight and obesity was much lower among men than women.

Obesity is associated with chronic low-grade inflammation, and markers of inflammation such as CRP, TNF-α and IL-6 have been reported to correlate positively with adipocyte size (39). Lifestyle-related risk factors such as physical inactivity, poor diet and emotional stress are considered triggers that can cause activation of the immune system. Consequently, the hypothalamic-pituitary-adrenal stress response system increases the risk for obesity and

chronic diseases such as CVD and diabetes mellitus (8,11,40,41). This study confirmed a high prevalence of inflammation in both urban and rural participants that could be attributed to the higher cumulative risk effects of multiple risk factors. More than half of both urban and rural participants had five or more risk factors present for CDL. Almost 90% of rural participants had high Hs-CRP levels that have been associated with lifestyle risk factors such as smoking and physical inactivity (42) and correlate positively with BMI (43). Significant differences ($p < 0.01$) were observed between the study populations for the following inflammatory markers: total leucocytes levels (13.1% rural vs 4.3% urban), lymphocytes (7.7% rural vs 1.7% urban) and fibrinogen (32.9% rural vs 48.3% urban). An elevated leucocyte count is a strong independent risk factor for coronary heart disease morbidity and mortality, while NLR can also be used as a predictive tool for adverse cardiac events in diabetic patients with CVDs (44). Elevated fibrinogen levels were the highest-ranked inflammatory marker in both communities. The Emerging Risk Factors Collaboration group (45) investigated the value of CRP or fibrinogen in CVD prediction and found that one additional CDV event over a period of 10 years could be prevented with additional assessment of CRP or fibrinogen in patients at intermediate risk for a CDV event after an initial screening of conventional risk factors. Chen and Lacey (7) used CRP and fibrinogen to indicate adult inflammation in a 1958 British birth cohort. They illustrated that adverse childhood experiences related to socioeconomic and health behavioural factors were associated with inflammation in mid-life.

In a community-based study in Shanghai, Zhang et al. (46) reported that hypertension, diabetes, and dyslipidemia were positively associated with obesity. In this study, multivariate logistic regression analysis revealed that in both the rural and urban sample, obesity was also associated with having hypertension. In addition, obesity was positively associated with being female and elevated fibrinogen levels. In the rural sample, obesity also increased the odds of having increased triglyceride and Hs-CRP levels. In the urban sample, high blood glucose was positively associated with obesity. A community-based cross-sectional Ethiopian study (47) reported that obesity was positively associated with the daily intake of alcohol. This study found that former and current smoking was negatively associated with obesity in both the urban (OR 0.42; $p < 0.01$) and rural (OR 0.25; $p < 0.01$) study populations.

In terms of hypertension, multivariate logistic regression analysis showed that age advancement was more likely to be associated with the presence of hypertension in both

rural and urban areas; a finding also observed in the earlier South African Adult Demographic and Health Survey (48) and a recent African based study (49). This study found that the probability of having hypertension in the rural area was higher with increased reported stress levels, while high HbA1c levels increased the odds of having hypertension 10.40 (95% CI 1.37;78.98) times. The current study also found that increased waist circumference and BMI ≥ 25.0 kg/m^2 were positively associated with the presence of hypertension. Zekewos, Egeno, and Loha (49) made similar observations, who reported that age advancement, BMI (≥ 25.0 kg/m^2) and central obesity (waist-to-height ratio ≥ 0.50) were positively associated with hypertension. Mbouemboue and Ngoufack (50) also reported that in a low-resource African setting, age, overweight and high serum triglyceride level were identified as independent factors predicting hypertension. Mahmood, Ahmad and Kashyap (51) found that in addition to age, education was an independent risk factor of hypertension for urban participants living in India; this was not confirmed in the current study. However, adults residing in rural areas with higher education levels were three times more likely to have CVDs. This could be attributed to higher employment and income levels leading to unhealthy eating habits due to a higher intake of fast foods (6). Urban participants with hypertension (OR 2.84, 95% CI 1.39;5.78), high glucose levels (OR 2.24, 95% CI 1.03;4.88) and elevated leucocytes (OR 3.17, 95% CI 1.09;9.21) were more likely to have CVDs. The logistic regression related to CVD and stress delivered unexpected results. The authors acknowledge that categorising stress as "never", "few periods," and "several periods" may have been confusing to participants. Answers to questions related to concrete variables such as age and level of education are more easily answered by participants than variables that are more fluid, such as one's experience of stress.

Regarding diabetes, for participants living in a rural area, being physically inactive, having increased waist circumference, elevated triglycerides and leucocytes levels emerged as important associated risk factors of diabetes. On the other hand, in an urban area, advanced age was associated with diabetes. Vijayakumar et al. (52) reported that advanced age and the presence of central obesity were important risk factors for type 2 diabetes mellitus in an Indian study. As part of lifestyle management, the American Diabetes Association (ADA) (53) recommends focused goal-based behavioural lifestyle intervention programmes for

prediabetes patients that include 7% weight loss and physical activity (150 minutes of physical activity, similar in intensity to brisk walking, per week).

Many governments are not keeping pace with the growing burden of lifestyle-related chronic diseases and associated demands on health services. Baird et al. (54) and Mikkelsen et al. (55) have emphasised the importance of adopting a life course approach that recognises the opportunity to promote health, prevent and control NCDs at key stages throughout the life course, from preconception to adulthood. Focusing on key life stages throughout the individual's life course and implementing targeted lifestyle modifications and awareness programmes can reduce the prevalence of prioritised risk factors for communities identified in this study and break the risk cycle and the current intergenerational transmission of CDL in communities.

The authors acknowledge the following limitations of the study. Firstly, more females than males participated in the study, mainly because more males are employed labourers and therefore not available to participate on weekdays when the study was conducted. Thus, the authors acknowledge that the study population was not completely representative of the target population and that not all relevant psychosocial factors (e.g., household composition, social support, depressive symptoms) were assessed or reported on in this publication. The exclusion of participants due to missing values occurred and is acknowledged by the authors as a limitation of the study. The authors also acknowledge that multiple testing took place due to the numerous variables involved, and spurious results may occur.

4.5 Conclusion and recommendations

This study aimed to better understand the health needs of urban and rural communities in the Free State. The goal was to contribute to focused, targeted primary health care prevention and intervention programmes for CDL, supporting the vision of the NDP to reduce the prevalence of chronic diseases in South African communities. The WHO has emphasised the importance of developing a holistic, integrated approach that targets the major common risk factors for CDL in the most cost-effective way to prevent and control CDL in communities.

Various studies have confirmed that a healthy lifestyle is associated with lower concentrations of inflammatory markers. Gaesser et al. (13) indicated that exercise and dietary factors, including dietary fibre, fruits (especially berries), omega-3 unsaturated fatty acids, antioxidant vitamins E and C and zinc, could reduce inflammatory markers. Johannsen et al. (39) found that aerobic exercise not only reduced total WBC and neutrophil count in a group of overweight/obese women but was particularly beneficial for those with low-grade systemic inflammation.

Based on the findings of this study, the researchers recommend:

- Focused and tailor-made community-based primary health care prevention. For example, early screening toolkits and important point-of-care devices that can immediately identify critical biochemical markers (HbA1c, Hs-CRP, fibrinogen) and intervention programmes that prioritise the identified multi-factorial etiology of CDL and related health needs in the different communities.
- Use the proposed approach to strengthen health and wellness educational programmes in the different communities, emphasising the benefits of a healthy early environment and anti-inflammatory lifestyle throughout the individual's life course.
- Incorporating the following essential components in community-based chronic disease learning modules for undergraduate Health Professions programmes:
    - Contextual understanding of the multi-factorial etiology of CDL in different communities, emphasising the different determinants (social, cultural, behavioural, biological, psychological, economic, and environmental) that drive CDL disease processes at individual and collective levels in the communities.
    - Promote a holistic, integrated primary health care approach that focuses on the complementary roles of different health professionals involved in the care of patients with CDL to reduce the prevalence and associated prioritised risk factors of these diseases in the communities.

4.6 Conflict of Interest

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

4.7 Author contributions

All authors were involved in the protocol and publication planning, writing, editing and finalisation. Except for the above-mentioned, SvZ was also responsible for the protocol and manuscript preparation, data collection, and interpretation. GJ and CvR were responsible for the data analysis. CW was the primary investigator of the AHA-FS study.

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4.9 List of non-standard abbreviations

CDL	Chronic diseases of lifestyle
CVD	Cardiovascular disease
Hs-CRP	High sensitivity C-reactive protein
NCD	Non-communicable disease
NDP	National Development Plan
PAL	Physical activity level

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CHAPTER 5: ARTICLE 2: Medical students' perceptions of the chronic diseases of lifestyle curriculum and related experiences in primary health care settings in central South Africa

Preparation for submission of this article to an accredited Medical educational journal is currently in progress.

Medical students' perceptions of the chronic diseases of lifestyle curriculum in primary health care settings in South Africa

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Keywords: chronic diseases of lifestyle, medical education, chronic diseases of lifestyle curriculum, community-based education, primary health care settings

Running title: Chronic diseases of lifestyle curriculum

Abstract

Background*:* Non-communicable diseases are the leading cause of death globally, with the World Health Organization projecting a significant increase, especially in developing countries. Community-based primary health care forms the foundation of health care in South Africa; therefore, medical programmes need to equip future health practitioners to face the challenges of the rising burden of lifestyle-related chronic diseases in different communities. Community-based education (CBE) rotations contribute to the development of knowledge, skills, and attitudes appropriate to the challenges experienced in the primary healthcare context.

Aim: To explore medical students' perceptions of the current medical curriculum and their experiences implementing the chronic diseases of lifestyle programmes during community-based education rotations in urban and rural primary health care settings in the Free State, South Africa.

Methodology*:* Focus group discussions were conducted with medical students in the clinical phase of training. Using a thematic analysis approach, perceptions of the current chronic diseases of lifestyle curriculum content, the relevance thereof for the primary health care setting and barriers and challenges to implementing primary healthcare programmes in primary health care settings were reported.

Results*:* This study identified foundational chronic diseases of lifestyle content that needs to be incorporated or revisited at strategic points throughout the curriculum. Students identified barriers and challenges, including high patient load, staff and resource shortages, lack of continuous care and a general focus on communicable diseases. Participants identified the need to contextualise educational programmes and focus on affordable, culturally acceptable and holistic health care prevention strategies for chronic diseases of lifestyle. Participants described community-based education rotations as a positive and meaningful experience that presents students with the opportunity to develop a range of professional attributes, competencies and skills.

Conclusion*:* Specific emphasis on socio-cultural-behavioural-economic determinants throughout the chronic diseases of lifestyle curriculum can enhance students' socio-cultural sensitivity and understanding of challenges experienced in urban and rural communities.

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1. Introduction

According to the World Health Organization (WHO), non-communicable diseases (NCDs), also called chronic diseases, are the leading cause of death globally, and the projected increase in deaths due to chronic diseases from 36 million in 2018 to 55 million of total deaths globally by 2030, will place a significant burden on healthcare systems, especially in the developing countries (WHO, 2013; WHO, 2020a).

Chronic diseases constitute an essential part of the overall disease burden in South Africa, accounting for 51% of total deaths (Nojilana et al., 2016). Factors contributing to the growing tide of chronic diseases in South Africa include epidemiologic transition (urbanisation), nutrition transition, as well as socioeconomic, cultural and behavioural/lifestyle-related risk factors (Puoane et al., 2008; Frenk et al., 2010; Levitt et al., 2011). Modifiable lifestyle changes associated with these transitions include adaptation to a more "Westernised" diet, physical inactivity, increased alcohol intake and smoking. These behavioural factors can lead to physiological and metabolic adaptations and the development of chronic diseases, often referred to as chronic diseases of lifestyle (CDL) (Mayosi et al., 2009; WHO, 2013; WHO, 2018). The 2030 vision of the South African National Development Plan is to prioritise nine long-term health goals, including a reduction in chronic diseases, improvement of the health and well-being of the population and strengthening the health systems in the country (National Planning Commission, 2017).

The Global Action Plan for the Prevention and Control of NCDs 2013–2020 called for effective policies and interventions to reduce premature deaths by 25% by 2025 (WHO, 2013; WHO, 2016; WHO, 2020a). Several health promotion strategies, guidelines, and policies for communicable and chronic diseases were developed and implemented in the past decade. The Strategic Plan for the Prevention and Control of Non-Communicable Diseases states the importance of strengthening community-based primary healthcare and focusing on, inter alia, social and economic determinants of health, unhealthy lifestyles and metabolic risks to prevent chronic disease (DoH, 2013). Although some success in preventing and controlling chronic diseases has been reported, efforts to strengthen community-level prevention and control of chronic diseases in South Africa still need improvement (Puoane et al., 2017). Barriers and challenges reported in primary health care settings in South Africa ranged from complex health and

nutrition transitions, shortage of health care workers, inadequate training of staff in the comprehensive care approach for chronic diseases, lack of supervision, and lack of patient knowledge, awareness and self-management of chronic diseases (Steyn and Levitt, 2006; Steyn and McHiza, 2014; Maimela et al., 2015).

In response to the government's commitment to improve the health profile of all South Africans and align with the health needs of local communities (DoH, 2013), South African universities introduced community-oriented educational approaches to primary healthcare into their curricula. Since 2014, community-based education (CBE) has been incorporated into several modules throughout the five-year medical curriculum offered at the University of the Free State (UFS), South Africa. Furthermore, a CBE and Interprofessional Education (CBE-IPE) platform was established in the rural Free State town of Trompsburg in 2016. A structured CBE longitudinal approach was phased in since 2020 to link student community projects in different modules and consolidate vertical integration in the curriculum.

Barss et al. (2008) emphasised the importance of evaluating the appropriateness of CDL curricula to ensure that local and national future health practitioners are equipped to face national health priorities. Furthermore, the Health Professions Council of South Africa (HPCSA) encourages community-based research to advance healthcare development, inform teaching and learning practices in the undergraduate curriculum, and assist in delivering health practitioners that can provide health care in context (HPCSA, 2014). The objectives of this study were to evaluate students' perception of the current CDL curriculum and explore experiences related to CDL programmes during CBE rotations in primary health care settings in the Free State.

2. Materials and Methods

2.1 Study design and population

This study was set in the context of the medical curriculum of the Faculty of Health Sciences of the UFS in the Free State province of South Africa. This study followed a qualitative phenomenological design to provide an in-depth understanding of medical students' knowledge of CDL, awareness and descriptions of complexities observed during the implementation of current CDL intervention programmes in rural and urban settings in the

Free State. In this study, two focus group discussions were conducted with medical students of the UFS who were in their clinical training phase. The focus group discussions were deemed an effective qualitative data gathering method to present different perspectives, experiences and to explore issues of concern (Tausch and Menold, 2016).

Focus group discussions started after purposive sampling to recruit students with knowledge and experience to provide perspective and insight concerning the specific research topic (Mack et al., 2005). Recruitment criteria included registered students (from different genders and language groups) in the MBChB (undergraduate medical) programme offered in the Faculty of Health Sciences, UFS. Fourth-year MBChB students who had completed the required CBE rotation in the rural town of Trompsburg and fifth-year students who had completed CBE rotation in the urban Mangaung district were eligible to participate in the study. The aim was to recruit eight to 12 participants per focus group. The recruitment strategy included the electronic distribution of information letters (via class representatives) to all fourth and fifth-year MBChB students who have completed rotations in primary health care areas. The students were requested to participate in focus group discussions conducted in a venue in the FHS, UFS. The following was included in the information letter: an explanation of the purpose of the study, inclusion criteria, what was expected of participants during the focus group discussions, and the voluntary nature of participation in the research study (Botma *et al*., 2010: 203,204). Following a three-week recruitment period, the researcher scheduled an information session with prospective participants (the researcher received a list of those that indicated interest to participate from the respective class representatives). During this session, information regarding the study was verbally communicated to prospective participants, and participants had the opportunity to raise questions. After the researcher explained the voluntary nature of participation in the study, the participants gave written consent, after which the focus group discussions commenced (Mack *et al*., 2005:11, 54, 59).

2.2 Ethical considerations

Ethics approval to conduct the study was obtained from the Health Sciences Research Ethics Committee of the UFS (UFS-HSD2017/1435), the Free State Department of Health and local municipalities before conducting the study. The principal investigator (with the assistance of the translator) explained the research project to participants before obtaining written informed consent from all participants.

2.3 Data collection

In order to achieve the objectives of the study, the principal investigator compiled a focus group discussion guide (Table 5.1) after completing a comprehensive literature review. An experienced facilitator conducted focus group discussions in the field in English. Focus groups lasted between 60 and 90 minutes. The facilitator followed a focus group discussion agenda compiled by the researcher that included an outline of the purpose of the study, discussion of ground rules, confidentiality and respect for privacy before starting each focus group discussion (Supplementary file 1). Each participant's assigned number (identifier) was displayed on a number tag, and a seating chart was used for note-taking purposes (Mack et al., 2005).

The focus group discussions were recorded with a digital recorder while the principal investigator observed the sessions. Documenting of focus group discussions comprised MP3 audiotape recordings and written field notes taken by the principal investigator. Immediately after each focus group discussion, the principal investigator conducted a debriefing session with the facilitator to note important nonverbal communication, group dynamics, the effectiveness of questions, and new topics that emerged during the focus group discussion (Mack et al., 2005).

2.4 Thematic analysis

The principal investigator transcribed audio-recorded data verbatim, and field notes were also noted on the transcript. The principal investigator listened to the audio recordings and read the transcript again after transcribing them to confirm that the transcript was accurate

(Botma et al., 2010). Following an inductive strategy, the thematic analysis included data coding, identifying categories/sub-categories, and recognising emerging themes (Stalmeijer et al., 2014). The principal investigator followed a systematic approach to organise and interpret qualitative data. The principal investigator initially read through the transcript to obtain a general overview of the data and identify statements relevant to the research topic, separating relevant and irrelevant information. The principal investigator again reviewed the transcript notes, breaking data into words/phrases/sections of text that reflected participants' specific thoughts. Recurring topics for individuals within a particular group and among the different focus groups were identified, and emerging topics were grouped into categories. Following a convergence process, related categories were grouped and integrated into sub-themes and themes (significant findings reflecting the participants' different experiences). The principal investigator connected the emerging themes to develop overarching themes/concepts, as seen through the participants' eyes (Creswell and Plano Clark, 2011; Leedy and Ormrod, 2013; Stalmeijer et al., 2014). Credibility, transferability, dependability, and conformability were used as criteria to ensure the trustworthiness of this study. Credibility refers to the extent to which study results are accurate, believable, and authentic (Brink *et al*., 2012:127). Credibility was ensured by using the most appropriate methods for data collection and recruiting medical students in the clinical phase of their qualification who had relevant experience implementing CDL intervention programmes in urban and rural PHC settings. Rigorous data analysis methods were included (e.g., translation and back-translation). Also, experienced researchers (co-authors) conducted thematic exploration to ensure completeness and validity of results. This was done to confirm that categories and themes covered the data and that relevant data had not been accidentally excluded or irrelevant data included (Leedy and Ormrod, 2013:106; Brink *et al*., 2012:122, 127, 172). The researcher used a “thick” detailed description of the study context to demonstrate that the research findings were applicable and transferable to similar settings (Leedy and Ormrod, 2013:106; Connelly, 2016:436). Furthermore, dependability was assured by an audit trail that included detailed documentation of the chronology of the methodological and data analysis process through which the findings were derived. Finally, to address the researcher's neutrality and ensure that findings were accurately supported by the data rather than the researcher's bias, the researcher consciously identified and excluded preconceived ideas and a subjective opinion (Stalmeijer *et al.*, 2014:23, Connelly, 2016:435).

Table 5.1: Focus group discussion guide

	Question
Question 1	What is your opinion about the information provided in the MBChB programme regarding overweight, obesity, and the associated risk factors for the following chronic diseases of lifestyle: hypertension and diabetes?
Question 2	What is your opinion about the information provided in the MBChB programme of intervention programmes for chronic diseases of lifestyle (with specific reference to overweight, obesity, hypertension, diabetes) and the implementation thereof in a primary health care setting?
Question 3	Which operational protocols/guidelines to address risk factors for chronic diseases of lifestyle were displayed at the primary health care facility? **Additional probing question(s) if deemed necessary** ▪ What is your opinion about the protocols/guidelines to reduce physical inactivity and promote physical activity in the individual/community? ▪ What is your opinion about protocols/guidelines to reduce unhealthy eating and promote healthy eating in the individual/community? ▪ What is your opinion about the protocols/guidelines to reduce the burden of tobacco use in the individual/community? ▪ What is your opinion about the protocols/guidelines for preventing non-communicable diseases in the individual/community?
Question 4	Which areas of good practice, with reference to the effective implementation of CDL prevention and intervention programmes, did you observe during your CBE rotation in the primary health care facility?
Question 5	Which prevention and intervention programmes observed in the primary health care facility integrated shared risk factors for lifestyle diseases (unhealthy diet, physical inactivity, smoking)? **Additional probing question(s) if deemed necessary** ▪ What is your opinion about integrated approaches to address lifestyle diseases? ▪ Integrate shared risk factors for lifestyle diseases (unhealthy diet, physical inactivity, smoking) with maternal programmes.
Question 6	What is your opinion regarding adequate opportunity to understand and experience acute management of chronic diseases of lifestyle (e.g., hypoglycaemia in a diabetic patient)?
Question 7	What is your opinion regarding adequate opportunity to understand and experience ongoing management of chronic diseases of lifestyle (e.g., identify chronic complications in a patient with hypertension)?

CBE, community-based education; CDL, chronic diseases of lifestyle

3 Findings

A total of 22 participants participated in focus group discussions; this included 12 fourth-year MBChB students and 10 final-year MBChB students. More females (82%) than males (18%) participated in the focus group discussions. Table 5.2 provides an overview of the overarching themes/concepts, main themes and sub-themes that emerged during data analysis. The discussions about the five main themes and associated sub-themes are followed by quotes reflecting the student's views, attitudes, and experiences.

Theme 1 and 2 focus on participants' academic knowledge that includes the participants' perception of the CDL curriculum content, the relevance thereof for the primary health care setting, and the community's health needs. **Theme 3 to 4** reveal the participant's perceptions, observations and experiences relating to the functioning of CDL programmes in urban and rural primary health care settings. **Theme 5** focuses on participants' CBE experience and the associated opportunities to develop professional attributes, competencies and skills. In the section below, statements from fourth-year MBChB students are referred to as MSG1 (medical student group one), followed by the participant's number. Statements from final-year MBChB students are referred to as MSG2 (medical student group two), followed by the participant's number.

Table 5.2: Overarching concepts, global themes and sub-themes identified from the focus group discussions

Overarching theme/concepts	Main theme	Sub-themes
Academic knowledge of chronic diseases of lifestyle	1. Responsiveness and relevance of the MBChB (undergraduate medical) curriculum to the growing burden of CDL	1.1 Quantity of CDL curriculum content
		1.2 Quality of CDL curriculum content
		1.3 Transition from theory to clinical practice
	2. Realities faced in primary health care settings	2.1 Alignment of theoretical content with the health needs of the community
		2.2 Implementing health care in context
Experiences of chronic diseases of lifestyle programmes in rural and urban primary health care setting	3. Implementation of CDL programmes in resource-constrained primary health care settings	3.1 Health promotion and education programmes: a need to contextualise health needs and offer culturally acceptable and holistic health care
		3.2 Effectiveness of existing prevention and intervention programmes.
	4. Acute and ongoing management of CDL	4.1 Challenges and barriers observed for the management of acute complications of CDL
		4.2 Challenges and barriers observed for the ongoing management of CDL
		4.3 Areas of good practice observed in the management of CDL
Development of professional attributes and competencies	5. Reflection on the CBE experience	5.1 Meaningful experiences that broaden the understanding of primary healthcare and the concept of delivering health care in context
		5.2 Opportunity to develop graduate competencies
		5.3 Improve the understanding of the social-cultural context of health and disease in different communities
		5.4 Psychological impact of the CBE experience

CBE, community-based education; CDL, chronic diseases of lifestyle

3.1 Theme 1: Responsiveness and relevance of the MBChB curriculum to the growing burden of chronic diseases of lifestyle

Reflecting on the *CDL curriculum content*, most participants of both student groups reported being satisfied with the *quantity of information* provided in the curriculum and the broad spectrum of CDL discussed. Participants agreed that the topics addressed in the preclinical phase were relevant and representative of what they observed during CBE rotations in the different primary health care settings, as demonstrated in the following statements.

> *You don't realise how real it is until you get a patient right in front of you, and then you see everything that you were learning about. I'm always really impressed when you get a patient, how it is really typical of what you have learned about in class* (MSG1, No. 3).

> *Yes, I remember we were in a group with other disciplines, the OTs [occupational therapists], nurses, and staff. We were the ones who knew everything about all the chronic diseases, diabetes, hypertension, everything … so we were very confident in that* (MSG2, No. 10).

However, regarding the *quality of the information*, participants felt that the information conveyed, with specific reference to epidemiology and treatment management, was not relevant for the uniquely South African setting. Some participants identified that new and fast-developing fields, for example epigenetics, were omitted, while others felt that some content was obsolete. The comments below reflected the views of the participants:

> *My information for hypertension and diabetes comes from Davidsons [prescribed textbook], but the epidemiology, you don't get epidemiology for this country or stats for this country* (MSG1, No.1).

> *We can focus on the latest research regarding epigenetics; things like that is very actual at the moment, hot topics* (MSG1, No. 4).

> *We don't have a uniquely South African syllabus on healthy lifestyle modification in South Africa* (MSG1, No. 10).

Specialists have their own way of teaching about management. You will always hear 'in private they will use' or 'in America, they will use'. I think there should just be consensus on what should the students be taught, from which source, for example, the EML [Essential Medicine List for South Africa] (MSG2, No. 1).

In pharmacology, we studied everything, and we don't see any of that, so the non-practical drugs. They [pharmacology lecturers] could just highlight this is what we use in South Africa (MSG2, No. 10).

Participants also referred to the *transition from theory to practice* and the gap between the theoretical knowledge obtained in the preclinical phase and the practical application thereof in the clinical phase. The participants reflected on this gap with statements such as:

In the preclinical years, they're [lecturers] emphasising obesity, for example, but once you get to a clinic, it is just completely not like it is a risk factor anymore, nobody cares about it, they [staff at the clinic] just say everybody is obese (MSG1, No. 5).

We do need the foundation of the basic medical sciences. I feel there was just too much information. We had to go into the clinical phase of our degree; we were just expected to know automatically exactly how everything is supposed to be. I feel there was a bit of a gap there between the theory and then the practical application (MSG2, No. 1).

It is important to improve primary health care that we don't see so many complications. We are being taught that, but just a reinforcement of primary and preventative measures that can be improved and be a lot better (MSG2, No. 8).

3.2 Theme 2: Realities of primary health care settings

Participants commented on the discrepancy between *the theoretical knowledge obtained in CDL programmes and the realities of implementing these programmes in primary health care settings.*

The problem is they [lecturers] tell us you have to have a proper diet and you tell your patients to have a proper diet, and you know a proper diet [consists] of some meat,

some veggies, but in the South Africa setting, it is really impossible to afford that (MSG1, No.5).

They [lecturers] also taught us the importance of screening for chronic lifestyle disease. I think the only problem with that, especially in our rural clinics, there is no equipment to screen the patients, while I think that is very important in preventing a lifestyle disease before it begins to escalate (MSG1, No. 6).

There are no protocols, especially in the rural areas, as what to do with a patient when you find something, for example, with high glucose at a lifestyle club. We learn about all these treatments, but it is very rare that the treatment is actually available. We need to know about the prevention methods and protocols that are appropriate for our setting (MSG1, No. 11).

The importance of *teaching and implementing health care in context*, for example, the need for affordable, culturally acceptable and holistic health care, is demonstrated in the following statements:

They tell a person to eat healthy, but they don't consider the person's background, and if you say the person has to eat healthy, and they don't have food, but you don't teach them how to make a [vegetable] garden. We have to individualise the patients, and I don't think they emphasised that much (MSG1, No. 3).

There was a nice diabetic poster put up by the students in the clinic, and everyone said it is completely useless because it is in a language that they [patients] do not understand and with information that they do not know how to use. It is not applicable to their specific diet or their culture, and I feel that is something that surely lacks in that rotation. We should have been taught some of those things, what food is available, the cultural norms and teaching us conversational language (MSG2, No. 4).

3.3 Theme 3: Implementation of chronic diseases of lifestyles programmes in resource-constrained primary health care settings

Participants acknowledged that visiting primary healthcare facilities and patients' homes during CBE rotations increased their understanding of healthcare systems and the challenges

experienced in the different primary health care settings. However, participants indicated several barriers and challenges for the effective implementation of *health promotion and educational strategies* for CDL. These barriers and challenges ranged from a lack of educational material, outdated information on educational material, poster display not optimal, language barriers and posters that focus mostly on communicable diseases (e.g., HIV and TB):

> *Diabetes posters were in the clinics, but I think that is as far as it goes. I have not seen any obesity posters or healthy diet poster. You see dietetics things about eating salmon; once again, it is way out of context* (MSG1, No.5).

> *They [lecturers] teach us a lot about the risk factors for developing chronic lifestyle diseases, but I don't think they emphasised it enough in the community outside of the healthcare centre. So I think this is also a problem in the community in terms of promoting a better and a healthier lifestyle because that is where it all starts, and I don't think they [staff at the primary care facility] know how important this is* (MSG1, No. 6).

> *A lot of time, the posters [are] mainly in the consulting room where the patients are more focused on the doctor, so perhaps placing it in the waiting room would be more effective* (MSG1, No. 7).

> *Sometimes the posters are only in English. I don't remember even one time that I have ever seen a patient even looking as if they are interested or even asking what it says. I don't think they are effective at all* (MSG2, No. 5).

Participants accentuated the practical contributions they can make in *promoting health education* during CBE rotations in primary health care, and these are reflected in the following comment:

> *When we did our presentation, we did it on the diabetic foot. We would explain from the pictures; there was very little wording. You could see that they [patients] understood more. We even showed them instead of just telling them, 'this is how you wash your foot'* (MSG1, No. 3).

Evident from the following comments, participants noted that effective CDL prevention strategies and protocols were followed for communicable diseases (e.g., HIV and TB, immunisation and needle stick injury) in both urban and rural primary health care settings, while this was *less evident for CDL*.

> *One protocol was the standard needle sticking injuries; at every clinic, the protocol is up, those vaccinations schedule are displayed* (MSG1, No. 2).

> *The system at MUCPP [Mangaung University Community Partnership Programme clinic] do the patients injustice because a lot of them [patients] are presenting already with complications, and then again, they [staff at the clinic] must refer the patients. I feel rather powerless because these things are theoretically put in place, they are put on paper, and there are protocols, but they are not followed* (MSG2, No. 5).

> *I have seen a lot of TB posters in MUCPP [Mangaung University Community Partnership Programme clinic], it is always – stop TB, and even in other languages, but I have never seen anything about hypertension anywhere* (MSG2, No. 7).

Challenges and barriers observed for the effective implementation of *CDL prevention programmes* include a lack of resources for screening, lack of medication, high patient load and staff shortages, as mentioned in the following comments:

> *The load on the staff is too much, so there is no time to explain everything; you just want to get through the line [of patients]* (MSG1, No. 4).

> *I think it is quite lacking due to not having the equipment, not having the manpower to basically see all those patients and serve the whole community* (MSG1, No. 7).

> *Sometimes they [staff at the clinics] have all of these screening resources, so I think sometimes they do try; there is just too many patients, so it does not get implemented everywhere* (MSG2, No. 3).

The WHO (2016, p. 4) defined integration of health services as the "*management and delivery of health services so that clients receive a continuum of preventive and curative services, according to their needs over time and across different levels of the health system*". Asked

about the integration of shared risk observed in the different primary health care settings, participants confirmed the lack of integration observed to the challenges experienced (e.g., staff shortages, time constraints) in the different primary health care settings.

The mom is maybe obese, and she has all [these] risk factors, but due to time, we don't take that extra five or ten minutes and just quickly check the blood pressure, do a glucose screen and just eliminate those risk factors before she even gets the disease (MSG1, No. 4).

I also remember, I think it was a diabetes, hypertension clinic, the patients [were] supposed to have this yearly follow-up forms where blood should be taken every year, it should be arranged to check their eyes, all of these things should be done yearly and then with some of the patients I could not find one [follow-up form] in the file. I look for results, and the last was done in 2012, and they should actually be done every year (MSG2, No. 3).

We are always taught about a multi-disciplinary approach with regards to chronic illnesses where a patient must be taken to the dietician. I don't think we see that a lot in the clinics (MSG2, No. 4).

3.4 Theme 4: Acute and ongoing management of chronic diseases of lifestyle: challenges and successes

Participants mentioned that the lack of resources in primary health care clinics contributed to the difficulties observed in the acute management of CDL on primary health care level.

Also, I think what might help in our context is to be taught what every level of health care's role is in these lifestyle diseases is because we were not really sure. We found a patient with a glucose of 22. Should they be taken to the clinic as soon as possible, to the hospital, should the doctor be notified? (MSG1, No. 10)

I saw a patient in the clinic at Springfontein that has longstanding diabetes and hypertension, and heart problems, and she came in with signs and symptoms of heart failure, but there was no ECG stickers in the clinic; I think that is a big problem (MSG2, No. 7).

Regarding the ongoing management of CDL, poor control of CDL contributed to the lack of patient education and compliance, staff and resource shortages, high patient load (especially a problem in the urban setting), late presentation due to inadequate risk prevention measures, lack of continuous care (incomplete files, different physicians), treatment management problems, cultural and traditional beliefs. Participants also mentioned that the focus in the primary setting remains mainly on treatment regimens and not customised preventative measures.

It is very important that they customise the interventions for a South African setting (MSG1, No. 9).

In Trompsburg, we checked each patient's blood pressure and the medication they are on. If the blood pressure was too high, we adjusted the medication every time, but you don't check the patient's weight; you don't check if the patient is losing some weight or if the BMI is above 40 (MSG1, No. 3).

I just want to say a few things about intervention; firstly, the medication patients get, they don't know why they have these different medications. I think then they don't use it as it is prescribed because they don't really think it is necessary (MSG1, No. 4).

The problem is that our system is very understaffed. We have a shortage of doctors and health staff (MSG1, No. 6).

Regarding the interventions, I think it is quite lacking due to not having the equipment, not having the manpower to basically see all those patients and serve the whole community (MSG1, No. 7).

When we were at the clinics, I think all the patients were out of control with regards to diabetes and hypertension. Many people are not either being compliant or they are not being taught properly. There is definitely something that is lacking in the system currently (MSG2, No. 1).

The chronic management of our patients is very difficult in our clinics because our patients see different doctors the whole time. You don't know how correct the diagnosis is (MSG2, No. 2).

Patients have these carry cards where they [clinic staff] write their blood glucose levels or their blood pressure levels, but sometimes you find that their cards are incomplete, so I just ask myself what are the point of having these things if you are not going to be consistent and fill it in every time the patient comes (MSG2, No. 7).

In Trompsburg, we were able to follow up our patients, but at MUCPP [Mangaung University Community Partnership Programme clinic], you just walk in, and there is a whole room full of patients, and you cannot sit down with every patient as you would like to do (MSG2, No. 8).

Successful practices observed include active participation in lifestyle groups in the rural area and effective screening practices at local schools, while successful screening practices were observed at the diabetes clinic located at a primary level hospital in the urban area.

In terms of ongoing management, I feel like those lifestyle group therapy [rural setting] are aimed in terms of that. They [clinic staff] identify the hypertensive patients or diabetic patients, and they make sure that every week they come together and, let's say one of the patients this week suffered from some sort of problem, they discuss it there so that everyone gets educated together (MSG1, No. 2).

If we speak about Trompsburg, there is a very good screening programme for the school children. I think that would be amazing if they could implement it in the country on a national level ... (MSG1, No. 5).

I think in the small communities [rural setting], there is a good interpersonal relationship that has been built between the health care workers and the community (MSG1, No. 11).

When we were rotated at policlinic B at the diabetic clinic [urban setting], each patient will come in, and their blood pressure is taken, the finger prick glucose, dipstick is done, and then they do the Snellen chart, and then only the patient is seen, so in some clinics, there is actually some intervention that is working (MSG2, No. 5).

3.5 Theme 5: Development of professional attributes and competencies

Participants agreed that CBE was a *meaningful experience and assisted in broadening their understanding of primary health care and the concept of delivering health care* in context. Although CBE was a meaningful experience for the students, the importance of mutual benefit for both patients and students was stressed by the participants. Participants emphasised that they want to play an active role in CDL prevention and intervention strategies, such as health dialogue, education, and other intervention strategies.

> *In Trompsburg, they have a diabetes club which meet up every week, and we started by checking all of the patients' blood pressure and their glucose levels. So I think [it] is a great way of using us as students to help with the screening load of the patients, and secondly, we gave them information, especially on the risk factors which cause diabetes* (MSG1, No. 6).

> *CBE was very helpful to us, and I also learned that we must be examples to our patients. We live in communities with our patients, and they look at us, our lifestyle* (MSG2, No. 2).

> *It was not just about the patient who came to us for help. We also showed the patients that we care for them and went into their homes to find out the challenges they face with regards to their illnesses* (MSG2, No. 2).

> *I will say it is just the importance of actually us being a benefit to the patient. We don't want to just be there and say we had community-based education, but the patient is coming back, and they still have the same problem, and there still have not been an intervention* (MSG2, No. 6).

> *We saw a patient with critical limb ischemia, so we taught them how to take care of their limbs, and I also think that was a good intervention* (MSG2, No. 6).

> *CBE is very helpful. It helps for us to see where it starts, and it is important for us to improve primary health care, that we don't see so many patients with complications* (MSG2, No. 8).

The HPCSA (2014) refers to core competencies that should be developed during the training of undergraduate medical students in South Africa. For example, graduates need to develop

a *range of competencies and essential skills* relevant to the primary health care setting. Participants indicated that CBE and IPE provided the opportunity to develop communication, collaboration skills, and the different roles expected of a healthcare provider (e.g., being a health promotor and health advocate). Regarding collaboration and delivering integrated, holistic care, participants believed that earlier exposure (e.g., receiving lectures from the multi-disciplinary team members from the first year in the preclinical years before CBE rotation) would be more beneficial.

> *I don't feel that we are adequately trained, specifically regarding dietetics and when to refer accordingly* (MSG1, No. 1).

> *I think definitely our training with regards to other health professions is lacking and I've heard that some of the others [other health sciences student groups] get lectures from our lecturers, for example, about the effects of certain medications. I think we had maybe one lecture in the first year from dietetics, no lectures from physiotherapy, none from occupational therapy and maybe one or two from nursing, and I think we could learn a lot more about when to refer and what they can help us help the patient with* (MSG1, No. 10).

> *I think it would be helpful if we could maybe have lecturers from, say, occupational therapist and physiotherapist within each rotation that we have a broader vision of how they are involved* (MSG1, No. 11).

The WHO (2013) emphasised the importance of considering social determinants of CDL throughout the life course of patients. Participants in this study reported that CBE provided them with an opportunity to observe the *social, cultural, and economic contexts of health and disease* in communities and the role that they, as future physicians and the patient (self-care), can play as agents of change.

> *I think it would be very effective if a questionnaire could be done to find out what the people know about their disease and what they don't know* (MSG1, No. 11).

> *I think we focus more on diabetes, hypertension, but we don't really focus on the holistic individual as a person; we focus more on to restrict your salt intake, but what*

happens if you are depressed, suicidal, burnout, or if stress is causing you your illnesses? (MSG1, No. 12)

There was a nice diabetic poster, but it is in a language that they do not understand, and it is not applicable to their specific diet or their culture or anything (MSG2, No. 4).

And I feel that is something that surely [lacks] in that rotation. We should have been taught what food is available to the patients, what are the cultural norms—teaching us conversational language so that you can actually get ideas across to your patient, without having to abandon the conversation thing … (MSG2, No. 4).

One of the recurring themes emerging from the focus group discussions was the psychological effect of the CBE exposure. Participants reported feelings of anxiety and stress during CBE rotations in primary health care settings. They reported, for example, "*not feel comfortable, it was a stress factor, distressing, you are a bit worried, you are not sure, feel rather powerless*". A wide range of factors contributed to the emotions experienced: the lack of supervision, language barriers, resource constraints, and protocols not followed/or not available in primary health care settings.

There are no protocols, especially in the rural areas, as what to do with a patient when you find, for example, a high glucose at a lifestyle club. What do you do with the patient? Or this patient has a hypertensive urgency, what do you do with the patient? And it [makes] it specifically difficult if the facilitator is not with you. In one specific instance, we had a lifestyle group where we were there, and the doctor was not with us, and we could not get hold of the doctor or the programme facilitator in the region, and it's very distressing if you don't know what to do and you have identified a problem (MSG1, No. 11).

We should have been taught some of those things ….; what food is available to the patients, what are the cultural norms and teaching us conversational language that you can actually get ideas across to your patient without having to abandon the conversation (MSG2, No. 4).

Additional factors such as the lack of knowledge of the acute management of CDL, different levels of referral, and the roles and responsibilities of health care workers when patients need to be referred for special care further contributed to the psychological stress experienced by the participants.

> *They don't tell us who to call when you find a high blood pressure or high blood sugar, or if it is so severe, phone the ambulance; here is the ambulance's number. They don't tell us which services will be given to us when in acute situations, especially in the rural clinic* (MSG1, No. 1).

> *When we were in Trompsburg, I realise for the first time actually how important the referral system is because we had our patients we needed to visit, and they had multiple problems. I didn't even know where to refer someone with a problem, and the occupational therapists taught us where we should refer the patients to* (MSG1, No. 6).

> *I remember we were at a clinic; this lady had a DVT [deep vein thrombosis]. We all knew what to do as medical students. I don't know if there was a referral problem or a lack of insight from the staff side* (MSG2, No. 10).

4 Discussion

With the growing burden of CDL worldwide, preventive and long-term management strategies have become increasingly important. Many countries, including South Africa, work towards the WHO's global strategy of reorientation and strengthening health care services to provide high quality, effective primary and community-based care (WHO, 2015:10, 27; Schneider et al. 2015:9). Quality health care is underpinned by patient-centred care, also known as person-centred care, that provides health care services and promotes health care centred on individuals' needs and preferences (WHO, 2015:7). Medical education in the 21st century must prepare students for the changing landscape of health care that includes a sensitivity for the social, cultural, behavioural, biological and economic determinants of diseases and the specific health needs in different communities (HPCSA, 2009). Therefore, medical students need to be exposed to primary and community-based care as part of their curriculum. As a result, the University of the Free State included CBE rotations in the curriculum. Research on students' experiences is necessary as the observations during CBE

rotations can inform teaching and learning practices, assist students in developing a better understanding of the determinants of diseases, and deliver health care in context. This research confirmed that CBE is a valuable experience in medical students' teaching and learning process. The students emphasised how important it is to contextualise educational programmes in these communities and to focus on affordable, culturally acceptable and holistic healthcare strategies for CDL. Furthermore, this study identified foundational CDL content that needs to be incorporated or revisited at strategic points throughout the curriculum to have an effective integrated curriculum. However, students identified specific challenges for the effective implementation of CDL programmes in urban and rural primary health care settings. These challenges are not unique as other countries in Africa are experiencing similar challenges (Ahmed et al., 2011, Assefa et al., 2019), but such challenges should not be ignored.

The truly integrated curriculum provides an important way to close the gap between theory and practice by reinforcing and integrating basic and clinical sciences throughout the curriculum (Brauer and Ferguson, 2015). Challenges often experienced in integrated curricula include making meaningful connections between the theoretical and applied content and, therefore, ensuring a smooth transition from theory to practice (Atherley et al., 2019). In this study, participants identified such challenges by highlighting the fact that there is a need to revisit CDL protocols, prevention and intervention programmes before CBE rotation in the clinical phase commences. Participants also identified a disconnect regarding implementation of management protocols, where references were often made to CDL management as applicable for a tertiary or private health care setting and not what transpired in a primary health care setting. Gouda et al. (2019) commented on the importance of incorporating preventative and lifestyle interventions in CDL curricula to equip students for primary healthcare settings. Refresher courses in the clinical phase, before CBE/IPE rotations commence, can ensure a smooth transition from theory to practice and equip students for the realities faced in primary health care settings. These courses should focus on preventative, lifestyle interventions and treatment management protocols (e.g., emphasis on essential drugs available in the public sector), roles and responsibilities of the primary health care team, and different levels of referral and referral pathways.

Reporting on global progress, the Commission on the Social Determinants of Health (Donkin et al., 2017) emphasised the commitment and efforts of many countries at the national and local level to improve the social determinants of health, quality and effectiveness of medical care. Despite the fact that South Africa's National Health Promotion Policy and Strategy (2015–2019) focuses on creating an enabling environment and strengthening human resource capacity to deliver health promotion services, there are still a number of challenges and barriers to CDL health promotion and education strategies (DoH, 2014). Participants in this study confirmed that these challenges are a reality in practice. They identified a range of challenges and barriers, including a lack of/outdated educational material, placement and display of posters not optimal, posters that focus mainly on communicable diseases, and health education that is not delivered in context. Apart from addressing identified challenges and barriers, health services tailored to the individual's needs may enhance health literacy, promote greater participation and patient empowerment to self-manage, and control chronic health conditions. Chen et al. (2016) also suggested that patient empowerment should include the design of cultural-sensitive programmes and educational materials to improve patients' knowledge and self-management. Parker et al. (2012) also noted the importance of providing health education in context. They found that most patients with CDL attending primary healthcare facilities were not opposed to lifestyle modification education. Still, the patient's preference for health promotion materials and methods must be considered. Furthermore, they identified a lack of resources (including staff and equipment), patient load and non-compliance as barriers experienced on primary healthcare level for the effective implementation of CDL programmes. Similar challenges and barriers were also observed in the current study and include lack of patient education and compliance, suggested intervention not relevant for the socioeconomic context, staff and resource shortages, high patient load (especially a problem in the urban setting), lack of continuous care (incomplete files, different physicians), late presentation due to inadequate risk prevention measures, cultural and traditional beliefs, and greater emphasis on infectious diseases (HIV, TB). In another South African community-based study, Madela et al. (2020) commented on the strong emphasis on communicable diseases at primary healthcare level while observing deficiencies in hypertension and diabetes patient education, care and management. Health empowerment focuses on strengthening the roles of individuals or communities to manage their own health needs by adopting healthier habits and providing health education and

support to enable them to manage their disease (WHO 2015:11,22). Participants in this study reported that the focus in the primary setting remains mainly on treatment regimens and not preventative measures. However, some successful health empowering practices identified in the rural setting included fruitful health dialogue and support for hypertension and diabetes patients in lifestyle groups and a points reward system to enhance patient compliance. Sheik et al. (2016) also reported on the effectiveness of chronic disease clubs in the Western Cape, South Africa. In addition, commendable diabetes care and effective screening practices for CDL in antenatal and specialist clinics in urban areas were reported in this study.

Graduates need to demonstrate the development of a range of competencies and essential skills relevant to the primary health care setting. This includes demonstrating the effective use of preventive, promotive and therapeutic interventions, practising effective communication as a core clinical skill, and timely consultation and collaboration with other health care professionals (HPCSA, 2014). This study confirmed that CBE and IPE were meaningful experiences that can assist students in contextualising and broadening their understanding of communities' health needs and assisting in developing collaboration and communication skills. Frenk et al. (2010) emphasised that the modern curriculum must enhance interprofessional training, break down divides between different professions, and focus on developing generic competencies, such as communication, leadership, and management skills. Although CBE and IPE enhanced the development of competencies and skills necessary for collaborative practice, participants felt that earlier exposure, for example, to interprofessional teaching and learning, from the first year in the preclinical curricula, would be beneficial.

The biopsychosocial model of health refers to the holistic, integrated approach to health that includes the biological, psychological and social determinants (economic, environmental and cultural) that contribute to the development of diseases (Engel, 1978; Gillam and Maudsley, 2010). Although social responsiveness was demonstrated in the current study with students' comments on various social determinants observed in the different communities, students' understanding of the biopsychosocial determinants is of utmost importance. It needs to be thoroughly underpinned in the preclinical CDL curriculum before CBE rotations commence. Mamot *et al.* (2012:1014) emphasised the importance of awareness of the social

determinants of health throughout an individual's lifespan, leading to health-promoting opportunities and even impacting future generations. Incorporating opportunities for students to develop their social, cultural and self-awareness in the preclinical phase can form the basis of the lifestyle components of the chronic disease curriculum. Furthermore, participants in this study referred to the critical role that students can play in patient education and related self-management and self-care. Health empowerment provides opportunities and skills to enable individuals or communities to take control of their own health needs (self-management and self-care) (WHO, 2015: 21,22). In a collective effort between higher education institutes and the Department of Health in Ireland, an undergraduate curriculum for chronic disease prevention and management was developed that incorporated curriculum content on patient self-management and self-care. This assisted the students as future health care practitioners to develop competencies and skills to advise patients on self-management and assist patients in becoming actively involved in their own health care (National Undergraduate Curriculum for Chronic Disease Prevention and Management Working Group, 2019).

5 Conclusion and recommendations

The HPCSA (2014) encourages community-based research to advance healthcare development, inform teaching and learning practices in the undergraduate curriculum, and deliver health practitioners that can provide health care in context. The escalating burden of CDL in rural and urban communities in South Africa necessitates the need for effective community-based health promotion and care. Community-based education provides a platform for medical students to actively participate in CDL health promotion. In addition, it allows students to apply academic knowledge in context and observe the challenges faced during the implementation of CDL health promotion, prevention and treatment programmes in resource-constrained primary health care settings. The participants of this study confirmed the importance of CBE and that it should be part of an integrated medical curriculum. However, this study also emphasised specific challenges experienced in the integrated medical curriculum with a particular reference to CDL content and identified important foundational knowledge that needs to be incorporated or revisited at strategic points throughout the curriculum. Community-based education provides a valuable opportunity to

develop a student's knowledge, skills and attitudes. However, more emphasis should be placed on the students' understanding of the biopsychosocial determinants of CDL and the development of self-efficiency (knowledge and confidence) to prepare future physicians for the realities of rural and urban primary health care settings.

The findings of this study lead to various important recommendations, as will be discussed next. The incorporation of the following components in CDL learning modules for undergraduate Health Professions programmes:

- Contextual understanding of the multi-factorial etiology of CDL, focusing on the importance of biopsychosocial determinants of CDL risk factors that drive the CDL disease processes in urban and rural communities, respectively.
- Integrating socio-cultural and emotional experiences as part of a student professional development e-portfolio throughout the curriculum to enhance students' socio-cultural and self-awareness.
- Involve students in developing healthy lifestyle and health empowerment information/educational material during the CBE component of the CDL curriculum. These activities can be assessed and incorporated as part of the student's professional development e-portfolio.
- In the preclinical years of training, exposure of students to interprofessional teaching and learning to enhance the role that different health professionals play in the holistic care of patients with CDL.
- A treatment management refresher course before the CBE/IPE rotations focusing on the core knowledge applicable to the primary health care setting can add value, for example, a course on the use of the WHO *"*package of essential non-communicable (PEN) disease interventions for primary health care" (WHO, 2020b:67)
- Development of a national curriculum for CDL, through a collaborative effort between educationalists and policymakers, to produce health care professionals sensitive to the health needs, physical, mental and social well-being of communities, which can ultimately contribute to a healthy life for all.

The authors acknowledge the following limitations of the study. Firstly, this study was conducted at only one higher education institution in SA, which included only two, one urban and one rural, service-learning site due to resource constraints. Furthermore, the study was conducted in a province in South Africa and represents specific challenges experienced within the particular province in a South African urban and rural primary health care context. The researchers also acknowledge the small sample size (22 medical students participating in the study).

6 Conflict of Interest

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

7 Author contributions

S.v.Z. (PhD student), the principal investigator of the study, transcribed audio-recorded data, analysed the data and wrote the manuscript. W.H.K. (promotor) reviewed the internal consistency of the interpretation and contributed to editing and reviewing the manuscript. C.M.W. (promotor) edited and reviewed the manuscript. All authors read and approved the final manuscript.

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9 List of non-standard abbreviations

CBE	Community-based education
CDL	Chronic diseases of lifestyle
DoH	Department of Health
HPCSA	Health Professions Council of South Africa
NCD	Non-communicable disease

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Supplementary file

S1: Focus group discussion agenda (adopted from Mack et al., 2005)

1. **Welcome and scene-setting**
2. **Outline purpose of the research study**
3. **Validation of participant's availability and contribution**
4. **Discuss time frame (duration no longer than one and a half hours)**
5. **Ground rules**
    - Confidentiality
        - The facilitator will explain the confidential nature of the discussions.
        - Participants will be requested not to reveal the content of the discussions outside the focus group discussion room.
        - Participants will be informed that coded numbers will be used to identify participants during the focus group discussions. Participants will be assigned a number (identifier) that will be displayed on a number tag; this will correspond with a seating chart indicating participants and their corresponding number.
        - A request to record the discussion for recollection purposes will be made.
        - Participants will be informed about the note-keeping responsibility by the researcher, safekeeping of the recordings, and that transcription will be done word for word.
        - No information will allow individual subjects to be linked to specific statements.
    - Respect for privacy will be emphasised
        - Participants will be requested not to reveal the identity of other participants outside the focus group discussion room.
        - Participants will be requested to value each other's contributions by listening to everyone's contribution and refraining from criticising other contributions
        - Participants will be informed that they are not obligated to answer questions
6. **Discussions as per focus group discussion guide**
7. **Conclusion**
    - Confidentiality and respect for privacy will be re-emphasised at the end of focus group discussions.
    - Participants' valued contributions will be emphasised.
    - The way forward with the research project will be explained.
    - Availability of researcher to answer questions.

8. **Debriefing session**
    - Immediately after each focus group discussion, the note-taker (researcher) will conduct a debriefing session with the facilitator. The following will be noted:
        - Important nonverbal communication,
        - Group dynamics observed during the discussion,
        - Questions that are not effective,
        - Information that either contradicts/confirms data collected in previous sessions,
        - New topics that arose during the focus group discussion.

CHAPTER 6: ARTICLE 3: Perceived barriers and challenges to the implementation of Chronic Diseases of Lifestyle programmes experienced by patients and primary health care teams in an urban and rural primary health care setting in the Free State

Preparation for submission of this article to an accredited PHC journal is currently in progress.

Perceived barriers and challenges to the implementation of Chronic Diseases of Lifestyle programmes experienced by patients and primary health care teams in an urban and rural primary health care setting in the Free State

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Keywords: Non-communicable diseases (NCDs), chronic diseases, chronic diseases of lifestyle (CDL), primary health care (PHC), barriers and challenges, community-based intervention programmes

Abstract

Background: Non-communicable diseases (NCDs), also called chronic diseases, are the leading cause of death globally. The World Health Organization projects a significant increase in chronic diseases, especially in developing countries. The challenges posed by the growing burden of lifestyle-related chronic diseases (CDL) significantly impact the primary health care (PHC) context. Effective community-based PHC responses can reduce morbidity and mortality associated with CDL. This study aimed to provide a better understanding of the health needs of patients in urban and rural communities in central South Africa and determine the different barriers and challenges experienced to the effective implementation of CDL programmes.

Methodology: Focus group discussions conducted with patients and PHC teams presented participants' views and experiences relating to current CDL intervention programmes in urban and rural PHC settings. Using a thematic analysis approach, patients' knowledge of CDL and PHC team members' observations of existing CDL protocols and both groups' experiences of the barriers and challenges to successfully implementing CDL programmes were reported.

Findings: PHC team members indicated that CDL guidelines covered a range of diseases relevant to the South African context; however, several challenges and barriers to implementing the protocols and guidelines were identified: The lack of training, guidelines not considering patients' socioeconomic conditions, lack of patient education (due to time constraints, staff shortage), patient noncompliance, and patients not taking ownership of their disease. PHC team members in the rural setting also mentioned resource constraints, lack of security, and infrastructure issues, while urban PHC team members reported the collapse of support groups due to a high patient load. Both urban and rural patients reported that staff shortages, high patient load leading to long waiting times, lack of supporting health care services, and transport were barriers to optimal health care at PHC facilities.

Conclusion: This study found similarities and distinct differences in the barriers and challenges reported in rural and urban PHC settings in central South Africa. Tailor-made strategies can lead to focused and effective responses and improve health care services in these communities.

Abstract number of words: 332

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6.1 Introduction

Non-communicable diseases (NCDs), also called chronic diseases, account for 71% of deaths worldwide (WHO, 2018), with a projected increase in mortality from 36 million (2018) to 55 million by 2030. Such a dramatic increase will place a significant burden, especially on the developing countries of the world, where NCDs contribute to 82% of premature deaths (WHO, 2021). In South Africa, NCDs are among the top ten causes of mortality and account for 51% of all deaths (WHO, 2020; Nojilana et al., 2016). Factors contributing to the high prevalence of NCDs include epidemiological and nutritional transitions and associated socioeconomic, cultural, and lifestyle-related risk factors (DoH, 2013; Levitt et al., 2011; WHO, 2011*).*

Behavioural risk factors, such as an unhealthy diet, physical inactivity, increased alcohol intake, and smoking, can lead to physiological changes that predispose to chronic diseases later in life, often referred to as chronic diseases of lifestyle (CDL) (WHO, 2021). Most chronic diseases prevention, education, and awareness programmes focus on background risk factors (family history, increased age, socioeconomic factors) and modifiable lifestyle-related risk factors (tobacco and alcohol use, harmful alcohol use, physical inactivity, unhealthy diet). To reduce chronic diseases mortality (Bodai et al., 2018; Whelton et al., 2018; Maimela et al., 2015; WHO, 2011; Cecchini et al., 2010), patients' poor knowledge of chronic diseases and related risk factors hinder effective self-management and successful health outcomes. Reid et al. (2018) proposed targeted health promotion strategies, such as peer support groups and mobile devices, to deliver self-management educational material to encourage healthy behaviour.

The South African National Strategic Plan (DoH, 2015) aims to reduce the growing tide of chronic diseases in South Africa by implementing interventions that promote health, prevent disease and provide equitable health care. A shift from a hospital-centred to community-based primary health care (PHC) response was necessitated (DoH, 2014; WHO and UNICEF, 2018). Consequently, the PHC re-engineering process focused on decentralising health services, with PHC teams tasked to deliver services at the community level to align with the country's health needs (DOH, 2018; DOH, 2015; DOH, 2012). Barriers and challenges

previously identified for the effective implementation of NCD programmes on community-level included limited access to health care, lack of knowledge of CDL, shortages of staff, and long travel distances to local health care facilities (Ameh et al., 2017; Maimela et al., 2015; Perri et al., 2008). Although the service platforms for integrated chronic diseases management have been established on PHC level, the response to the growing tide of chronic diseases in South Africa calls for innovative intervention strategies, especially in resource-constrained areas (Murudi-Manganye et al., 2020; Lebina et al., 2019). Smith and Ansa (2016) emphasised the importance of considering the health needs of communities, for example, access to healthcare, economic and educational factors, when implementing interventions. The discrepancy between health care needs and service, particularly at the primary care level, can prevent effective, efficient, and equitable health care. Detailed information relating to the barriers and challenges experienced during implementing chronic diseases of lifestyle programmes in the Free State's urban and rural primary health care settings is still insufficient.

This study evaluated patients' knowledge of CDL and PHC team members' experience of related protocols and guidelines. Furthermore, the study aimed to identify barriers and challenges to implementing CDL programmes at PHC level in urban and rural communities in the Free State. A better understanding of the specific health needs of different communities can assist in implementing appropriate community-orientated interventions that can promote targeted and effective health care (Ricanati et al., 2016:312).

6.2 Methods

6.2.1 Study design and study population

This study was set in urban and rural PHC settings in the Free State province of South Africa. The study followed a qualitative phenomenological design to provide an in-depth understanding of patients' and PHC team members' awareness of CDL and current CDL programmes, respectively, and provide insight into the barriers and challenges experienced by both groups regarding the practical implementation of these programmes. PHC team

members included professional nurses, staff nurses, clinical associates, health promoters, and community health workers. PHC team members and patients, aged 25 to 65 years, who visited PHC facilities as part of a treatment programme for obesity and/or the following CDL (cardiovascular disease (CVD) and/or hypertension and/or type 2 diabetes mellitus) were eligible to participate in the study. Focus group discussions were conducted to gather data presenting participants' different experiences and explore issues of concern (Tausch and Menold, 2016).

6.2.2 Data collection

Focus group discussions commenced after purposive sampling to recruit patients and health care team members who had experience and could provide perspective and insight concerning the specific research topic (Mack et al., 2005). Recruitment criteria included male and female patients and PHC team members working in local PHC facilities in the rural town of Trompsburg and the urban Mangaung district. The aim was to recruit 10 to 12 participants per focus group. Written informed consent was obtained after scheduled information sessions before focus group discussions commenced.

After completing a comprehensive literature review, the researcher compiled focus group discussion guides (Table 6a and 6b); this formed part of the methodological triangulation that provides scientific rigour. Five focus group discussions (three with primary health care team members and two with patients groups), which lasted between 60 and 90 minutes, were conducted by an experienced facilitator in English, with a translator and the researcher as a note-taker also present. Confidentiality and respect for privacy were emphasised before each focus group discussion, using coded numbers to identify participants during the interview. Each participant's assigned number (identifier) was displayed on a number tag, and a seating chart was used for note-taking purposes (Mack et al., 2005). Documenting of focus group discussions comprised of MP3 audiotape recordings and written field notes. After each focus group discussion, the note-taker conducted a debriefing session with the facilitator to note important nonverbal communication, group dynamics, questions' effectiveness, and new topics that emerged during the focus group discussion (Mack et al., 2005).

Table 6.1a. Focus group discussion guide: primary health care team members

QUESTION 1	Which operational protocols/guidelines are available to address risk factors for chronic diseases of lifestyle?
QUESTION 2	What is your opinion regarding the practical implementation of these guidelines?
QUESTION 3	Which national policies and operational protocols/guidelines for managing obesity and following chronic diseases of lifestyle, hypertension, and diabetes are available in this primary health care facility?
QUESTION 4	How do you feel about training provided to you to implement chronic disease of lifestyle intervention programmes?
QUESTION 5	What is your opinion about an integrated approach to address lifestyle diseases?
QUESTION 6	In your experience, which barriers and/or practical implementation issues hinder the effective implementation of chronic diseases of lifestyle prevention and intervention programmes at this PHC facility?
QUESTION 7	Which areas of good practice exist?

Table 6.1b. Focus group discussion guide: patients

QUESTION 1	Which factors do you think can contribute to the development of obesity and chronic disease(s) such as high blood pressure and high blood sugar?
QUESTION 2	How do you think lifestyle factors such as diet, smoking, and physical activity contribute to chronic diseases like obesity, high blood pressure, and high blood sugar?
QUESTION 3	How can a mother's unhealthy lifestyle (e.g., an unhealthy diet, smoking, physical inactivity) contribute to the development of chronic diseases (e.g., high blood pressure and high blood sugar) later on in the life of her child/children?
QUESTION 4	What do you know about your disease?
QUESTION 5	Besides medicine, what other service/advice have you received regarding your chronic disease at your primary health care facility?
QUESTION 6	What is the importance of attending scheduled follow-up visits to manage your obesity and/or chronic disease (hypertension and diabetes)?
QUESTION 7	Which factors make it difficult to access your local health care services?
QUESTION 8	What is your experience of the quality of health care at your primary health care facility?

6.2.3 Ethical considerations

Approval to conduct the research study was obtained from the Health Sciences Research Ethics Committee (HSREC) of the University of the Free State (UFS-HSD2017/1435), the Free State Department of Health, and local municipalities before the commencement of the study. Before all participants signed written informed consent, the researcher (and, if necessary, the interpreter) explained the research project to all the participants.

6.2.4 Analysis of data

The researcher transcribed audio-recorded data by listening to each MP3 audio recording and simultaneously typing the content into a Microsoft Word document verbatim. The transcripts also included nonverbal sounds and field notes. Following the initial transcription, the researcher verified the accuracy of data transcription by simultaneously listening to the recording and reading the transcript (Botma et al., 2010). An inductive strategy to organise and interpret the qualitative data was followed by coding, identifying categories/sub-categories, and recognising emerging themes (Stalmeijer et al., 2014). After reading through the whole transcript to obtain a general overview of the data and identifying statements relevant to the research topic, irrelevant information was separated. Words/phrases/sections of text that reflect participants' specific thoughts were identified, including recurring topics amongst individuals within a particular group and the different focus groups. Emerging topics were grouped into categories. Following a convergence process, related categories were grouped, categories were integrated into sub-themes and themes (significant findings reflecting the different experiences of the participants), and emerging themes were grouped to develop overarching themes/concepts (Ramani and Mann, 2015). After the researcher completed the systematic process to organise and explore associations between themes, the internal consistency of the interpretation of data and inductive thematic saturation was confirmed by the other two authors (Mack et al., 2005; Saunders et al., 2018).

6.3 Results

A total of 39 participants, 20 patients, and 19 PHC team members participated in the five focus group discussions. Ten patients and seven PHC team members from the rural town of

Trompsburg in the Xhariep district and 10 patients and 12 PHC team members from the urban MUCPP clinic in the Mangaung district participated in the study. More females (76.9%) than males (23,1%) participated in the focus group discussions. PHC team members that participated in the study included professional sisters, staff nurses, clinical associates, and community health workers.

6.3.1 RESULTS OF FOCUS GROUP DISCUSSIONS WITH PRIMARY HEALTH CARE TEAM MEMBERS

Table 2a provides a summary of the four overarching themes and associated sub-themes that emerged from the data. Theme 1 reports on the **knowledge** of operational CDL protocols/guidelines. Theme 2 focuses on the **training** provided before implementing guidelines and protocols. Theme 3 focuses on participants' practical **experience and reported barriers and challenges** experienced to implement CDL protocols/guidelines and intervention programmes. Theme 4 reports on participants' **proposed solutions** and current best practices. In the next section, statements from urban and rural PHC team members are referred to as PHR (primary health care members rural) and PHU (primary health care members urban – Group 1 and 2), followed by the participant's number.

Table 6.2a. Overarching themes, sub-themes, and an overview of the main findings of focus group discussions in urban and rural primary health care team members

OVERARCHING THEME	SUB-THEMES	OVERVIEW OF MAIN FINDINGS
Knowledge of CDL protocols/guidelines	• Awareness and availability of guidelines • Range of CDL covered • The relevance of the guidelines for the SA context	**Urban and rural:** CDL protocols and guidelines are available and aim to achieve goals of CDL intervention Guidelines for some risk factors not available **Urban:** CDL protocols and guidelines are consolidated into one book. Covers a range of CDL. Relevant for the SA context **Rural:** Use guidelines in clinic and community workers for patient education
Training to implement guidelines and protocols	• Training programme • Training need • Challenges experienced	**Urban:** The facilitator provides training at the clinic Currently no training and updates due to a shortage of staff **Rural:** Need for recurrent and thorough training
Practical implementation of CDL protocols and guidelines	Barriers/challenges experienced: • Appropriateness of guidelines • Socioeconomic conditions • Patient compliance • Resource constraints (human, medication) • Accessibility of PHC settings • Infrastructure and security	**Urban and rural:** Guidelines are not always practical Certain CDL risk factors not covered in the guidelines The socioeconomic condition of patients/community Noncompliance and/ denial Lack of health education (staff shortage, time constraints, misinformation) Transport problems **Urban:** No support groups Bedridden patients, side effects of medication Rural: barriers/challenges Resource constraints: the shortage of stock Patient referral and transport over weekends PHC facility: Infrastructure, security
Proposed solutions and current best practices	Proposed solutions • Fully functional and active PHC teams • Focus on a patient-centred approach • Address human resource constraints • Improve community-based health education strategies	**Urban** Holistic patient-centred approach Patients taking ownership of the disease Focused health education and awareness campaigns - multi-media approach (TV/video's for patient's education followed by questions and answer session, posters, pamphlets (multi-lingual), newspapers Active support groups Functional community outreach teams (community health workers - home visits and door-to-door campaigns) and multi-disciplinary teams (important roles of dieticians and phychologist) **Rural:** An active community outreach team Staff appointments Improve management reporting system
	Best practices • Progress with integrated programmes • Communicable disease intervention programmes	**Urban** Integrated programmes Contribution of clinical assistants **Rural** Integrated programmes Implementation of CDL guidelines during home visits. Communicable diseases: adherences groups Card system for appointments - even distribution of patients

6.3.1.1 THEME 1: Knowledge of CDL protocols/guidelines

Participants reported that operational CDL protocols and guidelines are available in urban and rural clinics. The guidelines and protocols are consolidated into one book and cover a range of CDL relevant to the South African context. Rural participants mentioned that guidelines are also used for patient education by community health workers during home visits. Although participants deemed guidelines and protocols useful, easy to use and noted that they covered a range of CDL relevant to the SA context, guidelines for specific risk factors (smoking, obesity, and specific dietary guidelines) were unavailable.

> *"We are using APC, Adult Primary Care, and the guidelines are consolidated into one book. Everything that you think about in the clinic setting. It is very useful; it depends what the patient presents with or the condition they present with. You can easily navigate through that book. "* PH2U5
>
> *"Yes, we do have guidelines as community health workers. We have guidelines that show how we can talk to the patients, how they need to eat, and the ways of exercising."* PHR 2
>
> *"Normally with the guidelines, they are quite helpful, now the problem comes when maybe your patient does not necessarily fit the guidelines that you use, the flow chart or diagram that you need to follow. Most of the time, I find that we follow the guidelines, but when the patient goes beyond the scope of the guidelines, then the problem comes."* PH2U6
>
> *"I think that we need training because the guidelines we have it is basics; there is no training on obesity guidelines."* PHR 5

6.3.1.2 THEME 2: Training provided to implement guidelines and protocols

Professional nurses indicated that they were facilitators for local, in-house training at the PHC facilities. However, both urban and rural participants thought the training was inadequate and expressed the need for recurrent and thorough training. Urban participants reported that training sessions did not occur as indicated (bi-annually update sessions) due to time constraints and staff shortages.

> *"Since January this year, I have not trained anyone because of the staff shortage. The training was done some time ago but not thoroughly; it was not enough."* PH2U5
>
> *"Most of us we have not yet been on the training, and so it is very difficult for us to go and visit houses. So whenever they (sisters) are on leave, it is very difficult for us to go and visit the*

house to make sure that the patient is still on track with the medication and everything." PHR 3

6.3.1.3 THEME 3: Practical experience and implementation of CDL protocols and guidelines

Barriers/Challenges experience to the effective implementation of CDL protocols and guidelines

One of the main complaints of urban and rural participants was that guidelines are not practical because they do not consider patients' socioeconomic conditions. PHC team members mentioned that socioeconomic barriers relate to poverty, unemployment, lack of education, and drought. Furthermore, rural participants identified patient non-compliance, lack of patient education (time constraints, staff shortages), patients not taking ownership of their disease (lifestyle changes and pharmaceutical interventions), transport issues, shortage of stock, lack of security and infrastructure as additional challenges and barriers experienced in the effective implementation of CDL protocols and guidelines. Urban PHC team members also mentioned patient non-compliance, socioeconomic conditions, transport issues, and support groups collapsing (due to the high patient load, staff shortages, and lack of physical spaces to conduct support groups) as challenges experienced in the urban PHC setting.

Appropriateness of guidelines and socioeconomic conditions

"Some of the guidelines I say they are impossible to implement due to the economics of our community, but then it is also impossible for us to achieve that goal of the guideline due to the lack of education because you find that some people you do tell them even if they cannot afford this food, they can do this, but then you get that it is very difficult for them to understand that there are other ways for them to use to be in a better position." PHR 3

"Poverty is the problem; most of them cannot afford it." PH1U1

"We used to advise the patients to have a small garden, but now it is very difficult to advise them to make sure that they do have those small gardens because there is no water." PHR 2

Patient compliance

"When I see the patient, I give them the education, but they don't apply it" PHR 4

"Sometimes the dietician tells them to eat certain foods, but they don't buy that; they eat junk food." PH1U5

" They (patients) are denying that they do have sugar/diabetes or hypertension. It does not matter how long you talk to them. Some of them will tell you that I ate sugar for my whole life and now I am 50 years, and now you are telling me that I have diabetes. Where did I get it? You are going to struggle with that person, and he or she is going to default." PH1U1

"Follow-up visits, they don't come, we find maybe 2/10 or 3/10 (comply), it is a very low number." PH2U7

Resource constraints (human, medication)

"The professional nurses are not enough, and we take a lot of strain because sometimes one of them is on leave. Also, in the pharmacy, when the pharmacist is not there, then the sister will have to take over the medication. So the professional nurses they are in shortage." PHR 3

"We have a shortage of stock. You need to order, and by that time the medication comes, there will be an over-demand for that." PHR 1

"We do educate patients, but we realise that we don't have adequate time to sit down with the patient and make sure the education is provided and they do understand." PH2U6

Accessibility of PHC settings

"Because of distance, some of the patients need to walk. If they cannot walk they have to use transport, but they don't have money, some of them are bedridden, so they cannot come. " PH2U6

"It is difficult on the weekends to get the ambulance." PHR 3

Infrastructure and security

"We don't feel safe because there is no security, and sometimes we are not even sure that maybe at night they are at work because sometimes we find in the morning that some of the medication, the drugs are gone." PHR 3

"There is only one toilet for the public, so you can say it is a problem; men and women have to share." PHR 3

6.3.1.4 THEME 4: Possible solutions and best practices

Urban PHC team participants suggested that health care teams follow a more holistic patient-centred approach, while it was stressed that patients need to take ownership of their

diseases. The multi-disciplinary team's role was emphasised, specifically, the essential roles of dieticians and psychologists as part of the team.

Fully functional and active PHC teams

"And at the end of the day, the multi-disciplinary team can be functional. When we diagnose a diabetic, we try to also involve the dietician. Patients with hypertension, we find that they are so stressed; if we can find someone to help with the condition, maybe we can have a psychologist that can be functional." PH2U5

"We are doing our home visits. It is then where you have enough time with that household to do health promotion. I show them the importance of eating well and all that stuff." PHR 2

Focus on a patient-centred approach

"What would help, I think if a patient takes ownership of disease. We are the ones that care more than they. The medication that they are taking is for their benefit. When we are giving them education about their lifestyle, it is not for me. At the end of the day, it is going to help them, because most of the time it is not only the medication that is helping, it is what the patient does that count." PH2U6

"Mostly, it was dieticians that will come to the support group for the education." PH2U7

Address human resource constraints

"Just about the diabetes groups, they basically died because there were just too many patients, just too many patients, there was just not room for everybody." PH2U5

"The sisters are busy; if someone comes to do the health talks, then I think it will be much better." P1HU4

Suggested ways to improve patient health education included focused educational programmes at the clinic, such as videos (TV screens) to play in waiting rooms. It was proposed that this must be followed up by health talks and question and answer sessions. In addition, posters, pamphlets, newspapers, and the reestablishment of support groups as solutions to improve CDL education were suggested. Health education and community awareness campaigns outside the PHC facilities conducted by community health workers (door-to-door campaigns) were proposed.

“Yes, this is a waiting area, and then if the sister is busy, that person can stand in front of them (the patients) and do the health talk. I think it will be much better." PH1U5

"Although the patient may not know how to read, if you can give pamphlets in different languages because here we are Xhosas, Sothos, Tshwanas, Zulus. Maybe with pictures, not so much writing that they can at least understand through the pictures." PH2U5

"Even where the patients are sitting all together like in the hall there, there must be TV for videos for the time they are sitting here; they can be educated there." PH2U4

"There are very few posters. If they can laminate the posters, they will last longer." PH2U5

Improve community-based health education strategies

"There must be community health workers that do home visits so that they must reduce the load of people coming to the clinic. Yes, do education at home." PH2U4

"Awareness campaigns, outside the institution, in newspapers and door to door campaigns." PH1U4

"As she indicated, some of the groups collapse, but I think if we can resuscitate that support groups, it can work." PH2U7

Participants also emphasised a need to improve reporting systems as there is currently a shortage of professional nurses. Both urban and rural participants mentioned that integrated programmes (chronic care and antenatal) effectively address shared risk factors. Rural participants indicated that they follow an integrated approach to address lifestyle diseases during health talks at the clinic and home visits.

"Yes, it is very useful because some of the patients have diabetes and the mother is pregnant, even just now, I have met a patient, and the mother is also hypertensive and diabetic." PH2U4

"I have realised something that works well in the clinic, the integration for the antenatal because there is a lot of things that are picked up during the antenatal visit. Maybe you find out that a patient has a chronic disease, either hypertension or diabetes, and you can start the medication. I have realised that the transition after that into the chronic care clinic works quite well." PH2U6

"Yes, we do that (follow an integrated approach). When we are doing our home visits, it is then when you have enough time with that household when you do health promotion." PHR 2

6.3.2 RESULTS OF FOCUS GROUP DISCUSSIONS WITH URBAN AND RURAL PATIENTS

Table 2b provides a summary of the overarching themes and associated sub-themes that emerged. Theme 1 reveals patients' knowledge of CDL, the perceived factors that contribute to CDL development, including the following sub-themes: knowledge of the development, factors preventing CDL development, and the long-term treatment of CDL. Theme 2 focuses on CDL health promotion and education, including different factors contributing to CDL knowledge. Theme 3 focuses on participants' experience of the quality of health care at PHC facilities. In the next section, quotes from urban and rural patients are referred to as PU (patient urban) and PR (patient member rural), followed by the participant's number.

Table 6.2b. Overarching themes, sub-themes, and an overview of the main findings of focus group discussions in urban and rural patients with chronic conditions

OVERARCHING THEMES	SUB-THEMES	COMPARISON OF THE MAIN FINDINGS
Knowledge of CDL	• Knowledge of factors that contribute to the development of CDL. • Knowledge of factors that prevent the development of CDL. • Knowledge of the pathophysiology/development of CDL. • Knowledge of pregnancy and CDL • Long term treatment of CDL	**Urban and rural:** Genetic factors, lifestyle factors, dietary factors, physiological factors, social-economic factors Regular checkups, taking medication, and monitoring of adverse effects of medication
Health promotion and education	• Factors contributed to participants knowledge of CDL • Type of health education and additional health promotion services provided	**Urban and rural:** Doctors and sisters in the clinic, pamphlets, radio, home visits **Urban:** Sometimes sisters, dieticians, pamphlets (urban – none at the clinic, mainly in hospital) **Rural:** Home visit
Experience of the quality of CDL health care at the primary health care facility	Factors that affect the delivery of optimal, quality health care service at PHC facilities • Resource constraints (human, medication) • Poor service delivery • Transport issues • Infrastructure and security	**Urban and rural:** Poor/lack of services (patient load/staff shortage) Lack of supporting health care services Transport and distance to travel to primary health care facilities **Urban:** Long waiting time Shortage of medicine Lack of holistic care Mobile clinics not available Poor service (no physical examinations) **Rural:** Security Infrastructure (dilapidated clinic building, ablution facilities, and terrain) Shortage of support staff (cleaners)

6.3.2.1 THEME 1: Knowledge of chronic disease of lifestyle

Knowledge of factors that contribute to the development of CDL

Factors mentioned by participants that can contribute to the development of CDL include genetic factors (history of diabetes, hypertension), lifestyle factors (behavioural factors, lack of exercise, alcohol, smoking), dietary factors (salt, fat, spices, lack of vegetables), physiological/metabolic factors (being obese, having high blood pressure), stress due to socioeconomic factors (unemployment, poverty, family dynamics, food insecurity). This is demonstrated in the following quotes:

> *"I was very young; when I got information from my parents, my mom was a diabetic, that is why I am diabetes."* PU No 1
>
> *She is just explaining the number of people in the family who's having diabetes mellitus, and two weeks ago, she buried her grandmother; it was due to diabetes.* Translator PU No 7
>
> *"I struggled for so many years with high blood and sugar, but when I quit drinking, quit smoking, now I control."* PU No.2
>
> *"Stress, I do not have money, my children do not have shoes, they do not have water. The stress goes up."* PR No. 7

Knowledge of factors preventing the development of CDL

Participants acknowledged the importance of healthy lifestyle choices, for example, being physically active and following a balanced diet. However, important factors such as achieving and maintaining a healthy body weight or the importance of avoiding tobacco use (passive) were not mentioned. Some misconceptions also exist: drinking a lot of water and using cooked salt can prevent CDL development, such as diabetes and hypertension.

> *"By exercising and eating vegetables, you prevent diabetes. Yes, a balanced diet must contain vitamins. The body must have vitamins and proteins."* PU No 1
>
> *"The salt we eat must be cooked with the food, and raw salt is very dangerous."* PU No 8

Knowledge of the pathophysiology/development of CDL

Participants generally had a lack of knowledge regarding the pathophysiology of CDL and the development of complications of CD. From the following quotation, it is clear that participants knew that stress and following an unhealthy diet contribute to CD's development, but the mechanism thereof was unknown.

> *She is just explaining that stress does contribute to high blood, but she doesn't know how.* Translator PU No 9
>
> *"Fatty foods store fat in one's body then it causes thick blood."* PR No. 2

Some misconceptions regarding the development of CDL diseases exist, for example, child immunisation after birth can prevent hypertension, and hypertension is an infective disease.

> *"I want to know the cause of hypertension; my mother and dad don't have it. I am the only one who has it. All my siblings are healthy, but I am the only one who has hypertension. I want to know who infected me. Even my distant relatives do not have hypertension."* PU No 6

Knowledge of pregnancy and CDL

Several participants acknowledged the effect that maternal lifestyle has on the offspring: participants noted that an unhealthy lifestyle, for example, using alcohol and smoking, can have detrimental effects on foetal brain development and the appearance of the offspring. Although participants indicated the importance of regular antenatal follow-up visits, they mentioned certain misconceptions such as antenatal alcohol consumption can lead to hypertension in the offspring.

> *"They say if you are pregnant, you should not drink beer because when the baby is born, sometimes he has small eyes, small nose, mouth, and small ears."* PR No. 5
>
> *She says not to drink alcohol, as it affect the child.* Translator PR No. 4

Knowledge of long-term treatment of CDL

Both rural and urban participants indicated that regular checkups and taking medication could avoid complications. Rural participants also mentioned effective monitoring of adverse effects of the medication.

"The follow-up visits are very important so that the doctors can see if they have to change your medication or if there is a problem. If you sit and do not go to the clinic for follow up, then you won't know about your health or the conditions that you have at that time." PR No. 8

"They say it is important because the staff can evaluate if the treatment is working." PU No 5

"Even the medication that they give you, I went to the sisters and told them the medication make me ill, and then they put me on another medication, and I feel better." PR No. 4

6.3.2.2 THEME 2: Health promotion and education

Factors that contributed to participants' knowledge of CDL

Participants mentioned that members of the PHC team, radio, television, and pamphlets contributed to their CDL knowledge. In the rural setting, the participants indicated that the clinic sisters mainly contributed to participants' knowledge of CDL diseases. It was also mentioned that home visits conducted by members of the rural PHC team (mostly staff nurses) contributed to participants' knowledge of chronic diseases. Although urban participants indicated that home visits were conducted previously, none were currently conducted in the urban setting.

"Most of the time, we get information from the sister." PR No. 2

"I agree that it comes from the sister. In the morning, she talks to us about what we should do or what we should not do." PR No. 4

"The doctor sends me to a dietitian who told me how to eat. She gave me information and told me what kind of life I could live." PU No 1

"I listen to diabetes on the radio and high blood too. At the clinic, they tell us about the high blood." PR No. 8

Type of health education and additional health promotion services provided

Participants indicated that they received information on healthy eating, the benefit of physical activity, and treatment information. In addition, pamphlets and radio were mentioned as sources of health education; however, alternatives, for example, advertisements, health awareness days, and food packaging were not mentioned. In the urban setting, the doctor, sister, and dietician were perceived to contribute to health

education, while community health workers, health promoters, and nurses were not mentioned. Urban participants indicated that they receive health education during consultations, mainly focused on treatment information. Additional educational material, for example, pamphlets, was mainly available in urban hospital settings. Urban participants mentioned church support groups and the "Phelophepha" train as additional sources of health information. Urban participants suggested that support groups could make a valuable contribution to enhancing CDL education.

"Eating healthy and exercising. Let me say I can walk from home to town and back again." PR No. 9

"In 2015, a team from one of the churches at Methodist church talked about my disease. At the clinic here, they taught me about the medication. There is also a "Phelophepha" train that stops at the showground and Thabanshu; those people helped us a lot." PU No 4

"Pamphlets at the hospital." PU No 1 *"TV and radio"* PU No 3

She was just explaining about a support group. She said if sometimes they can gather in a place like this, she does not explain exactly what we should tell them, but she is happy that we gathered here and discuss their conditions. Translator PU 9

6.3.2.3 THEME 3: Experience of the quality of health care at the PHC facilities

Factors that affect the delivery of optimal, quality health care service

Factors mentioned that affect the delivery of optimal, quality health care service at PHC facilities in both urban and rural settings include: poor/lack of services (resource constraints), long waiting time (due to staff shortages, high patient load), lack of supporting health care services, transport issues (long distances to travel to PHC facilities).

Resource constraints (human, medication) and poor service delivery

"We suffer because of the shortage of the staff, we are sitting a long time and then sometimes you are hungry, you come from the morning there is long queues and no staff. Staff is an issue and long waiting time." PR No. 8

"As we said, it is a lack of services. We come early, and then we leave late, so there is a lack of services." PU No 1

"And the chest they don't check it, the nose, ears everywhere they do not check it, you must ask them. The reason for that is because there is a lot of patients." PU No 6

"We don't get all the medication that the doctor writes on your file. So you are getting half of the medication; that is why our high blood and sugar are high because of the problem." PR No. 7

Urban participants reported that mobile clinics and access to clinics closer to home were previously available, but these facilities were no longer in use. They also noted a shortage of medicine at clinics.

Transport issues

She was also saying the distance is too far. She says a clinic is closer to her home, but they don't want her to go there. They tell her that they don't have treatment for adult conditions. Translator, PU No 5

There was a mobile clinic where she stays, but it doesn't come anymore; it stops going there last year. Translator PU No 7

Although the clinic in the rural community was more easily accessible and closer, participants experienced difficulty travelling to the clinic when they were ill. Also, they mentioned various challenges when referred to Bloemfontein, including long waiting times for ambulances.

"The other thing most of the people they don't work, they don't have a job and don't have money, but when you come to the clinic they refer you to the hospital, and you have to pay the taxi, but you don't have money for transport." PR No. 8

"Sometimes you have an appointment at the hospital; if you come here, there is no ambulance." PR No. 10

Rural participants specifically mentioned the state of security, infrastructure (dilapidated clinic building, ablution facilities, and terrain) and identified the need for support staff shortages (cleaners and gardeners). Participants mentioned their involvement in keeping the clinic and grounds clean.

Infrastructure and Security

> *"The clinic is getting dirty. They do not have a cleaner because there is a staff shortage. Security and the security house, the fence in the corner they cut it, I do not know who goes in at night. "* PR No. 7
>
> *"The gardener, there is no one who picks up papers. The toilet, the door does not close. We use one toilet for men, women, and children."* PR No. 10

6.4 DISCUSSION

The reported barriers and challenges to the effective implementation of CDL intervention programmes in PHC settings in South Africa include health worker shortages, resource distribution, complex health and nutritional transitions, inadequate training of health personnel in a comprehensive approach to chronic diseases, lack of patient knowledge and self-management of chronic diseases (Maimela, 2015; Puoane et al., 2017; Steyn and Mchiza, 2014; Steyn and Levitt, 2006). Although the findings of the current study concur with the abovementioned, this study clearly illustrated similarities and distinct differences in the challenges experienced in urban and rural communities. Barriers and challenges to the effective implementation of the guidelines mentioned by both urban and rural PHC team members included patients' socioeconomic conditions, patients' non-compliance, lack of patient education (due to time constraints, staff shortage), patients not taking ownership of their disease (lifestyle changes and pharmaceutical interventions), and transport issues. Rural PHC teams also mentioned the shortage of stock, lack of security and infrastructure issues, while urban PHC team members mentioned that side effects of medication and support groups collapsing (due to the high patient load, lack of staff, and physical resources/rooms to conduct support group) were challenges experienced in the urban PHC setting.

Urban and rural patients confirmed that socioeconomic conditions, staff shortage, high patient load that lead to long waiting times, and transport issues (long distance to travel to primary health care facilities in urban areas and long waiting time for ambulances in rural areas) were barriers and challenges experienced to quality health service at their local health care facilities. In addition, rural patients mentioned the lack of supporting health care services (e.g., dieticians, physiotherapists). They confirmed concerns of the PHC team regarding

infrastructure (rundown buildings and clinic grounds, insufficient ablution facilities) and security. Urban patients mentioned that services previously available (support groups, mobile clinics and access to clinics closer to home) were no longer accessible due to scarce resources (staff and medication).

The South African National Development Plan (NDP) sets out nine long-term goals to improve the population's health and well-being and strengthen health systems. One goal envisioned a significant reduction of chronic disease prevalence by 2030 (NDoH, 2015). Despite some success in preventing and controlling chronic diseases, efforts to strengthen community-level prevention and control in South Africa still need improvement (Puoane, 2017). Primary intervention strategies focus on background risk factors (family history, increased age, low socioeconomic/educational status, psychosocial stress) and behavioural/lifestyle risk factors (tobacco use, hyperglycemia, dyslipidemia, overweight/obesity, physical inactivity, and unhealthy diet) (WHO, 2020). This study confirms findings from other South African reports that mention socioeconomic factors and poverty as important risk factors that limit the ability of individuals, households, and communities to reduce the risk of developing CDL (DoH, 2013; Mayosi et al., 2009; Schneider et al., 2009). Urban and rural PHC members reported that CDL guidelines did not consider patients' socioeconomic conditions. Patients (both urban and rural) confirmed this, indicating that socioeconomic factors, such as poverty, unemployment, food insecurity, and drought, made it difficult to follow health education guidelines (e.g., following a healthy balanced diet) to reduce risk.

Furthermore, patients in both communities referred to the stress and psychological effects they experienced due to ever-prevalent socioeconomic barriers and challenges. The biopsychosocial (BPS) model of health was first suggested by Engel in the 1980s and referred to the holistic, integrated approach to health that includes the biological, psychological, and social determinants (economic, environmental and cultural) that contribute to the development of diseases (Engel, 1980). This study confirmed the need for a holistic multi-disciplinary health care approach that addresses the biological, psycho-social-economic determinants that contribute to chronic diseases development (Conversano, 2019). While socioeconomic barriers restrict patients' ability to implement lifestyle change (Gee *et al*.,

2012), a body of evidence suggests that chronic psychological stress can alter the physiological immune responses. This further contributes to chronic diseases, morbidity and mortality (Antoni and Dhabhar, 2019; Femke Rutters et al., 2014; Seib et al., 2014) and the vicious cycle of CDL (WHO, 2006). Patients with chronic conditions participating in the study acknowledged the importance of behavioural/lifestyle changes to prevent CDL; however, maintaining a healthy body weight was not mentioned as part of healthy lifestyle choices. The relationship between obesity and the development of CDs, for example, type 2 diabetes mellitus, hypertension, cardiovascular disease, is well established (Kyrou et al., 2018; NCD Risk Factor Collaboration, 2017). Effective health education and lifestyle coaching can assist patients in taking ownership of their health.

During the re-engineering process of PHC in South Africa, it was envisioned that PHC teams that include community health workers, health promoters, and environmental health officers would provide practical and quality health education during home visits and at local clinics (DOH, 2014). The focus group discussions provided insight into a range of health promotion and educational activities. In the rural community, members of the PHC team (nurses) are involved in health education talks in the clinic, and community health workers conduct home visits. In the urban setting, participants reported that the doctor (during the consultation), sister, and dietician contribute to health education in the clinic setting. Urban participants indicated no home visits were conducted, but church support groups and the "Phelophepha" train contributed to health education. Pamphlets and radio were cited as contributing factors, but support groups, advertisements, awareness campaigns, and food packaging were not mentioned (Masupe et al., 2018). While urban participants stated that support groups, mobile clinics, and access to clinics closer to home were previously available, these facilities were no longer used due to the unavailability of doctors or medication.

6.5 Conclusion and recommendations

The National Strategic Plan for the Prevention and Control of Chronic Diseases (DoH, 2013) called for strengthening community-based PHC. It encouraged provinces in South Africa to identify and overcome challenges and barriers in PHC settings. Current intervention strategies promote a healthy diet, weight loss, and physical activity and emphasise the dangers of

smoking and increased alcohol consumption to reduce CDL risk (WHO, 2011). According to Ricanati (2011), appropriate comprehensive CDL intervention programmes could lead to sustainable health outcomes. Primary health care teams can lead to education and health promotion activities (Whitehead, 2000). PHC members working in these communities made valuable suggestions to improve patient education and awareness. They also emphasised the importance of functional community outreach teams and multi-disciplinary teams that include dietitians and psychologists, follow a holistic patient-centred approach, address staff shortages, and assist patients in taking ownership of their disease.

The valuable contributions made by the PHC team members and patients with chronic conditions that participated in the current study can assist in revising current responses and lead to improved and effective tailor-made interventions. Therefore, based on the findings of the study, we recommend the promotion of holistic, integrated, tailor-made interventions that:

- Emphasise the multi-disciplinary team and the complementary roles of various health professionals involved in the holistic care of patients with CDL. Therefore, implementing community-based interactive health education strategies that focus on behavioural changes and psycho-social support to assist patients in managing stress and reducing disease risk.
- Targeted context-appropriate health education for patients that focuses on evidence-based data for the specific communities can include a range of complementary innovated health education strategies:
    - Effective health education and awareness campaigns at local clinics that use, for example, multi-media approaches (e.g., video-recorded sessions), followed by questions and answer sessions/health talks, the use of new technologies (e.g., eHealth/healthy lifestyle applications) (Monzani and Pizzoli, 2020), and displaying multilingual educational posters and pamphlets.
    - Active support group sessions, including health literacy, healthy lifestyle coaching (focus on implementing healthy lifestyle recommendations and patients' ability to manage their condition), and psychosocial support.

6.6 Acknowledgements

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6.7 Limitations

Although the small sample size (45 participants) may not represent the entire community, sub-themes presented were identified in both the primary health care group and the participants.

6.8 References

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CHAPTER 7: ARTICLE 4: Chronic diseases of lifestyle: A risk assessment and health promotion framework for a rural and urban primary health care setting in the Free State province, South Africa

Preparation for submission of this article to an accredited PHC journal is currently in progress.

Chronic diseases of lifestyle: A risk assessment and health promotion framework for a rural and urban primary health care setting in the Free State province, South Africa

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Keywords: chronic diseases of lifestyle, primary health care settings, community-based education

Running title: Chronic diseases of lifestyle risk assessment and health promotion framework

Abstract

Background*:* Non-communicable diseases (NCDs), also called chronic diseases, account for 71% of deaths globally. In South Africa (SA), the mortality rate due to NCDs has shown an alarming increase from 43% (2006) to 57.4% (2016). The WHO's country-specific profile for NCDs highlights the persistently high prevalence of modifiable risk factors in SA related to chronic diseases of lifestyle (CDL), which place a considerable burden on the country's health systems.

Aim: This study aimed to develop a risk assessment and health promotion framework and formulate recommendations to strengthen existing efforts to prevent and control CDL in a rural and urban community in the Free State (FS) province in central SA.

Methodology*:* A convergent mixed method design was applied in this study. Using the existing Assuring Health for All in the Free State (AHA-FS) database, the quantitative study (Phase I) compiled a risk factor profile for the FS's rural and urban study populations. Qualitative data (Phase II) obtained during focus group discussions, with primary health care (PHC) team members, patients and medical students, explored knowledge of CDL, awareness, attitude, and practical implementation issues experienced relating to CDL intervention programmes in these communities. Quantitative and qualitative data were used in combination to construct a CDL risk assessment and health promotion framework for the urban and rural settings in the FS.

Results*:* The quantitative phase of the study identified similarities and distinct differences in the CDL risk profiles between the urban and rural study communities. The qualitative part of the study revealed several challenges and barriers to implementing the existing protocols and guidelines. These included a lack of training, guidelines not considering patients' socioeconomic conditions, lack of patient education (time constraints, staff shortage), patient noncompliance, and patients not taking ownership of their disease. Both urban and rural patients indicated that staff shortages, high patient load leading to long waiting times, lack of supporting health care services, and transport were barriers to optimal health care at PHC facilities. Focus group discussions conducted with medical students confirmed the before-mentioned findings.

Discussion: In Step 1 of developing the risk assessment and health promotion framework, identified CDL risk factors in each study population were prioritised to complete the risk assessment process. Step 2 identified CDL training needs for PHC teams, patient educational needs, and MBChB CDL curriculum development needs. Step 3 revealed three main barriers: resource constraints, patient noncompliance, and the lack of supporting healthcare services to effectively implement CDL programmes in urban and rural communities. During the final step, Step 4, the six main focus areas identified in steps 1-3 were used to develop a tailor-made community-based patient-centred approach to address CDL.

Conclusion*:* The tailor-made community-based patient-centred approach can facilitate the development of focused and effective CDL PHC prevention and intervention programmes in resource-constrained areas and eventually impact future generations' health and well-being.

Number of words: 468

Number of figures: 5

Number of tables: 5

7.1 INTRODUCTION

Chronic diseases and the need for action

Non-communicable diseases (NCDs), also called chronic diseases, are the major cause of death worldwide, accounting for nearly 85% of premature deaths in low- and middle-income countries (WHO, 2021). Developing countries such as South Africa face significant health challenges, including communicable diseases, maternal/perinatal challenges, and an increasing burden of chronic diseases. These also include cardiovascular diseases (CVDs), diabetes, chronic lung diseases, and mental illness (WHO, 2013a:25). The mortality rate due to NCDs has shown an alarming increase from 43% (2006) to 57.4% (2016) in South Africa (Statistics SA, 2019:29; WHO, 2014:173). NCDs also account for the highest proportion, 40.7% of deaths, followed by HIV/AIDS and tuberculosis (Msemburi et al., 2016:18) in the Free State (FS) province in South Africa (SA). In the rural FS Xhariep district, the total percentages of NCDs deaths for the district increased from 46.5% and 37.7%, amongst females and males, respectively, for the period 2008-2013 (Massyn et al., 2015:341). For the period 2012-2017, it increased by 58% amongst females and 46% amongst males (Massyn et al., 2020:330). Similar trends were observed for the urban FS Mangaung district with a total percentage of NCDs deaths of 46.7% and 39.9%, amongst females and males respectively, reported for the period 2008-2013 (Massyn et al., 2015:373), with a significant increase to 59% and 49%, amongst females and males respectively, for the period 2012-2017 (Massyn et al., 2020:330).

Chronic diseases of lifestyle (CDL) refer to the group of NCDs that develop later in life after long-term exposure to various modifiable risk factors, such as unhealthy dietary habits, tobacco use and physical inactivity (Steyn, Fourie and Temple, 2006). The high burden of CDL impacts heavily on primary health care (PHC) settings in South Africa. This is because it is the first point of contact with health services for many patients, with hypertension and type 2 diabetes mellitus ranking amongst the four most diagnosed conditions at PHC facilities (Mash, 2012; Mayosi et al., 2009). Attention has shifted from focusing only on adult modifiable risk factors for the prevention of CDL to considering wider determinants of health such as socioeconomic factors and early life experiences as important determinants that maintain the vicious cycle contributing to CDL morbidity and mortality (Chen and Lacey, 2018; WHO,

2013a:20,21). Subsequently, various strategies, including a life-course approach, have been suggested to acknowledge the influence of early life experiences and exposure to multiple risk factors throughout the lifespan that can impact adult health and mortality (Jacob et al., 2017).

Current intervention strategies in SA include integrated chronic care and management strategies (DoH, 2012), directed by the WHO's (2006) framework for preventing and controlling chronic diseases. In expanding the latter, the WHO's (2013:41-43) Innovative Care for Chronic Conditions (ICCC) Framework focuses on the importance of evidence-based decisions to develop and drive new, innovative and cost-effective interventions to promote quality integrated patient-centred health care. In this context, it is of the utmost importance to align the country's escalating CDL burden and health needs with health system planning.

Aim and purpose of the study

This study aimed to develop a risk assessment and health promotion framework and formulate recommendations to strengthen existing efforts to prevent and control CDL in rural and urban communities in the FS.

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7.2 METHODS

Research design and setting

The study applied a convergent mixed method design. The quantitative phase of the research study described CDL risk profiles in the urban and rural FS study populations. The qualitative phase generated an in-depth overview of the barriers and challenges that impact the effective implementation of CDL programmes using focus group discussions.

During the quantitative phase of the study, data from a cross-sectional population-based study was utilised to provide a comprehensive overview of the prevalence and risk factors for CDL (type 2 diabetes mellitus, hypertension, CVDs) in rural and urban study samples. Adult household members, between 25-64 years, from the three rural communities in the Southern Free State and a proportional cluster sample of urban community members within the University of the Free State community service area, participated in the study. The detailed methodology applied in the quantitative phase of the study is described in Van Zyl et al.

(2020). Data included socio-demographic and self-reported health information, medical examinations, and blood analysis to measure metabolic risk factors and inflammatory markers. Statistical analysis included determining CDL-associated risk factors using multiple logistic regression models after variable selection separated for the rural and urban study populations.

During the qualitative phase of the study, PHC staff, patients with chronic diseases, and medical students provided insight into their experiences relating to CDL protocols and guidelines used in the PHC setting (PHC workers), the implementation of CDL programmes in PHC settings (PHC workers, patients, medical students) and the CDL curriculum (medical students). After transcribing audio-recorded data, the researcher followed an inductive strategy for thematic data analysis (Stalmeijer et al., 2014), including data coding, identifying categories/sub-categories, and recognising emerging themes (significant findings reflecting the different experiences of the participants).

Content and purpose of the framework

The theoretical base (literature review), quantitative findings (CDL risk assessment for the study populations), and qualitative results (outcomes of focus group discussions with medical students, patients, and PHC teams) were integrated during the interpretative phase of the study. This was done through data triangulation to construct a framework and formulate recommendations to strengthen existing efforts for health promotion, CDL prevention and control in the rural and urban communities in the Free State. **Figure 7.1** summarises the **four-step process** that was applied to construct the framework.

In order to compile the framework, this study integrated findings from the following: WHO (2013) Innovative Care for Chronic Conditions (ICCC) Framework, WHO (2006) Action Framework for the Prevention and Control of Chronic Diseases, the National Development Plan 2030 (National Planning Commission, 2012), Integrated Chronic Disease Management Model (NDoH, 2012), Integrated Clinical Services Management Manual (NDoH, 2016) and the Strategic Plan for the Prevention and Control of Non-Communicable Diseases, 2020-2025 (NDoH, 2019).

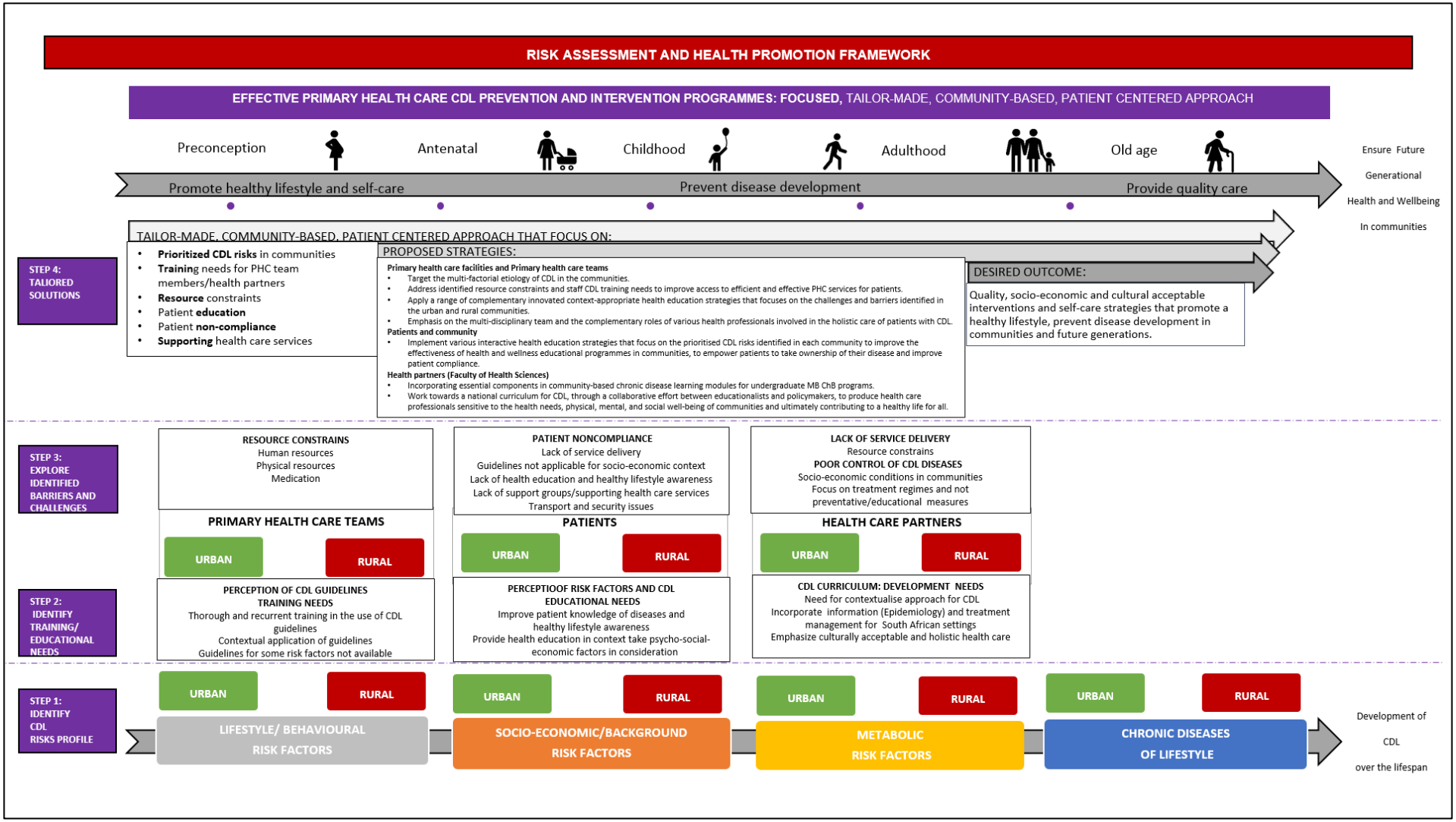


Figure 7.1: **Summary of the four-step process followed to construct the CDL risk assessment and health promotion framework for the urban and rural study population** (compiled by the researcher, S van Zyl 2021)

7.3 RESULTS

Step 1 of the framework development comprised constructing the CDL risk assessments profiles for the urban and rural study populations. Risk assessments allow the identification of several risk factors that deserve attention (Forouzanfar et al., 2016). The prevalence of different socio-behavioural-metabolic risk factors associated with CDL was summarised and prioritised to construct the CDL risk profiles for each study population (**Figures 7.2, 7.3a, and 7.3b**). The risk profiles provided insight into the similarities and differences in CDL risks between the urban and rural study populations.

A comparison of the socio-behavioural-metabolic risk profiles and associated risk factors for chronic diseases of lifestyle in urban and rural communities in central South Africa has been described in detail in Van Zyl et al. (2020). Results revealed the high prevalence of socioeconomic and potentially modifiable behavioural and metabolic risk factors for CDL, such as low fruit and vegetable intake, physical inactivity, alcohol and tobacco use, obesity, high blood pressure, hyperglycaemia, and dyslipidaemia in both study populations. However, several differences between the rural and urban samples were observed; for example, results for socioeconomic determinants illustrated that unemployment status was twice as high in the urban study population (54.8%) than in the rural group (24.2%). In addition, three times more urban participants revealed that they experienced permanent stress, which could be related to their unemployment status. Furthermore, more than half of both urban and rural participants had five or more behavioural and metabolic risk factors present for CDL (**Figures 7.3a and 7.3b)**.

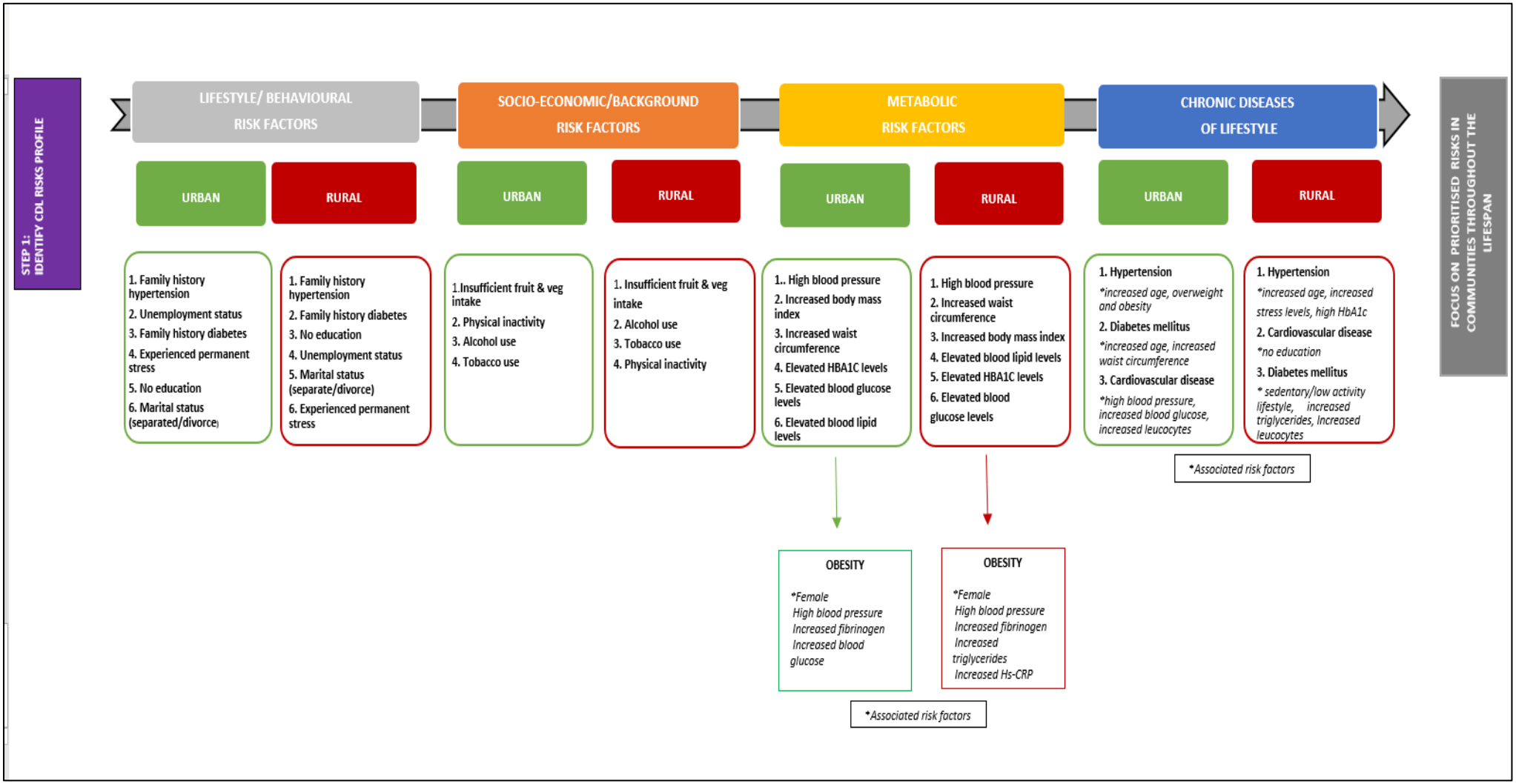


Figure 7.2: **Prioritised risk and associated risk factors for obesity, diabetes, hypertension, and CVD in the rural and urban study population** (Compiled by the researcher, S van Zyl 2021)

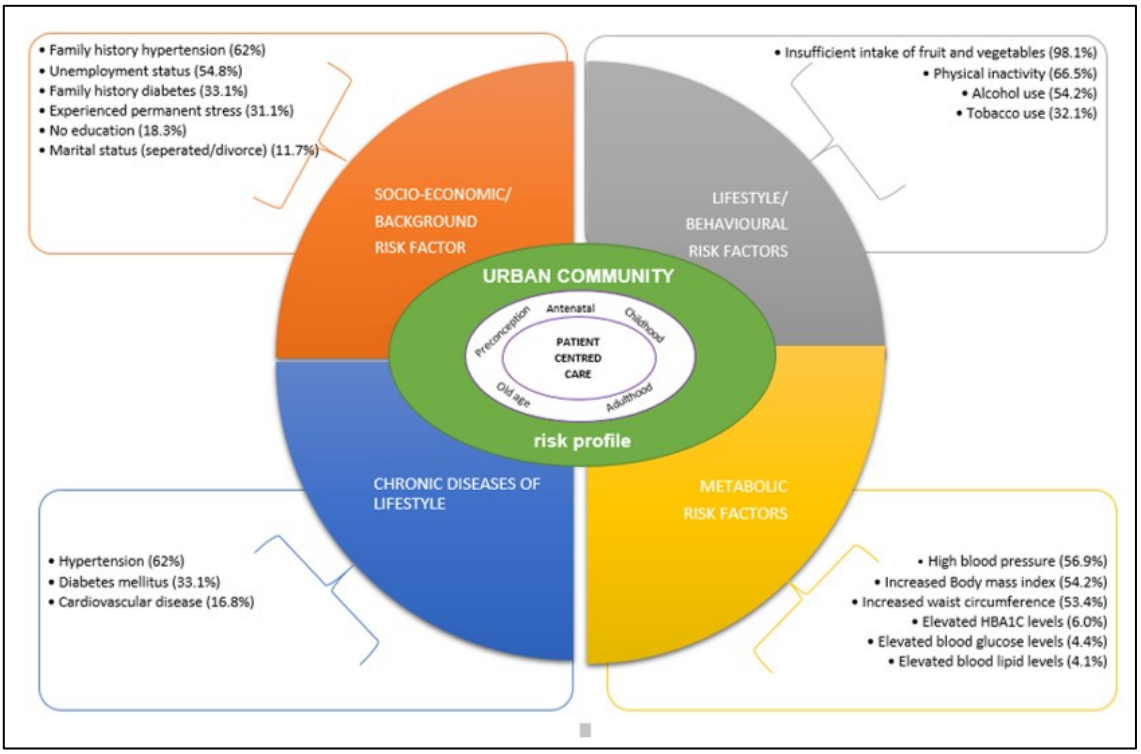


Figure 7.3a: Step 1: Summary of prioritised socioeconomical, behavioural and metabolic determinants of CDL, CDL, and associated risks in the urban study population (compiled by the researcher, S van Zyl 2021; Van Zyl *et al.*, 2020)

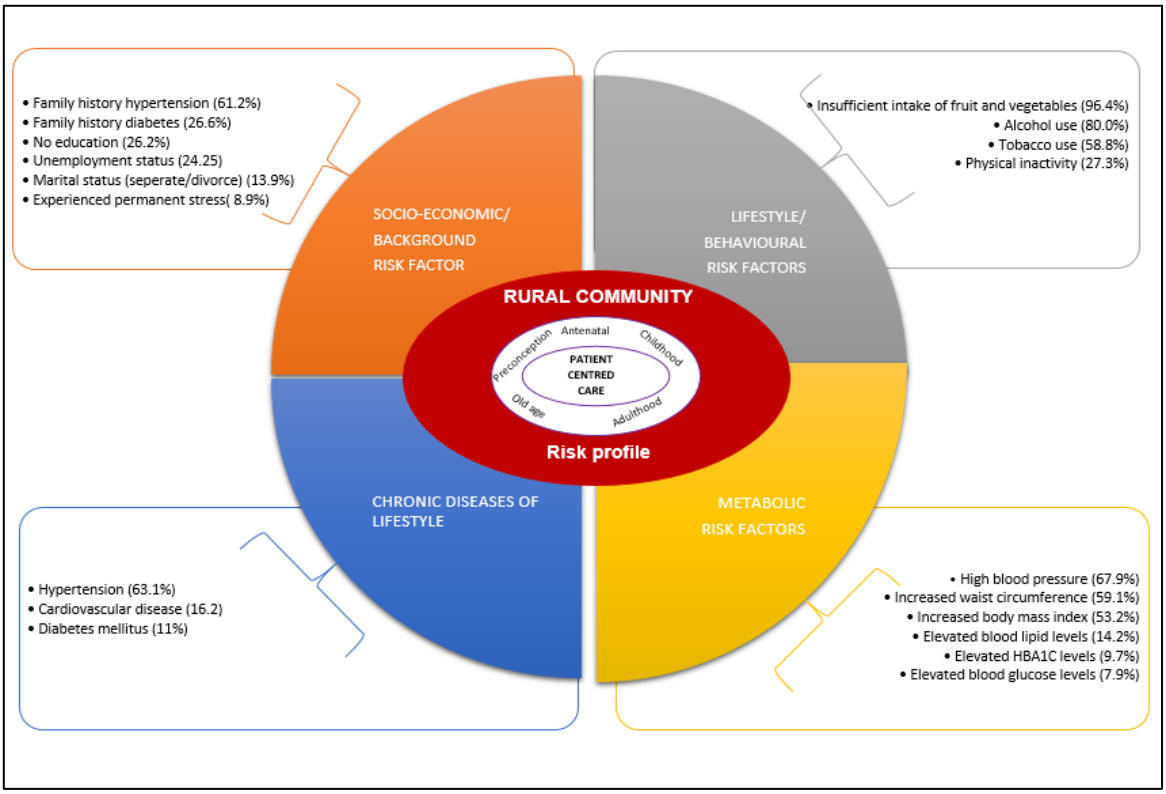


Figure 7.3b: Step 1: Summary of prioritised socioeconomical, behavioural and metabolic determinants of CDL, CDL, and associated risks in the rural study population (compiled by the researcher, S van Zyl 2021; Van Zyl *et al.,* 2020)

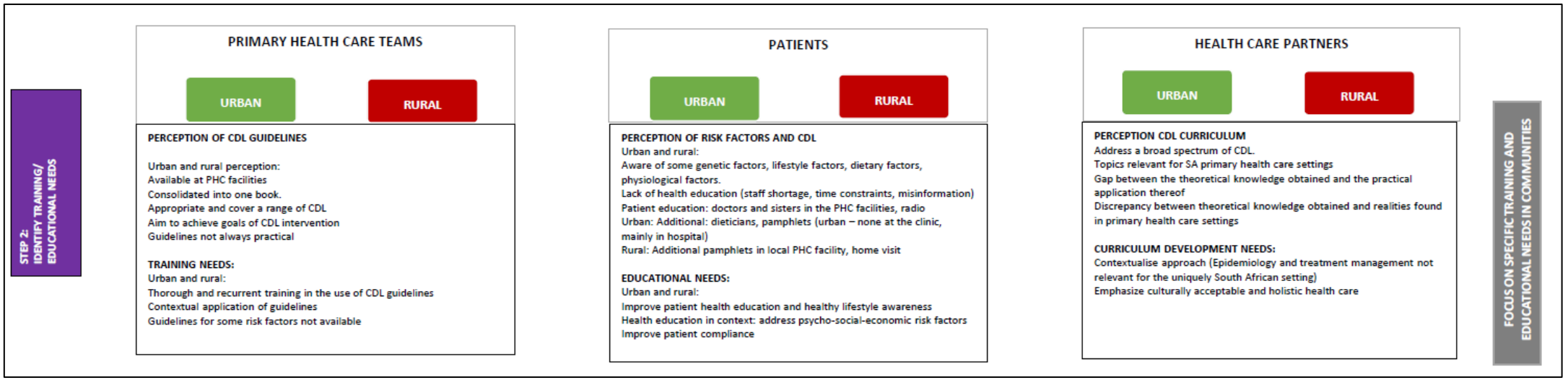
The leading behavioural risk factor in both communities was the insufficient intake of fruit and vegetables attributed to the socioeconomic determinants of CDL discussed above. Other contributing factors could include the considerable distances participants had to walk to buy fruit and vegetables (Walsh and van Rooyen, 2015) and the nutritional transition to a more "Westernised" diet with a low intake of fresh fruits and vegetables (Tydeman-Edwards et al., 2018). Physical inactivity was significantly more prevalent (66.5%) in the urban study population versus 27.3% in the rural study population. In both study communities, high blood pressure was one of the top three risk factors (67.9 percent rural vs 56.9 percent urban).

This study confirmed that components of the metabolic syndrome (obesity, high blood pressure, dyslipidaemia, and increased blood glucose), tobacco, and alcohol consumption were more prevalent among the rural than urban study population. More than half of the participants (53.2% urban and 54.2% rural) were either overweight or obese, while 59.1% of rural participants and 53.4% of urban participants had waist circumference measurements that exceeded the cut-off values. The relationship between obesity and the development of chronic diseases, for example, type 2 diabetes mellitus, hypertension and CVD, is well established (Zatterale *et al.,* 2020). **Figure 7.2** provides more detail on the risk factors associated with obesity and CDL (type 2 diabetes mellitus, hypertension, and CVD) estimated from multiple logistic regression models. Results revealed that being female, having high blood pressure, and increased fibrinogen were associated with obesity in urban and rural study populations. It was also found that increased blood glucose (urban) and increased Hs-CRP and triglycerides (rural) were associated with obesity. Advanced age (urban and rural participants), overweight and obesity (urban), and increased stress and high HbA1c (rural) were positively associated with hypertension. The considerable intra- and intergenerational burden is illustrated by the high incidence of reported CDL (cardio-metabolic disorders) among rural and urban individuals and family members. For example, more than two-thirds of the participants in both samples reported a medical history of hypertension amongst family members. More than a third of urban participants and 27% of rural participants reported a family history of diabetes. This raises the question of the effectiveness of current CDL education, prevention and intervention strategies in these communities.

Therefore, **Step 2** of the framework development aimed to investigate participants' knowledge and implementation of CDL guidelines and protocols (PHC team), knowledge of CDL (patients'), and the application of CDL curriculum content in practice (medical students). *Perceived barriers and challenges to the implementation of Chronic Diseases of Lifestyle programmes experienced by patients* and primary health care teams in an urban and rural primary health care setting in the Free State and *Medical students' perceptions of the chronic diseases of lifestyle curriculum in health care settings in South Africa* has been described in detail in Van Zyl et al., 2020 (submitted). The finding of Step 2 (summarised in **Table 7.4**) revealed three main development areas: **training needs** (PHC team members), **educational needs** (patients) and **curriculum development needs** (health partners – medical students). Both urban and rural PHC team members referred to staff shortages and related time constraints as important factors that affect the training of PHC team members in the management (guidelines and protocols) of CDL and affect patient education. Furthermore, PHC team members indicated that existing guidelines do not always consider the patients' socioeconomic conditions (more detail will be provided in Step 3). They also considered patient noncompliance and patients not taking ownership of their disease as contributing factors for the high CDL intra- and intergenerational burden observed in the communities.

This study revealed important patient educational needs. Patients with chronic conditions (hypertension, type 2 diabetes mellitus, and CVDs) are aware of genetic factors and unhealthy lifestyle factors contributing to CDL development. However, patients in this study lacked knowledge of CDL, had misconceptions of the contributing factors and the development of CDL. Misconceptions include: hypertension is an infectious disease, drinking a lot of water and using cooked salt can prevent the development of CD, such as diabetes and hypertension. The following statements reflect the mentioned misconceptions: *"I want to know the cause of hypertension; my mother and dad don't have it. I am the only one who has it. I want to know who infected me."* (Patient Urban No 6)*; "The salt we eat must be cooked with the food; the raw salt is very dangerous."* (Patient Urban No 8).

Table 7.4: **Step 2: Identified training needs for the effective implementation of CDL guidelines and protocols (PHC team), CDL educational needs (patients), and CDL curriculum development needs (medical students)** (compiled by the researcher, S van Zyl 2021)



Despite the high prevalence of overweight and obesity observed in both study groups **(Figure 7.3a and 7.3b),** maintaining a healthy body weight was not mentioned as part of healthy lifestyle choices during focus group discussions with patients. Patients attributed the lack of health education to various factors, such as staff shortages and related time constraints, and the factors elaborated on below.

Regarding CDL education and healthy lifestyle information, urban and rural patients indicated that they receive health education from physicians during consultations (focused mainly on treatment management and not healthy lifestyle information), nursing sisters in the clinic, radio, and pamphlets (rural). Patients (urban and rural) mentioned a lack of supporting health services (dietetics, physiotherapists). Urban participants revealed that these services were previously available but reported that no functional support groups for CDL (hypertension, diabetes support groups) had been available for the past few years. Furthermore, urban participants stated that they had not been visited at home by PHC team members, community health workers, or health promoters. Advertisements and health awareness days were also not cited as contributing to patients' health knowledge. In the rural setting, the patients indicated that the clinic nursing sisters mainly contributed to what they knew about CDL diseases, while home visits by PHC workers also contributed to their understanding of their disease. Rural PHC team members also confirmed this. However, participants proposed more effective community outreach programmes to improve patient education. One participant highlighted: *"The thing that we need is an outreach team, like a professional nurse. She has to go with us, so if you have a problem, they (patients) can go straight to her"* (PHC worker Rural No 6). This study identified important patient health educational needs and training needs for PHC team members in both the urban and rural study populations. Addressing the patients' educational needs, improving the training needs of PHC teams and applying health education and interventions in context can contribute to improved patient compliance in these communities.

Focus group discussions with medical students emphasised the importance of contextualising educational programmes in these communities, focusing on affordable, culturally acceptable

and holistic healthcare strategies for CDL. Students also identified CDL curriculum development needs; for example, certain CDL content needs to be incorporated or revisited at strategic points throughout the curriculum to have an effective integrated curriculum preparing students for the changing landscape of health care. Furthermore, emphasising socio-cultural-behavioural-economic determinants throughout the CDL curriculum can enhance students' socio-cultural sensitivity and understanding of challenges experienced in urban and rural communities. *Medical students' perceptions of the chronic diseases of lifestyle curriculum in health care settings in South Africa and perceived barriers and challenges to the implementation of Chronic Diseases of Lifestyle programmes experienced by patients and primary health care teams in an urban and rural primary health care setting in the Free State* has been described in detail in Van Zyl et al., 2020 (submitted).

Step 3 of the framework development aimed to provide more insight into the existing environment and report on the challenges and barriers experienced to effectively implement CDL programmes in each community (see **Figure 7.4).** *Perceived barriers and challenges to the implementation of Chronic Diseases of Lifestyle programmes experienced by patients and primary health care teams in an urban and rural primary health care setting in the Free State* and *medical students' perceptions of the chronic diseases of lifestyle curriculum in health care settings in South Africa* have been described in detail in Van Zyl et al., 2020 (unpublished).

During Step 3, the integrated results obtained from focus group discussions with PHC team members, patients, and medical students identified **resource constraints, patient noncompliance** and the **lack of supporting health services** as three significant barriers to the effective implementation of CDL programmes in the urban and rural study populations **(Figure 7.4).** PHC team members indicated that the lack of **human resources** (staff shortages) contributed to the lack of time for proper physical examination of patients (urban), patient education (urban and rural) and training of staff members (urban and rural). In addition, the lack of **physical resources,** for example, the lack of patient education material (urban and rural), infrastructure for support groups (urban), and inadequate levels of medication (rural) were mentioned as contributing factors to the effective implementation of CDL educational, prevention and intervention programmes.

Medical students also attributed the poor control of CDL in the communities to a lack of human and physical resources. They confirmed observations of staff shortages (urban and rural), inadequate levels of medication (rural) and lack of patient education material (urban and rural). They also contributed the lack of services to high patient loads (urban and rural), incomplete files, different physicians (rural), and patients' socioeconomic conditions (urban and rural). This is reflected in the following statements: *"The problem is that our system is very understaffed. We have a shortage of doctors and health staff"* (Medical student No. 6)*; "Regarding the interventions, I think it is quite lacking due to not having the equipment, not having the manpower to see all those patients and serve the whole community"* (Medical student No.7); "*The mom is maybe obese, and she has all these risk factors, but due to time, we don't take that extra five or ten minutes and just quickly check the blood pressure, do a glucose screen and just eliminate those risk factors before she even gets the disease"* (Medical student No.4); *"The chronic management of our patients is very difficult in our clinics because our patients see different doctors the whole time"* (Medical student No. 2).

Furthermore, students observed that the focus in the primary setting remains mainly on communicable diseases and their treatment regimens and that preventative measures or holistic care are not effectively implemented. These observations are reflected in the following statements: *"In the preclinical years they're emphasising obesity for example, but once you get to a clinic it is just completely not like it is a risk factor anymore, nobody cares about it, they just say everybody is obese"* (Medical student No.5); *"In Trompsburg (rural community), we checked each patient's blood pressure and the medication they are on. If the blood pressure was too high, we adjusted the medication every time, but you don't check the patients' weight, you don't check if the patient is losing some weight"* (Medical student No. 3). Madela et al. (2020) also commented on the strong emphasis on communicable diseases at PHC level while observing deficiencies in CDL patient education, care and management.

Patient noncompliance was also identified as a significant barrier to the effective implementation of CDL programmes. Both PHC teams and medical students confirmed that socioeconomic factors, such as poverty, unemployment, food insecurity (urban and rural),

accessibility to PHC settings (urban and rural) and drought (rural) made it difficult for patients to comply and follow health education guidelines (such as following a healthy balanced diet) to reduce CDL risk. This is reflected in the following statements made by PHC workers: *"Some of the guidelines I say they are impossible to implement due to the economics of our community"* (PHC worker Rural No 3). *"We used to advise the patients to have a small garden, but now it is very difficult to advise them because there is no water"* (PHC worker Rural No 2); *"Poverty is the problem; most of them cannot afford it"* (PHC worker Urban No 1). Medical students also observed the socio-cultural and economic impact on health in these communities during CBE rotation. They commented on the different aspects as follows: "*We should have been taught what food is available to the patients, what are the cultural norms*" (Medical student No. 4). *"It is very important that they customise the interventions for a South African setting"* (Medical student No. 9). "*We focus more to restrict salt intake, but what happens if you (refer to the patient) are depressed, suicidal, burnout, or if stress is causing your illnesses?*" (Medical student No. 12). "*There was a nice diabetic poster, but it is in a language that they do not understand, and it is not applicable to their specific diet or their culture or anything*" (Medical student No. 4). The findings illustrate the limitation that socioeconomic factors, including poverty as an important risk factor, placed on patients and households in these communities and their ability to comply with current preventative strategies, such as healthy lifestyle and behavioural approaches. Furthermore, it illustrates the importance of following a patient-centred, contextualised approach as socio-cultural and economic factors experienced in a community may heavily impact patient compliance and the effectiveness of intervention programmes.

Socio-cultural and economic factors restrict patients' compliance and ability to implement necessary lifestyle changes (Gee et al., 2012). However, related chronic psychological stress can also alter the physiological immune responses, further contributing to CD morbidity and mortality (Antoni and Dhabhar, 2019) and contributing to the vicious cycle of CDL (WHO, 2006). In the qualitative phase of the study, patients confirmed that they were experiencing stress (reported in Step 1), and this was again confirmed in the qualitative phase (reported in Step 3) with patients in both communities confirming that they experienced stress due to the socioeconomic challenges (poverty, unemployment, drought) they encounter: *"Stress, I do*

not have money, my children do not have shoes, they do not have water. The stress goes up" (Patient rural No. 7); *"The other thing most of the people they don't work, they don't have a job, and they don't have money, but when you come to the clinic they refer you to the hospital, and you have to pay the taxi, but you don't have money for transport"* (Patient rural No. 8); *She is just explaining that stress does contribute to high blood, but she doesn't know how* (Translator Patient Urban No 9).

The **lack of supporting health services** was the third identified barrier to effectively implementing CDL programmes in the communities. Patients mentioned the lack of supporting health care services (e.g., dieticians, physiotherapists). Urban patients emphasised the need for active support group sessions that focus on healthy lifestyle coaching and psychosocial support to enhance patients' self-care and their ability to manage their chronic condition.

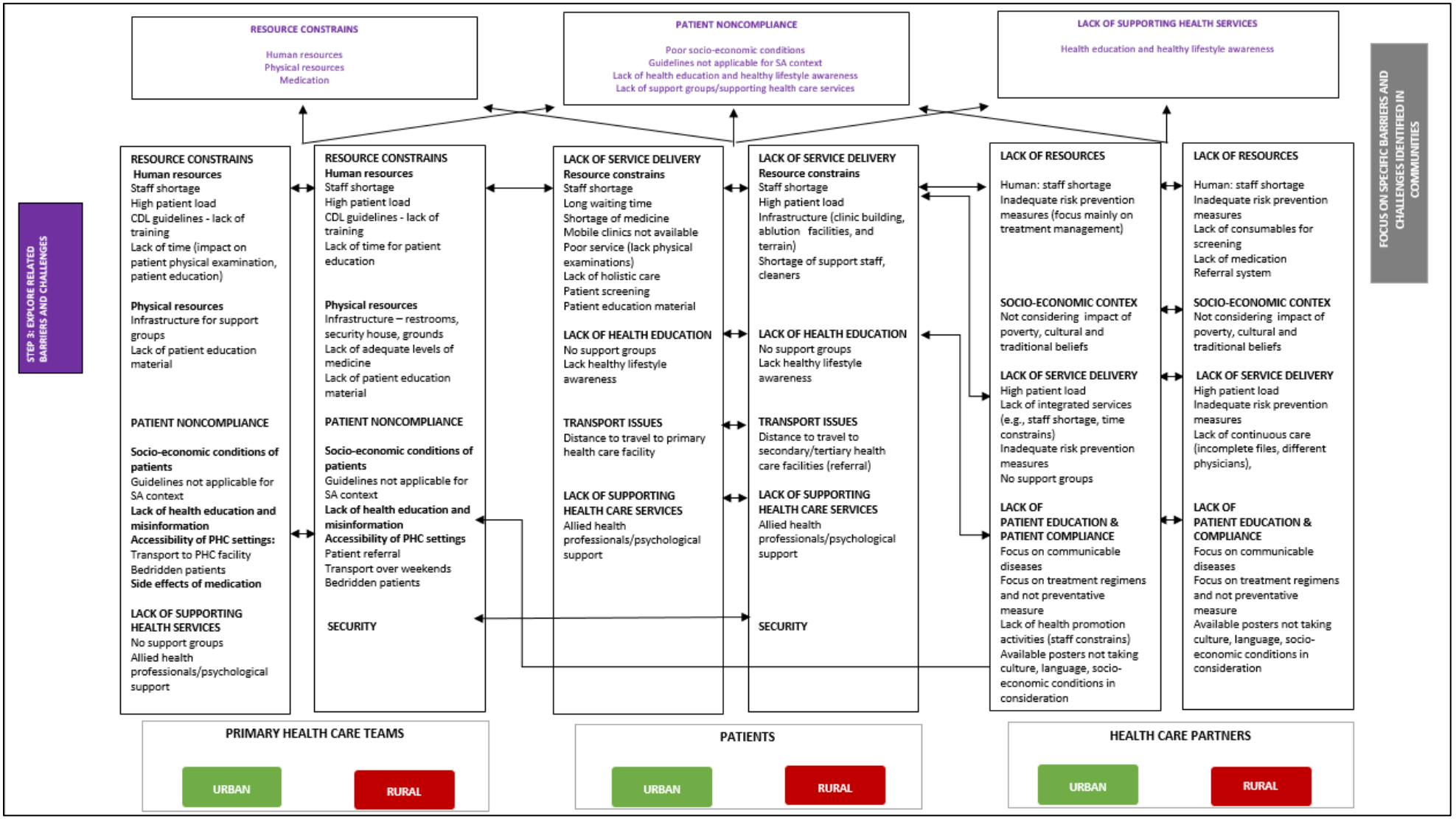


Figure 7.4: **Step 3: Challenges and barriers faced to the effective implementation of CDL programmes in the urban and rural study populations** (Compiled by the researcher, S van Zyl 2021)

With the growing burden of CDL, preventive and long-term management strategies have become increasingly important. Many countries work towards the WHO's global strategy of reorientation and strengthening health care towards high quality, effective primary and community-based care (WHO, 2015:10, 27). Quality healthcare is underpinned by patient-centred care, also known as person-centred care that provides health services and promotes health centred on people's needs and preferences (WHO, 2015:7). Furthermore, the WHO calls for the improved management of NCD, including interventions that focus on the risk factors for CDL in the most cost-effective way to prevent and control the diseases in communities (WHO, 2021). Health services tailored to the individual needs may provide better access, improved health literacy, increased patient participation in health care planning, increased capacity to self-manage and control long-term health conditions, among other benefits. In Step 1 of developing the risk assessment and health promotion framework, each study population's identified CDL risk factors were prioritised to complete the CDL risk profiles during the risk assessment process. Step 2 identified CDL training needs for PHC teams, patient educational needs, and MBChB CDL curriculum development needs. Step 3 revealed three main barriers: resource constraints, patient noncompliance, and the lack of supporting healthcare services to effectively implement CDL programmes in the urban and rural communities. During the final step, **Step 4**, the **six main focus areas** (prioritised CDL risks in communities, training needs, resource constraints, patient education, supporting health care services, patient noncompliance) identified in steps 1-3 (**Table 7.5**) were used to develop a **tailor-made community-based patient-centred approach (Figure 7.5, Table 7.5)** to improve the effectiveness of existing CDL prevention and intervention programmes in the urban and rural communities and eventually improve the health and well-being of all living in the communities.

Table 7.5 Six main focus areas identified and proposed strategies for the implementation of a tailor-made community-based patient-centred PHC approach in the urban and rural communities

MAIN FOCUS AREAS	PROPOSED STRATEGIES FOR THE IMPLEMENTATION OF A TAILOR-MADE COMMUNITY-BASED PATIENT-CENTRED PHC APPROACH IN THE URBAN AND RURAL COMMUNITIES		
	PHC FACILITIES AND PHC TEAMS	**PATIENTS AND COMMUNITY**	**HEALTH PARTNERS (MBChB STUDENTS)**
1. PRIORITISED CDL RISKS IN COMMUNITIES	Use identified prioritised psycho-socio-cultural-economic risk profiles, early screening toolkits and essential point of care devices in the different communities for early identification of patients at risk.	Apply CDL guidelines and interventions in context - consider the socio-cultural-economic context of communities.	Curriculum development: Refresher courses before CBE rotation in the clinical phase that focus on the prioritised CDL in urban and rural communities (for example, treatment management refresher courses, information of supporting health services, and different referral levels). Development of soft skills (Emotional (EQ), social (SQ), and cultural (CQ) intelligence). Incorporate healthy lifestyle coaching skills development opportunities. Work towards a national curriculum for CDL
2. TRAINING NEEDS	Provide adequate CDL guidelines training programmes to enhance the staff's ability to apply interventions in context.	Use healthy lifestyle counselling (focusing on the prioritised risk identified in the communities) during discussions of patient support groups and other health education campaigns (school programmes, home visits and door-to-door).	
3. RESOURCE CONSTRAINTS	Address identified human and physical resource constraints in PHC facilities in the different communities.		Health partners to develop healthy lifestyle educational material as part of module-specific outcomes in the preclinical phase.
4. PATIENT EDUCATION	Investing in multi-media health education and awareness campaigns that promote healthy lifestyle choices throughout the individual's life course.	Focus on the identified and prioritised CDL risks in each community to strengthen focused health and wellness educational programmes in the communities Provide healthcare literature in local languages that focus on the prioritised risk factors and relevant health lifestyle measurements.	Health partners to assist in promoting healthy lifestyle during CBE rotations in the clinical phase (using various methods: educational material, health dialogue during support groups, home visits and door-to-door campaigns).
5. SUPPORTING HEALTH CARE SERVICES	Supply essential supporting health care services (dieticians, phycologists, social workers, and healthy lifestyle coaches). Focus on active patient support groups.	Functional PHC/community outreach teams that expand the focused, tailor-made patient-centred approach beyond the PHC facility into the community: home visits and door-to-door campaigns.	
6. PATIENT NONCOMPLIANCE			

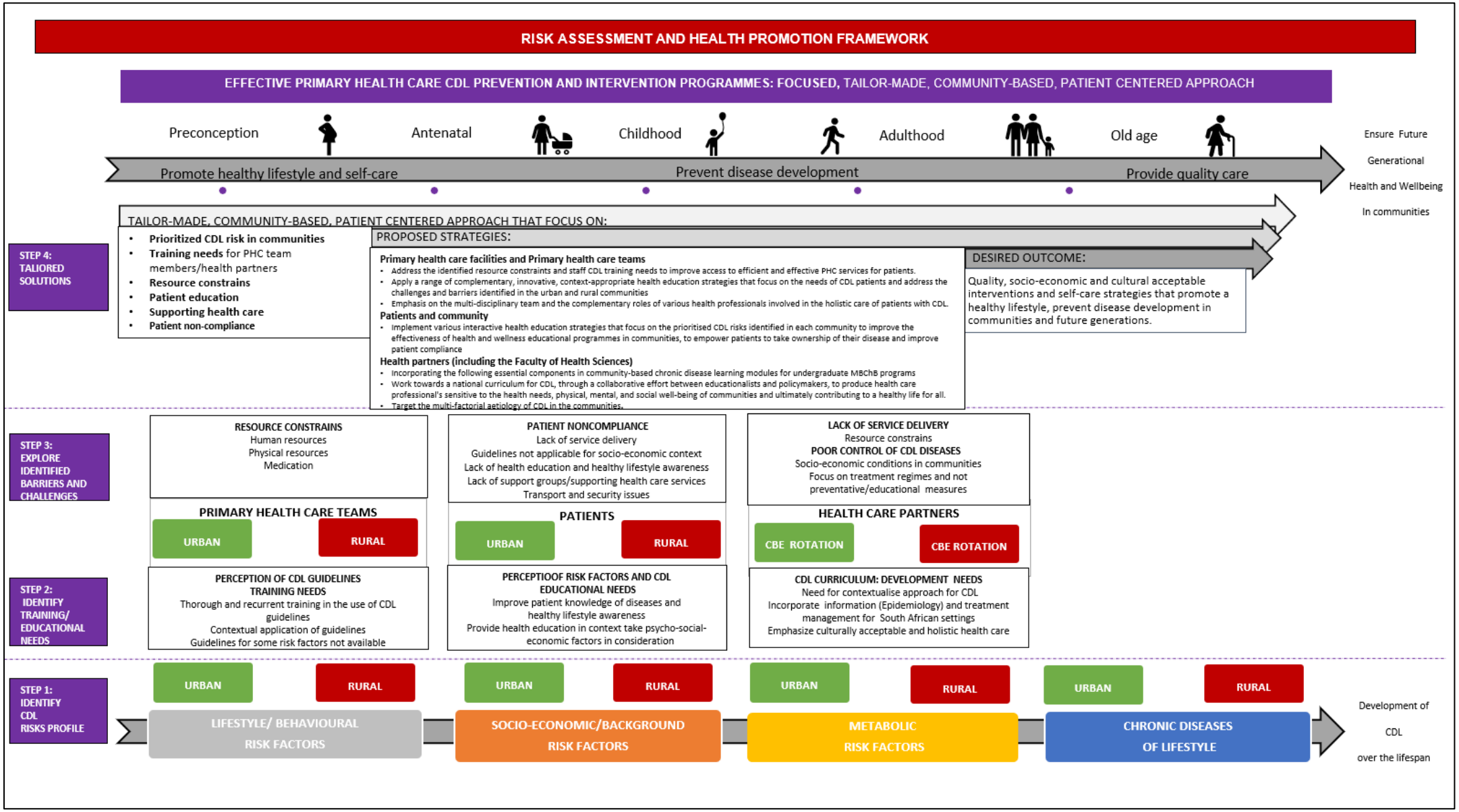


Figure 7.5. CDL risk assessment and health promotion framework (Compiled by the researcher, S van Zyl 2021)

7.4 CONCLUSION AND RECOMMENDATIONS

This study confirmed the high burden of CDL in the urban and rural FS communities and the need to implement effective and focused PHC prevention and intervention programmes in the communities. Furthermore, the results of the current study illustrate the importance of having a contextual understanding of the multi-factorial aetiology of CDL with emphasis on the different determinants (social, economic, cultural, psychological, behavioural, and metabolic factors), barriers and challenges experienced on PHC level that drive the CDL disease processes in these communities. Implementing focused and tailor-made community-based PHC prevention and intervention programmes is proposed to reduce the prevalence of prioritised risk factors in communities. Health education and healthy lifestyle counselling that focus on the prioritised risk factors in each community can empower patients to take ownership of their health. Furthermore, educational programmes that emphasise the benefits of a healthy early environment (using the identified prioritised CDL risk profiles for each community) and promoting a healthy lifestyle throughout the individual's life course can decrease the current intergenerational transmission of CDL in communities.

Based on the findings of this study (**Figure 7.5**), the researcher recommends the following strategies (summarised in **Table 7.5**) based on a tailor-made community-based patient-centred PHC approach:

Primary health care facilities and Primary health care teams

- Target the multi-factorial aetiology of CDL in the communities**.**
    - Intervention programmes that focus on the prioritised CDL risks and the risk factors associated with CDL (obesity, type 2 diabetes mellitus, hypertension, CVD) in each community (**Table 7.3a and 7.3b**) and optimise protocols to incorporate community-specific context.
    - Enhance the screening for CDL and associated risk factors (**Table 7.2**) by using essential point of care devices that can contribute to the immediate identification of critical biochemical markers (e.g., HbA1c, Hs-CRP, fibrinogen).

    - Apply CDL guidelines and interventions in context; for example, consider the socio-cultural-economic context of communities during the implementation of protocols, guidelines, and interventions (**Figure 7.4**).
- Address the identified resource constraints and staff CDL training needs to improve patients' access to efficient and effective PHC services.
    - Address identified human and physical resource constraints in the different PHC facilities in the urban and rural communities (**Figure 7.4**).
    - Provide adequate and recurrent CDL guidelines training programmes to enhance the ability of staff to apply interventions effectively (**Table 7.4**).
- Apply a range of complementary, innovative, context-appropriate health education strategies that focus on the needs of CDL patients and address the challenges and barriers the patients have identified in the study (**Table 7.4, Figure 7.4**). Strategies can include:
    - Effective health education and awareness campaigns implemented at local clinics that include, for example, multi-media approaches that consist of video recordings followed by live questions and answer sessions/health talks; assist patients in the use of new technologies, for instance, eHealth/healthy lifestyle applications (Monzani and Pizzoli, 2020); display of multilingual educational posters and pamphlets (also see the section on Health partners below).
    - Active support group sessions that include CDL health literacy, healthy lifestyle coaching (focusing on implementing healthy lifestyle recommendations and patients' ability to manage their condition), and psychosocial support.
- Place more emphasis on the multi-disciplinary team and the complementary roles of various health professionals involved in the holistic care of patients with CDL.
    - Apply a holistic PHC service by including essential supporting health care staff members (dieticians, phycologists, social workers, and healthy lifestyle coaches) as part of the PHC team in communities.

Patients and community

- Implement various interactive health education strategies that focus on the prioritised CDL risks identified in each community to improve the effectiveness of

health and wellness educational programmes in communities, empower patients to take ownership of their disease and improve patient compliance (**Figure 7.4**).

- Functional PHC teams and community outreach teams that expand the integrated, holistic patient-centred approach beyond the PHC facility into the community: home visits and door-to-door campaigns
- Active patient support groups outside the PHC facility (e.g., church groups) can effectively support health education efforts
- Investing in multi-media health education and awareness resources (e.g., pamphlets, posters) in local languages in local communities that focus on identifying prioritised risk factors and promoting associated healthy (anti-inflammatory) lifestyle interventions throughout the individual's life course. This can be done in conjunction with health partners (e.g., health science partners). Distribute the health information/educational material in local businesses, print media, and local awareness campaigns. Provide the resources to teachers to enhance awareness of significant risk factors for CDL in schools.

Health partners (including other health professionals involved in the training of undergraduate medical students in the Faculty of Health Sciences)

- Incorporating the following essential components in community-based chronic disease learning modules for undergraduate MBChB programmes (**Table 7.4 and Figure 7.4**):
  - Development of soft skills (Emotional (EQ), social (SQ), and cultural (CQ) intelligence) from the foundation phase (preclinical phase)
    - Integrating socio-cultural and emotional experiences as part of a student's professional development (an e-portfolio) throughout the curriculum can assist students in developing socio-cultural and self-awareness.
  - Incorporate healthy lifestyle counselling skills development opportunities (training opportunities/webinars) into the preclinical CDL curriculum component. Involve students in promoting healthy lifestyle information/educational material (using above obtained skills) during the clinical CDL curriculum (component CBE rotations) distribution in the

communities. These activities can be assessed and incorporated as part of a student's professional development (an e-portfolio).

    - Appropriate preparation of health professional students before CBE rotation, for example, the use of the WHO "Package of essential non-communicable (PEN) disease interventions for primary health care" as part of pre-clinical educational courses (WHO, 2020:67)

- Work towards a national curriculum for CDL, through a collaborative effort between educationalists and policymakers, to produce health care professionals sensitive to the health, physical, mental, and social well-being needs of communities and ultimately contributing to a healthy life for all.

Final recommendations, novel contributions and limitations of this study will be discussed in the last chapter.

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CHAPTER 7 ARTICLE 4 SUPPLEMENTARY FILES

Table S1 – S5 from Chapter 4, Article 1

Table S1: Reported socio-demographic/ background risk factors of rural and urban participants

Risk factor	Rural			Urban			*p*-value for % difference
	N	n	%	N	n	%	
Age	**575**			**429**			< 0.01
25 - 29 years		34	5.9		51	11.9	
30 - 34 years		52	9.0		37	8.6	
35 - 39 years		67	11.7		64	14.9	
40 - 44 years		80	13.9		58	13.5	
45 - 54 years		158	27.5		125	29.2	
55 - 65 years		184	32.0		94	21.9	
Gender	**575**			**429**			0.08
Men		167	29.0		103	24.0	
Women		408	71.0		326	76.0	
Marital status	**546**			**403**			< 0.01
Never married		110	20.1		137	34.0	
Married/Traditional marriage		182	33.3		120	29.8	
Living with a partner		73	13.4		40	9.9	
Widowed		104	19.1		58	14.4	
Separated		55	10.1		18	4.5	
Divorced		21	3.8		29	7.2	
Other		1	0.2		1	0.3	
Medical history							
Previously diagnosed with diabetes mellites	**547**	60	11.0	**405**	30	7.4	0.06
Previously diagnosed with hypertension	**548**	346	63.1	**405**	195	48.2	< 0.01
Previously diagnosed with the following CDVs:							
Stroke	**549**	36	6.6	**405**	21	5.2	0.33
Heart disease, angina, heart attack	**545**	88	16.2	**405**	68	16.8	0.79
Heart failure	**549**	6	1.1	**405**	19	4.7	< 0.01
Family history							
Member previously diagnosed with diabetes mellitus	**548**	145	26.6	**405**	134	33.1	0.03
Member previously diagnosed with hypertension	**544**	333	61.2	**405**	251	62.0	0.81
Member previously diagnosed with the following CDVs:							
Stroke	**543**	84	15.5	**405**	78	19.3	0.12
Heart disease, angina, heart attack	**542**	107	19.8	**405**	107	26.4	0.01
Heart failure	**546**	33	6.0	**405**	26	6.4	0.81
Level of education	**550**			**416**			< 0.01
None		144	26.2		76	18.3	
Primary school education		173	31.5		153	36.8	
Secondary school education:							
Grade 8—10		145	26.4		100	24.0	
Grade 11–12		85	15.5		84	20.2	
Tertiary education		3	0.6		3	0.7	
Employment status	**575**			**429**			< 0.01
Housewife by choice		14	2.4		3	0.7	
Unemployed		139	24.2		235	54.8	
Self-employed		9	1.6		4	0.9	
Full-time wage earner (receive a salary)		42	7.3		21	4.9	
Other (part-time job, piece job)		371	64.5		166	38.7	
Experienced stress	**539**			**405**			< 0.01

Never	173	32.1	54	13.3
Few periods of stress	173	32.1	129	31.9
Several periods of stress	145	26.9	96	23.7
Permanent stress	48	8.9	126	31.1

CDV = cardiovascular disease; N = number of participants

Table S2: Summary of behavioural and metabolic risk factors of rural and urban participants

Risk factor	Parameter	Rural			Urban			*p*-value for % difference
		N	n	%	N	n	%	
Behavioural risk factors								
Tobacco use	Currently smoke & formerly smoked	548	322	58.8	405	130	32.1	< 0.01
Insufficient intake of fruit and vegetables	Consumption less than five servings (400 grams) of fruit and vegetables per day	550	530	96.4	418	410	98.1	0.11
Alcohol use	Currently intake and formerly used	546	437	80.0	404	219	54.2	< 0.01
Physical inactivity	Level 1 (i.e., sedentary: less than 60 minutes of moderate to vigorous-intensity activity daily) and Level 2 (i.e., low activity: less than 150 minutes of moderate-intensity activity per week)	550	150	27.3	415	276	66.5	< 0.01
Metabolic risk factors								
Elevated blood lipids (total cholesterol)	High risk: ≥ 240 mg/dL (≥ 6.22 mmol/L)	52	75	14.2	415	17	4.1	< 0.01
High blood glucose	≥ 7.0 mmol/L (126 mg/dL)	544	43	7.9	411	18	4.4	0.03
HbA1c	Diabetes: 6.5% or higher (48 mmol/mol or higher)	548	53	9.7	415	25	6.0	0.04
High blood pressure	Systolic blood pressure of 140 mmHg or higher and/or a diastolic pressure of 90 mmHg or higher	563	382	67.9	413	235	56.9	< 0.01
Body mass index	Overweight and obese BMI ≥ 25.00	555	295	53.2	419	227	54.2	0.75
Waist circumference	Men ≥ 102 cm (high risk) / Women ≥ 88 cm (high risk)	547	323	59.1	418	223	53.4	0.08

Table S3: Ranked behavioural and metabolic risk factors of rural and urban participants

Rural	Percentage (%)	Ranking	Percentage (%)	Urban
Insufficient intake of fruit and vegetables	96.4	**1**	98.1	Insufficient intake of fruit and vegetables
Alcohol use	80.0	**2**	66.5	Physical inactivity
High blood pressure	67.9	**3**	56.9	High blood pressure
Increased waist circumference	59.1	**4**	54.2	Alcohol use
Tobacco use	58.8	**5**	54.2	Body mass index
Body mass index	53.2	**6**	53.4	Increased waist circumference
Physical inactivity	27.3	**7**	32.1	Tobacco use
Elevated blood lipid levels	14.2	**8**	6.0	Elevated HbA1c levels
Elevated HbA1c levels	9.7	**9**	4.4	Elevated blood glucose levels
Elevated blood glucose levels	7.9	**10**	4.1	Elevated blood lipid levels

Table S4: Ranking of the markers of inflammation in rural and urban participants

Rural		Ranking	Urban	
Marker	**Percentage (%)**		**Percentage (%)**	**Marker**
Fibrinogen	32.9	**1**	48.3	Fibrinogen
Total leucocytes	13.1	**2**	6.0	Monocytes
Lymphocytes	7.7	**3**	4.3	Total leucocytes
Monocytes	6.5	**4**	4.1	Neutrophil:leucocyte ratio
Neutrophil:leucocyte ratio	5.4	**5**	1.7	Lymphocytes
Neutrophils	4.6	**6**	1.4	Neutrophils

Table S5: Significant socio-behavioural-metabolic risk factors, inflammatory biomarkers associated with the presence of obesity, cardiovascular disease, hypertension, and diabetes mellitus in a rural and urban sample

		Rural		Urban	
	Variables	Odds ratio [95% confidence interval]	*p-value	Odds ratio [95% confidence interval]	*p-value
Obesity					
Sex	Female vs male	3.90 [2.35;6.48]	< 0.01	8.64 [4.14;18.04]	< 0.01
Smoke	Yes vs No	0.25 [0.16;0.40]	< 0.01	0.42 [0.23;0.72]	< 0.01
High blood pressure	Yes vs No	1.72 (1.01;2.94]	0.05	4.54 [2.60;7.93]	< 0.01
High blood glucose levels	Yes vs No			3.41 [1.27;9.13]	0.02
Elevated triglycerides	Yes vs No	2.95 [1.86;4.66]	< 0.01		
Average/high-risk Hs-CRP	Yes vs No	2.59 [1.20;5.60]	0.02		
Elevated fibrinogen	Yes vs No	2.04 [1.28;3.24]	< 0.01	2.11[1.27;3.49]	<0.01
Hypertension					
Age(years)	55–65 vs 25–34	11.82 [5.40;25.84]	< 0.01	19.16 [7.86;46.74]	< 0.01
Age (years)	45–54 vs 25–34	6.20 [3.05;12.60]	< 0.01	7.74 [3.96;15.14]	0.04
Age (years)	35–44 vs 25–34	1.93 [1.04;3.56]	0.01	3.03 [1.61;5.68]	0.02
Stress	never vs permanent stress	0.27 [0.08;0.95]	< 0.01		
Stress	few periods of stress vs permanent stress	0.40 [0.11;1.44]	0.21		
Stress	several periods of stress vs permanent stress	0.77 [0.21;2.88]	0.18		
BMI				2.19 [1.08;4.41]	0.03
Waist circumference				2.44 [1.22;4.90]	0.01
HbA1c	Diabetes (Yes vs No)	10.40 [1.37;78.98]	0.02		
Diabetes					
Age(years)	55–65 vs 25–34			8.84 [1.92;40.66]	< 0.01
Age (years)	45–54 vs 25–34			7.32 [1.61;33.30]	0.02
Age (years)	35–44 vs 25–34			2.23 [0.44;11.41]	0.25
Smoke	Yes vs No			0.23 [0.08;0.60]	< 0.01
Physical inactivity	1 vs 2	1.84 [1.01;3.38]	0.05		
Increased waist circumference	Yes vs No	4.10 [1.91;8.77]	< 0.01		
Elevated triglycerides	Yes vs No	2.14 [1.19;3.82]	0.01		
Elevated leucocytes	Yes vs No	2.33 [1.15;4.67]	0.02		
Cardiovascular diseases					
Stress	never vs permanent stress	1.90 [0.88;4.11]	0.05	0.75 [0.31;1.82]	0.86
Stress	few periods of stress vs permanent stress	2.14 [0.98;4.67]	0.01	0.30 [0.13;0.66]	< 0.01
Stress	several periods of stress vs permanent stress	0.74 [0.35;1.56]	< 0.01	1.75 [0.93;3.30]	< 0.01
Education	none vs tertiary education	2.91 [1.34;6.30]	0.04		
Education	primary school vs tertiary education	2.03 [1.12;3.67]	0.31		
Education	grade 8-12 vs tertiary education	1.24 [0.73;2.11]	0.12		
High blood pressure				2.84 [1.39;5.78]	< 0.01
Glucose levels	Diabetes (Yes vs No)			2.24 [1.03;4.88]	0.04
Elevated leucocytes	Yes vs No			3.17 [1.09;9.21]	0.03

* $p < 0.05$

Table S6 from Chapter 5, Article 2

Table S6. Overarching themes, main themes, sub-themes, and an overview of the main findings of focus group discussions with medical students

OVERARCHING THEME/CONCEPTS	MAIN THEME	SUB-THEMES	RELEVANCE, CHALLENGES AND BARRIERS
ACADEMIC KNOWLEDGE OF CDL	1. Responsiveness and relevance of the MBChB curriculum to the growing burden of CDL	1.1 Quantity of CDL curriculum content	• Address a broad spectrum of CDL. • Most topics relevant for SA primary health care settings
		1.2 Quality of CDL curriculum content	• Epidemiology and treatment management not relevant for the uniquely South African setting • Some content received was obsolete
		1.3 Transition from theory to clinical practice	• Gap between the theoretical knowledge obtained and the practical application thereof
	2. Realities faced in primary health care settings	2.1 Alignment of theoretical content with the health needs of the community 2.2 Implementing health care in context	• Discrepancy between *theoretical knowledge obtained and realities found in primary health care settings* *Importance of teaching health care in context, for example, the need for affordable, culturally acceptable, and holistic health care*
EXPERIENCES OF CDL PROGRAMMES IN RURAL AND URBAN PRIMARY HEALTH CARE SETTINGS	3. Implementation of CDL programmes in resource-constrained primary health care settings	3.1 Health promotion and education programmes	• Lack of educational material, outdated information on educational material, poster display not optimal, language barriers, and posters that focus primarily on communicable diseases. *Emphasise the positive contribution that students can make in promoting health education during CBE rotations in PHC facilities.*
		3.2 Effectiveness of existing prevention and intervention programmes.	• Urban and rural: Focus on communicable diseases (for example, HIV and TB, immunisation and needle stick injury), high patient load, and staff shortage • Lack of resources for screening, lack of medication (rural) • Lack of integration observed to the challenges experienced (e.g., staff shortage, time constraints) *Need to contextualised CDL health needs and offer culturally acceptable and holistic health care*
	4. Acute and ongoing management of CDL	4.1 Challenges and barriers observed for the management of acute complications of chronic diseases of lifestyle	• Urban and rural: Lack of resources in the primary health care clinics (lack of staff), apparatus for prevention, patient load, rural: referral system
		4.2 Challenges and barriers observed for the ongoing management of chronic diseases of lifestyle	• Urban and rural: Poor control: lack patient compliance (more in urban), staff and resource shortage, high patient load (especially a problem in the urban setting), lack of physical resources for screening (rural), lack of patient education, lack of consumables to diagnose complications, late presentation due to inadequate risk prevention measures, lack of continuous care - incomplete files, different physicians (rural), treatment management problems (rural), lack of medicine (rural), availability of protocols (rural), lack/old educational material (posters focus on communicable diseases, no obesity posters, cultural and traditional beliefs. • Focus in the primary setting remains mainly on treatment regimens and not preventative measures.
		4.3 Areas of good practice observed in the management of CDL	• Rural: diabetes lifestyle groups and a point reward systems • Urban: Integrated services, effective screening practices for CDL in antenatal clinics
DEVELOPMENT OF PROFESSIONAL ATTRIBUTES AND COMPETENCIES	5. Reflection on the CBE experience	5.1 Meaningful experiences	• Experiences broaden the understanding of primary health care and the concept of delivering health care in the context
		5.2 Opportunity to develop graduate competencies	• Develop communication and collaboration skills • Develop different roles expected of a health care provider (health promotor and health advocate) • Need to receive lecturers from other members of the multi-disciplinary team members in the preclinical years
		5.3 Improve the understanding of the social-cultural context of health and disease in different communities	• Need to develop social, cultural, and economic sensitivity before CBE *CBE provided an opportunity to observe the social, cultural, and economic context of health and disease in communities and their role as future physicians and the patient (self-care) can play as agents of change.*
		5.4 Psychological impact of the CBE experience	• Emotional (stress) experienced due to lack of supervision, language barriers, resource constraints, protocols not followed/or not available in primary health care settings, not being aware of different levels of referral, and the roles and responsibility of health care workers

Table S7 and S8 from Chapter 6, Article 3

Table S7. Overarching themes, sub-themes, and an overview of the main findings of focus group discussions with urban and rural primary health care team members

OVERARCHING THEME	SUB-THEMES	OVERVIEW OF MAIN FINDINGS
Knowledge of CDL protocols/guidelines	• Awareness and availability of guidelines • Range of CDL covered • The relevance of the guidelines for the SA context	Urban and rural: CDL protocols and guidelines available aim to achieve goals of CDL intervention Guidelines for some risk factors not available Urban: CDL protocols and guidelines are consolidated into one book. Covers a range of CDL. Relevant for the SA context Rural: Use guidelines in clinic and community workers for patient education
Training to implement guidelines and protocols	• Training programme • Training need • Challenges experienced	Urban: The facilitator provides training at the clinic Currently no training and updates due to a shortage of staff Rural: Need for recurrent and thorough training
Practical implementation of CDL protocols and guidelines	Barriers/challenges experienced: • Appropriateness of guidelines • Socioeconomic conditions • Patient compliance • Resource constraints (human, medication) • Accessibility of PHC settings • Infrastructure and security	Urban and rural: Guidelines not always practical Certain CDL risk factors not covered in the guidelines the socioeconomic condition of patients/community Noncompliance and/ denial Lack of health education (staff shortage, time constraints, misinformation) Transport problems Urban: No support groups Bedridden patients, side effects of medication Rural: barriers/challenges Resource constraints: the shortage of stock Patient referral and transport over weekends PHC facility: Infrastructure, security
Proposed solutions and current best practices	Proposed solutions • Fully functional and active PHC teams • Focus on a patient-centred approach • Address human resource constraints • Improve community-based health education strategies	Urban Holistic patient-centred approach Patients taking ownership of the disease Focused health education and awareness campaigns - multi-media approach (TV/video's for patients education followed by questions and answer session, posters, pamphlets (multi-lingual), newspapers Active support groups Functional community outreach teams (community health workers - home visits and door-to-door campaigns) and multi-disciplinary teams (important roles of dieticians and phycologist) Rural: An active community outreach team Staff appointments Improve management reporting system
	Best practices • Progress with integrated programmes • Communicable disease intervention programmes	Urban Integrated programmes Contribution of clinical assistants Rural Integrated programmes Implementation of CDL guidelines during home visits. Communicable diseases: adherences groups Card system for appointments - even distribution of patients

Table S8. Overarching themes, sub-themes, and an overview of the main findings of focus group discussions in urban and rural patients with chronic conditions

OVERARCHING THEMES	SUB-THEMES	COMPARISON OF THE MAIN FINDINGS
Knowledge of CDL	• Knowledge of factors that contribute to the development of CDL. • Knowledge of factors that prevent the development of CDL. • Knowledge of the pathophysiology/development of CDL. • Knowledge of pregnancy and CDL • Long-term treatment of CDL	**Urban and rural:** Genetic factors, lifestyle factors, dietary factors, physiological factors, social-economic factors Regular check-ups, taking medication, and monitoring of adverse effects of medication
Health promotion and education	• Factors contributed to participants knowledge of CDL • Type of health education and additional health promotion services provided	**Urban and rural:** Doctors and sisters in the clinic, pamphlets, radio, home visits **Urban:** Sometimes sisters, dieticians, pamphlets (urban – none at the clinic, mainly in hospital) **Rural:** Home visit
Experience of the quality of CDL health care at the primary health care facility	Factors that affect the delivery of optimal, quality health care service at PHC facilities • Resource constraints (human, medication) • Infrastructure • Security • Transport issues • Lack of supporting health services	**Urban and rural:** Poor/lack of services (patient load/staff shortage) Lack of supporting health care services Transport Need for support groups Distance to travel to primary health care facilities **Urban:** Long waiting time Shortage of medicine Lack of holistic care Mobile clinics not available Poor service (no physical examinations) **Rural:** Security Infrastructure (dilapidated clinic building, ablution facilities, and terrain) Shortage of support staff (cleaners)

CHAPTER 8: Conclusion, recommendations, novel contributions and limitations of the study

8.1 INTRODUCTION

It is of the utmost importance to curb the rising burden of CDL in developing countries such as South Africa. Given this, the study's overall goal was to develop a risk assessment and health promotion framework. The framework considered the prevalence of CDL (CVD, hypertension, and diabetes mellitus), related risks, and existing efforts and challenges experienced in preventing and controlling CDL in a rural and an urban PHC setting in the Free State, South Africa. The reason for developing the framework was to enhance the effectiveness of health promotion efforts and eventually positively impact the health and well-being of the study populations. The risk assessment and health promotion framework was developed by compiling risk profiles for each study population and evaluating challenges and barriers experienced to implementing current CDL intervention programmes. Implementing a tailor-made, community-based patient-centred approach as proposed by the developed framework can reduce the risk for CDL disease development in these communities, promote a healthy lifestyle, and ensure future generation health and well-being.

8.2 CONCLUSION AND RECOMMENDATIONS

This study confirmed the high burden of CDL and associated risk factors in the urban and rural FS study populations. Furthermore, various barriers and challenges experienced on PHC level in these communities were highlighted that identified a clear need for effective and focused PHC interventions on decreasing the CDL disease burden in these communities. Based on the findings in PHASE I and PHASE II of the study, the researcher constructed a risk assessment and health promotion framework (PHASE III) and developed a focused tailor-made community-based patient-centred PHC approach, focused on **six main areas** identified in this study (prioritised CDL risks in communities, training needs, resource constraints, patient education, supporting health care services, patient non-compliance). Recommendations and proposed strategies (discussed in Chapter 7 and summarised below) can assist in reducing the burden of CDL in these communities.

The researcher recommends utilising **prioritised CDL risk profiles of the study communities** to optimise current CDL programmes, such as applying protocols and guidelines in context and enhancing the screening of the prioritised risk factors identified in the different communities. Furthermore, patient access to efficient and effective PHC facilities and services can be improved by addressing the identified **resource constraints** at PHC facilities and providing the necessary CDL **training needs** for PHC team members in the different settings (elaborated on in Chapter 7). A range of complementary, innovative, and **context-specific health educational strategies** focusing on the prioritised CDL risks identified in each study community is also recommended (discussed in Chapter 7) to meet the needs of patients with CDL and to provide context-specific solutions in response to the challenges and barriers identified during this study. Imparting health education and providing healthy lifestyle counselling based on identified prioritised CDL and risk factors can empower patients to become proactive in the management of their health and will reduce **patient non-compliance**. Furthermore, educational programmes that promote a healthy early environment (focusing on the identified prioritised CDL risk profiles) and a healthy lifestyle **throughout the individual's life course** can reduce the current intergenerational transmission of CDL in communities. It is critical to follow a multidisciplinary team approach and emphasise the complementary roles of **supporting health care providers** (dieticians, phycologists, social workers, and healthy lifestyle coaches) to provide the best holistic care for CDL patients. In addition, strengthening the contribution of health partners (including health professionals from various disciplines), on Faculty level, through the incorporation of essential components in community-based chronic disease learning modules for undergraduate MBChB programmes and enhancing collaborative efforts between educationalists and policymakers can produce health care professionals that are sensitive to the health, physical, mental, and social well-being and needs of communities that can ultimately contribute to the vision of health for all South Africa.

Results of the study will be communicated widely through conference presentations, published articles in accredited research journals, and engagement with PHC facility managers, PHC teams, community members, and the MBChB programme director in the Faculty of Health Sciences. To date, one full-length publication article was published (2019),

three articles are prepared for submission to accredited journals. Furthermore, qualitative research results were presented at the FHS Research Forum (2019) and the FS DoH research day (2019), while qualitative research results were presented at the SAAHE conference (2021) and the FHS Research Forum (2021).

8.3 NOVEL CONTRIBUTION OF THE STUDY

The use of a mixed method study design strengthens the evidence-based data presented in this study. The CDL risk assessment and health promotion framework development provide evidence-based data that can inform focused and appropriate CDL prevention and intervention strategies in urban and rural communities. Quantitative results address the essential knowledge gaps relating to CDL risk factors and CDL in urban and rural areas in central South Africa. This study highlights the epidemiological transition in these communities, reveals similarities and differences in risk factor profiles in urban and rural settings. Furthermore, qualitative results also address the important knowledge gaps, providing insight into specific barriers and challenges observed to implementing CDL intervention programmes in the urban and rural settings and highlight the need for Public Health action. Therefore, the study's findings can be valuable for future planning, design, and implementation of focused community-based primary health care responses in resource-constrained areas. Implementing tailor-made, community-based patient-centred prevention and intervention strategies as recommended can assist in the promotion of a healthy lifestyle, reduce the risk for CDL disease development in the communities and ensure future generation health and well-being.

8.4 LIMITATIONS OF THE STUDY

The researcher acknowledges the following limitations of the study. Firstly, this study was only conducted in the FS province in central SA due to resource constraints. Furthermore, more females than males participated in the quantitative phase of the study; this can be attributed to the fact that the study was conducted during weekdays when employed males were not available to participate in the study. During the quantitative analysis stage, the exclusion of participants due to missing values occurred, and the authors acknowledge this as a limitation of the study. Although detailed information on behavioural, metabolic risk factors and other inflammatory markers were supplied, the researcher acknowledges that a more in-

depth review of contributing psychosocial aspects could contribute to the study. The researcher also acknowledges that the small sample size (22 medical students, 45 PHC team members and patients with CDL) participating in the quantitative part of the study may not represent the entire community. However, data collection during focus group discussions continued until saturation was reached and sub-themes presented were identified in all three groups.

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APPENDIX A: Protocol summary in lay terms

The rapid rise in chronic non-communicable diseases (non-infectious diseases), for example, overweight, cardiovascular diseases (heart attacks and stroke), lung diseases, cancers, hypertension (high blood pressure) and diabetes (high blood sugar), represents a significant health challenge to economic and social development in countries worldwide.

Unhealthy lifestyle choices, such as smoking/snuff, poor diet and the lack of regular exercise are risk factors that can lead to the development of chronic diseases in adult life. The presence of these risk factors and the chronic diseases of lifestyle (CDL) such as overweight, heart diseases, hypertension and diabetes later on in life is high in South Africa and create a significant burden on health systems. CDL is mostly preventable, but the development and implementation of effective prevention programmes require knowledge of the profile of unhealthy lifestyle risk factors in communities and information regarding barriers that prevent the effective implementation of current programmes. In South Africa, information relating to this is still scarce. Therefore, this research study aims to study rural and urban communities in the Free State to develop a risk assessment and health promotion framework for chronic diseases of lifestyle.

This study will use a mixed method research design. The first phase of the study will focus on the development of risk profiles for CDL such as overweight, heart diseases, high blood pressure and high blood sugar for rural and urban communities, using an existing database from a previous study in Mangaung (urban area) and the Southern Free State (rural area). During the second phase, focus group discussions with community members, health teams, and medical students will explore knowledge and awareness of CDL prevention programmes as well as practical implementation problems experienced. Approximately 12 to 15 participants will be included in each group. The information obtained will help the researcher construct a CDL risk assessment and health promotion framework. This framework may assist in developing effective CDL primary health care prevention programmes in areas where there is a lack of resources and eventually impact the health and well-being of future generations.

APPENDIX B: Letter to the Faculty management to request permission to conduct the research

RESEARCH TITLE: CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE (UFS-HSD2017/1435)

The Dean

Head School of Biomedical Sciences

Faculty of Health Sciences

University of the Free State

Dear Proff. GJ van Zyl and CD Viljoen

RE: PERMISSION TO CONDUCT RESEARCH STUDY

I am in the process of planning a research project to develop a risk assessment and health promotion framework for CDL (obesity, cardiovascular diseases, hypertension and diabetes mellitus) and formulate recommendations to facilitate and focus existing efforts for the prevention and control of CDL in rural and urban communities in the Free State. This will serve to obtain my Ph.D. (Community Health) and I would like to seek your permission to conduct this study.

The aim of **PHASE I** of the study is to compile a risk factor profile for CDL in communities in the Free State. **PHASE II** will evaluate knowledge, awareness and attitude amongst community members, local PHC team, health workers and medical students regarding current CDL guidelines and intervention programmes. Furthermore, this part of the study aims to identify barriers and practical issues experienced by community members and the primary health care team with the implementation of CDL primary health care programmes. **PHASE III** of the study will integrate results from PART I and II of the study to construct a risk assessment and health promotion framework for CDL in rural and urban Free State communities.

The overall goal of the study is therefore to construct a framework to facilitate existing efforts for the prevention and control of CDL in rural and urban Free State communities which may contribute to health promotion and impact positively on future generations.

This study will be a descriptive, cross-sectional study that will make use of a mixed methods research approach. Quantitative findings will be analysed by the Department of Biostatistics, Faculty of Health Sciences, University of the Free State. Qualitative findings will be analysed and both quantitative and qualitative findings will be interpreted by the researcher.

The necessary documentation will be submitted to the relevant authorities for approval to conduct this research project. These include the Evaluation committee, Health Sciences Research Ethics Committee of the FHS and the National Department of Health. After gathering all the relevant information and analysing the data, my findings will be published in (a) reputable journal/s.

Please find attached a copy of the study protocol containing information documents and study procedures, for your information, as well as the HSREC approval form.

Yours sincerely

Dr. S van Zyl

Principal investigator

Department of Basic Medical Sciences

Faculty of Health Sciences

Contact number: 051 401 7880

Email address: gnfssvz@ufs.ac.za

APPENDIX C:Letter to the Vice-rector: Research to request permission to conduct the research amongst students

RESEARCH TITLE: CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE (UFS-HSD2017/1435)

Prof. RC Witthuhn

Vice-Rector: Research

University of the Free State

Dear Prof. Witthuhn

RE: PERMISSION TO CONDUCT RESEARCH STUDY

I am in the process of planning a research project to develop a risk assessment and health promotion framework for CDL (obesity, cardiovascular diseases, hypertension and diabetes mellitus) and formulate recommendations to facilitate and focus existing efforts for the prevention and control of CDL in rural and urban communities in the Free State. This will serve to obtain my Ph.D. (Community Health) and I would like to seek your permission to conduct this study.

The aim of **PHASE I** of the study is to compile a risk factor profile for CDL in communities in the Free State. **PHASE II** will evaluate knowledge, awareness and attitude amongst community members, local PHC teams, health workers. Furthermore, this part of the study aims to identify barriers and practical issues experienced by community members and the primary health care team with the implementation of CDL primary health care programmes. **PHASE III** of the study will integrate results from PART I and II of the study in order to construct a risk assessment and health promotion framework for rural and urban Free State communities.

The overall goal of the study is therefore to construct a framework to facilitate existing efforts for the prevention and control of CDL in rural and urban Free State communities which will contribute to health promotion and impact positively on future generations.

This study will be a descriptive, cross-sectional study that will make use of a mixed methods research approach. Quantitative findings will be analysed by the Department of Biostatistics,

Faculty of Health Sciences, University of the Free State. Qualitative findings will be analysed and both quantitative and qualitative findings will be interpreted by the researcher.

The necessary documentation will be submitted to the relevant authorities for approval to conduct this research project. These include the Health Sciences Research Ethics Committee of the FHS and the National Department of Health. After gathering all the relevant information and analysing the data, my findings will be published in (a) reputable journal/s.

Please find attached a copy of the study protocol containing information documents and study procedures, for your information, as well as the HSREC approval form.

Yours faithfully

Dr. S van Zyl

Principal investigator

Department of Basic Medical Sciences

Faculty of Health Sciences

Contact number: 051 401 7880

Email address: gnfssvz@ufs.ac.za

APPENDIX D: Letter to the Dean student affairs to request permission to conduct the research amongst students

RESEARCH TITLE: CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTINGS IN THE FREE STATE PROVINCE (UFS-HSD2017/1435)

Mr Pura Mgolombane

Dean: Student Affairs

University of the Free State

Dear Mr Mgolombane

RE: PERMISSION TO CONDUCT RESEARCH STUDY

I am in the process of planning a research project to develop a risk assessment and health promotion framework for CDL (obesity, cardiovascular diseases, hypertension and diabetes mellitus) and formulate recommendations to facilitate and focus existing efforts for the prevention and control of CDL in rural and urban communities in the Free State. This will serve to obtain my Ph.D. (Community Health) and I would like to seek your permission to conduct this study.

The aim of **PHASE I** of the study is to compile a risk factor profile for CDL in communities in the Free State. **PHASE II** will evaluate knowledge, awareness and attitude amongst community members, local PHC teams, health workers. Furthermore, this part of the study aims to identify barriers and practical issues experienced by community members and the primary health care team with the implementation of CDL primary health care programmes. **PHASE III** of the study will integrate results from PART I and II of the study to construct a risk assessment and health promotion framework for rural and urban Free State communities.

The overall goal of the study is therefore to construct a framework to facilitate existing efforts for the prevention and control of CDL in rural and urban Free State communities which will contribute to health promotion and impact positively on future generations.

This study will be a descriptive, cross-sectional study that will make use of a mixed methods research approach. Quantitative findings will be analysed by the Department of Biostatistics, Faculty of Health Sciences, University of the Free State. Qualitative findings will be analysed and both quantitative and qualitative findings will be interpreted by the researcher.

The necessary documentation will be submitted to the relevant authorities for approval to conduct this research project. These include the Evaluation Committee, Research Ethics Committee of the Faculty of Health Sciences and the National Department of Health. After gathering all the relevant information and analysing the data, my findings will be published in (a) reputable journal/s.

Please find attached a copy of the study protocol containing information documents and study procedures, for your information, as well as the HSREC approval form.

Yours faithfully

Dr. S van Zyl

Principal investigator

Department of Basic Medical Sciences

Faculty of Health Sciences

Contact number: 051 401 7880

Email address: gnfssvz@ufs.ac.za

APPENDIX E: Letter to the Head: Free State Department of Health to request permission to conduct the research

RESEARCH TITLE: CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE (UFS-HSD2017/1435)

Dr. D Motau

Head: Free State Department of Health

Cnr Harvey and Charlotte Maxeke Streets
Bloemfontein

9300

Free State

Dear Dr. Motau

RE: PERMISSION TO CONDUCT RESEARCH STUDY

I am in the process of planning a research project to develop a risk assessment and health promotion framework for CDL (obesity, cardiovascular diseases, hypertension and diabetes mellitus) and formulate recommendations to facilitate and focus existing efforts for the prevention and control of CDL in rural and urban communities in the Free State. This will serve to obtain my Ph.D. (Community Health) and I would like to seek your permission to conduct this study.

The aim of **PHASE I** of the study is to compile a risk factor profile for CDL in communities in the Free State. **PHASE II** will evaluate knowledge, awareness and attitude amongst community members, local PHC teams, health workers. Furthermore, this part of the study aims to identify barriers and practical issues experienced by community members and the primary health care team with the implementation of CDL primary health care programmes. **PHASE III** of the study will integrate results from PART I and II of the study to construct a risk assessment and health promotion framework for rural and urban Free State communities.

The overall goal of the study is therefore, to construct a framework to facilitate existing efforts for the prevention and control of CDL in rural and urban Free State communities, this can contribute to health promotion and impact positively on future generations.

This study will be a descriptive, cross-sectional study that will make use of a mixed methods research approach. Quantitative findings will be analysed by the Department of Biostatistics, Faculty of Health Sciences, University of the Free State. Qualitative findings will be analysed and both quantitative and qualitative findings will be interpreted by the researcher.

The necessary documentation will be submitted to the relevant authorities for approval to conduct this research project. These include the Evaluation Committee, Research Ethics Committee of the FHS and the National Department of Health. After gathering all the relevant information and analysing the data, my findings will be published in (a) reputable journal/s.

Please find attached a copy of the study protocol containing information documents and study procedures, for your information, as well as the HSREC approval form.

Yours sincerely

Dr. S van Zyl

Principal investigator

Department of Basic Medical Sciences

Faculty of Health Sciences

Contact number: 051 401 7880

Email address: gnfssvz@ufs.ac.za

APPENDIX F: Request for community members to participate in focus group discussions

RESEARCH TITLE: CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTINGS IN THE FREE STATE PROVINCE (UFS-HSD2017/1435)

Dear Mr/Mrs/Ms

I, Dr Sanet van Zyl, am doing research to develop a risk assessment and health promotion framework for the following chronic diseases of lifestyle (overweight, heart diseases, high blood pressure and high blood sugar). You are cordially invited to participate in this study.

Community members who will be eligible to participate in the study will include:

- ✓ males and females
- ✓ between the ages of 25 - 65 years who
- ✓ regularly visit the local primary health clinic as part of
- ✓ follow-up treatment for overweight and/or heart disease and/or high blood pressure and/or high blood sugar

A focus group is a method of data collection in which one or two researchers and several participants meet as a group to discuss a given research topic. If you fulfill the above-mentioned criteria I would like to invite you to participate in this study and as a member of the focus group share your experiences. This focus group discussion will be conducted by a skilled interviewer and the expected maximum duration will be one and a half hours. Before the focus group discussion, you will be asked to give written informed consent, but your participation in this research study is completely voluntary and you can withdraw from participation at any time. Every effort will be made to protect participants' confidentiality and data collected will only be used for research purposes. Research results can be published in (a) reputable journal/s. Your participation in this study is valued as results from this study may contribute to health promotion in primary health care settings in the Free State.

Thank you very much for your consideration in this regard. You are welcome to contact the researcher for further information or if you have any questions about the research study. You may also contact the Secretariat of the Health Sciences Research Ethics Committee of the FHS, UFS at telephone number (051) 401 7794 if you have questions about your rights as a research subject.

Yours sincerely

Dr. S van Zyl
Principal investigator
Department of Basic Medical Sciences
Faculty of Health Sciences
Contact number: 051 401 7880
Email address: gnfssvz@ufs.ac.za

SEHLOMATHISO SA F:Kopo ya hore ditho tsa setjhaba di nke karolo dipuisanong tsa sehlopha se tsepamisitseng maikutlo

SEHLOOHO SA DIPHUPUTSO: MAFU A SA PHEKOLEHENG A BAKWANG KE MOKGWA WA HO PHELA: TEKOLO YA KOTSI E KA BANG TENG LE MORALO WA NTSHETSOPELE YA TSA BOPHELO BO BOTLE BAKENG SA TLHOKOMELO YA MOTHEO YA TSA BOPHELO BO BOTLE, MAEMONG A MAPOLASING LE DITOROPONG, PROVENSENG YA FREISTATA

(UFS-HSD2017/1435)

Monghadi/Mofumahadi/Mofumahatsana ya ratehang

Nna, ngaka Sanet van Zyl, ke etsa diphuputso ho lekola kotsi le ho etsa moralo wa ntshetsopele ya tsa bophelo bo botle bakeng sa mafu a sa phekoleheng a bakwang ke mokgwa wa ho phela, a latelang (mmele o moholo haholo, mafu a pelo, kgatello e phahameng ya madi le tswekere e phahameng mading). O mengwa ka mofuthu hore o nke karolo diphuputsong tsena.

Ditho tsa setjhaba tse tla dumellwang ka molao ho nka karolo diphuputsong tsena di tla kenyelletsa:

- ✓ ba batona (banna) le ba batshehadi (basadi)
- ✓ ba dipakeng tsa dilemo tse 25 – 65, ba
- ✓ atisang ho ya ditlililiniking tsa motheo tsa selehae; e le karolo ya
- ✓ kalafo e iphetang bakeng sa mmele o moholo haholo le/kapa lefu la pelo le/kapa kgatello e phahameng ya madi le/kapa tswekere e phahameng mading.

Sehlopha se tsepamisitseng maikutlo ke mokgwa wa ho bokella dintlha, e leng moo mofuputsi a le mong kapa ba babedi le bankakarolo ba mmalwa ba kopanang jwalo ka sehlopha ho shebisana ka sehlooho se itseng sa diphuputso. Haeba dintlha/ditlhoko tse boletsweng ka hodimo di dumellana le wena, nka rata ho o mema hore o nke karolo diphuputsong tsena, mme jwalo ka setho sa sehlopha se tsepamisitseng maikutlo, o re arolele boiphihlelo ba hao. Puisano ena ya sehlopha se tsepamisitseng maikutlo e tla laolwa le ho etellwa pele ke mobotsi wa dipotso ya rupelletsweng, mme tebello ke hore nako e ka nkuwang e se fete hora le halofo. Pele ho puisano ena ya sehlopha se tsepamisitseng maikutlo, o tla kopuwa ho fana ka tumello eo o e utlwisisang ka botlalo, empa ho nka karolo ha hao phuputsong ena ke boithaopo ba hao ka hohlehohle; mme o ka ikgula ho nkeng karolo nako e nngwe le e nngwe. Ho tla nkuwa matsapa ohle ho sirelletsa lekunutu la bankakarolo, hape dintlha tse bokelletsweng di tla sebediswa bakeng sa mabaka a diphuputso feela. Diphetho tsa diphuputso di ka phatlalatswa (a) dijenaleng tse nang le botumo bo botle. Ho nka karolo ha hao diphuputsong tsena ho nkuwa ho le bohlokwa haholo, kaha diphetho tsa diphuputso tsena di ka fana ka tlatsetso

bakeng sa ntshetsopele ya tsa bophelo bo botle ditlhophisong tsa tlhokomelo ya motheo ho tsa bophelo bo botle ka hare ho Freistata.

Ke leboha haholo ka ho inahana ha hao tabeng ena. O amohelehile ho ikopanya le mofuputsi bakeng sa tlhahisoleseding e fetang ena kapa haeba o na le dipotso dife kapa dife ka thuto ena ya diphuputso. O ka kgona hape le ho ikopanya le bangodi ba Health Sciences Research Ethics Committee ya FHS, UFS nomorong ena ya mohala (051) 401 7794 ha o na le dipotso tse mabapi le ditokelo tsa hao jwalo ka motho ya nkang karolo diphuputsong.

Wa hao ya tshepahalang

Dr. S van Zyl

Principal investigator

Department of Basic Medical Sciences

Faculty of Health Sciences

Contact number: 051 401 7880

Email address: gnfssvz@ufs.ac.za

AANHANGSEL F: Inligtingsbrief versoek aan gemeenskapslede om aan fokusgroep besprekings deel te neem

NAVORSINGSTITEL: CHRONIESE LEEFSTYLSIEKTES: ’N RISIKOBEPALING- EN GESONDHEIDSBEVORDERINGSRAAMWERK VIR 'N LANDELIKE EN STEDELIKE PRIMÊRE GESONDHEIDSORGFASILITEIT IN DIE VRYSTAATPROVINSIE (UFS-HSD2017/1435)

Geagte Mnr / Mev / Mej

Ek, dr. Sanet van Zyl, onderneem ’n navorsingstudie met die doel om ’n risikoprofiel te bepaal en ’n raamwerk vir die bevordering van gesondheid te ontwikkel vir die volgende chroniese leefstylsiektes: oorgewig, hartsiektes, hoë bloeddruk en hoë bloedsuiker. U word vriendelik uitgenooi om aan hierdie studie deel te neem.

Lede van die gemeenskap wat sal kwalifiseer om aan die studie deel te neem:

- ✓ mans en vroue
- ✓ tussen die ouderdomme van 25 - 65 jaar
- ✓ besoek gereeld die plaaslike primêre gesondheidskliniek as deel van
- ✓ opvolgbehandeling vir oorgewig en/of hartsiektes en/of hoë bloeddruk en/of hoë bloedsuiker

’n Fokusgroep is ’n metode van dataversameling waarin een of twee navorsers en verskeie deelnemers as ’n groep vergader om ’n gegewe navorsingsonderwerp te bespreek. As u aan bogenoemde kriteria voldoen, wil ek u graag uitnooi om aan hierdie studie deel te neem en as deelnemer aan die fokusgroep u ervarings te deel. Hierdie fokusgroepbespreking sal deur ’n kundige persoon gelei word en die verwagte maksimum tydsduur sal een en ’n half uur wees. Voor die aanvang van die fokusgroepbespreking sal u gevra word om skriftelik ingeligte toestemming te gee, maar u deelname aan hierdie navorsingstudie is heeltemal vrywillig en u kan u deelname te enige tyd staak. Alle pogings sal aangewend word om die vertroulikheid van die deelnemers te beskerm en data wat ingesamel word, sal slegs vir navorsingsdoeleindes gebruik word. Navorsingsresultate kan gepubliseer word in (’n) geakkrediteerde vaktydskrif(te). U deelname aan hierdie studie word opreg waardeer aangesien die resultate van hierdie studie kan bydra tot die bevordering van gesondheidsorg verskaf deur primêre gesondheidsorgfasiliteite in die Vrystaat.

Baie dankie vir u oorweging in hierdie verband. U is welkom om die navorser te kontak vir verdere inligting of enige navrae in verband met die navorsingstudie. U kan ook die Sekretariaat van die Navorsingsetiekkomitee van die Fakulteit Gesondheidswetenskappe, UV, kontak by telefoonnommer (051) 401 7794 indien u vrae het oor u regte as deelnemer aan ’n navorsingstudie.

Vriendelike groete

Dr. S van Zyl

Hoofnavorser

Departement Basiese Mediese Wetenskappe

Fakulteit Gesondheidswetenskappe

Kontaknommer: 051 401 7880

E-pos adres: gnfssvz@ufs.ac.za

APPENDIX G: Request for primary health care team members to participate in focus group discussions

RESEARCH TITLE: CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE (UFS-HSD2017/1435)

Dear Mr/Mrs/Ms,

I, Dr Sanet van Zyl, am conducting research to develop a risk assessment and health promotion framework for the following chronic diseases of lifestyle (obesity, cardiovascular diseases, hypertension and type 2 diabetes mellitus). You are cordially invited to participate in this study.

Members of the Primary Health Care team that will be eligible to participate in the study will include:

- ✓ male and female
- ✓ community health workers or health promoters or environmental health officers or staff members
- ✓ working at local primary health care facilities with
- ✓ knowledge and/or experience of CDL (obesity and/or cardiovascular disease and/or hypertension and/or diabetes mellitus)
- ✓ knowledge and/or experiences of prevention and intervention programmes for the following CDL: obesity and/or cardiovascular disease and/or hypertension and/or type 2 diabetes mellitus

A focus group is a method of data collection in which one or two researchers and several participants meet as a group to discuss a given research topic. If you fulfil the above-mentioned criteria, I would like to invite you to participate in this study and, as a member of the focus group, share your experiences. A skilled interviewer will conduct this focus group discussion, and the expected maximum duration will be one and a half hours. Before the focus group discussion, you will be asked to give written informed consent, but your participation in this research study is completely voluntary, and you can withdraw from participation at any time. Every effort will be made to protect participants' confidentiality, and the data collected will only be used for research purposes. Research results can be published in (a) reputable journal/s. Your participation in this study is valued as results from this study may contribute to health promotion in primary health care settings in the Free State.

Thank you very much for your consideration in this regard. You are welcome to contact the researcher for further information or if you have any questions about the research study. You may also contact the Secretariat of the Health Sciences Research Ethics Committee, UFS, at telephone number (051) 401 7794 if you have questions about your rights as a research subject.

Yours sincerely

Dr S van Zyl

Principal investigator

Department of Basic Medical Sciences

Faculty of Health Sciences

Contact number: 051 401 7880

Email address: gnfssvz@ufs.ac.za

SEHLOMATHISO SA G: Kopo ya hore ditho tsa sehlopha sa tlhokomelo ya motheo ya bophelo bo botle di nke karolo dipuisanong tsa sehlopha se tsepamisitseng maikutlo

SEHLOOHO SA DIPHUPUTSO: MAFU A SA PHEKOLEHENG A BAKWANG KE MOKGWA WA HO PHELA: TEKOLO YA KOTSI E KA BANG TENG LE MORALO WA NTSHETSOPELE YA TSA BOPHELO BO BOTLE BAKENG SA TLHOKOMELO YA MOTHEO YA TSA BOPHELO BO BOTLE, MAEMONG A MAPOLASING LE DITOROPONG; PROVENSENG YA FREISTATA

(UFS-HSD2017/1435)

Monghadi/Mofumahadi/Mofumahatsana ya ratehang

Nna, ngaka Sanet van Zyl, ke etsa diphuputso ho lekola kotsi le ho etsa moralo wa ntshetsopele ya tsa bophelo bo botle bakeng sa mafu a sa phekoleheng a bakwang ke mokgwa wa ho phela, a latelang (monono, mafu a pelo, kgatello e phahameng ya madi le lefu la mofuta wa 2 la tswekere (type 2 diabetes mellitus). O mengwa ka mofuthu hore o nke karolo diphuputsong tsena.

Ditho tsa sehlopha sa Tlhokomelo ya Motheo ya Bophelo bo botle tse tla dumellwang ka molao ho nka karolo diphuputsong tsena di tla kenyelletsa:

- ✓ ba batona (banna) le ba batshehadi (basadi)
- ✓ Basebeletsi ba setjhaba ba tsa bophelo bo botle kapa ba ntshetsang bophelo bo botle pele kapa baofisiri ba tsa bophelo bo botle tikolohong kapa basebetsi ba
- ✓ sebetsang dibakeng tsa lehae tsa tlhokomelo ya motheo ya bophelo bo botle, ba nang le
- ✓ tsebo le/kapa boiphihlelo ba CDL (monono le/kapa mafu a pelo le/kapa kgatello e phahameng ya madi le/kapa lefu la tswekere (diabetes mellitus)
- ✓ ba nang le tsebo le/kapa boiphihlelo ba thibelo le maano a bonamodi mabapi le di CDL tse latelang: monono le/kapa mafu a pelo le/kapa kgatello e phahameng ya madi le/kapa lefu la tswekere la mofuta wa 2 (type 2 diabetes mellitus)

Sehlopha se tsepamisitseng maikutlo ke mokgwa wa ho bokella dintlha, e leng moo mofuputsi a le mong kapa ba babedi le bankakarolo ba mmalwa ba kopanang jwalo ka sehlopha ho shebisana ka sehlooho se itseng sa diphuputso. Haeba dintlha/ditlhoko tse boletsweng ka hodimo di dumellana le wena, nka rata ho o mema hore o nke karolo diphuputsong tsena, mme jwalo ka setho sa sehlopha se tsepamisitseng maikutlo, o re arolele boiphihlelo ba hao. Puisano ena ya sehlopha se tsepamisitseng maikutlo e tla laolwa le ho etellwa pele ke mobotsi wa dipotso ya rupelletsweng, mme tebello ke hore nako e ka nkuwang e se fete hora le halofo.

Pele ho puisano ena ya sehlopha se tsepamisitseng maikutlo, o tla kopuwa ho fana ka tumello eo o e utlwisisang ka botlalo, empa ho nka karolo ha hao phuputsong ena ke boithaopo ba hao ka hohlehohle; mme o ka ikgula ho nkeng karolo nako e nngwe le e nngwe. Ho tla nkuwa matsapa ohle ho sirelletsa lekunutu la bankakarolo, hape dintlha tse bokelletsweng di tla sebediswa bakeng sa mabaka a diphuputso feela. Diphetho tsa diphuputso di ka phatlalatswa (a) dijenaleng tse nang le botumo bo botle. Ho nka karolo ha hao diphuputsong tsena ho nkuwa ho le bohlokwa haholo, kaha diphetho tsa diphuputso tsena di ka fana ka tlatsetso bakeng sa ntshetsopele ya tsa bophelo bo botle ditlhophisong tsa tlhokomelo ya motheo ho tsa bophelo bo botle ka hare ho Freistata.

Ke leboha haholo ka ho inahana ha hao tabeng ena. O amohelehile ho ikopanya le mofuputsi bakeng sa tlhahisoleseding e fetang ena kapa haeba o na le dipotso dife kapa dife ka thuto ena ya diphuputso. O ka kgona hape le ho ikopanya le bangodi ba Health Sciences Research Ethics Committee ya FHS, UFS nomorong ena ya mohala (051) 401 7794 ha o na le dipotso tse mabapi le ditokelo tsa hao jwalo ka motho ya nkang karolo diphuputsong.

Wa hao ya tshepahalang

Dr. S van Zyl

Principal investigator

Department of Basic Medical Sciences

Faculty of Health Sciences

Contact number: 051 401 7880

Email address: gnfssvz@ufs.ac.za

AANHEGTING G: Inligtingsbrief: Versoek aan primêre gesondheidsorgspanlede om aan fokusgroepbesprekings deel te neem

NAVORSINGSTITEL: CHRONIESE LEEFSTYLSIEKTES: ‘n RISIKO BEPALING- EN GESONDHEIDSBEVORDERINGRAAMWERK VIR 'N LANDELIKE EN STEDELIKE PRIMÊRE GESONDHEIDSORGFASILITEIT IN DIE VRYSTAATPROVINSIE (UFS-HSD2017/1435)

Geagte Mnr / Mev / Mej

Ek, dr. Sanet van Zyl, onderneem ’n navorsingstudie met die doel om ’n risiko-profiel te bepaal en ’n gesondheidsbevorderingsraamwerk te ontwikkel vir die volgende chroniese leefstylsiektes: oorgewig, hartsiektes, hoë bloeddruk en hoë bloedsuiker. U word vriendelik uitgenooi om aan hierdie studie deel te neem.

Lede van die primêre gesondheidspan wat sal kwalifiseer om aan die studie deel te neem:

- ✓ mans en vroue
- ✓ gemeenskapsgesondheidswerkers of personeel betrokke by die bevordering van gesondheidsorg, of personeellede
- ✓ werksaam by plaaslike primêre gesondheidsorgfasiliteite met
- ✓ kennis en/of ervaring van chroniese leefstylsiektes (vetsug/of kardiovaskulêre siekte en/of hipertensie en/of diabetes mellitus)
- ✓ kennis en/of ervarings van voorkomings- en intervensieprogramme vir die volgende chroniese leefstylsiektes: vetsug en/of kardiovaskulêre siekte en/of hipertensie en/of diabetes mellitus

’n Fokusgroep is ’n metode van dataversameling waarin een of twee navorsers en verskeie deelnemers as ’n groep vergader om ’n gegewe navorsingsonderwerp te bespreek. As u aan bogenoemde kriteria voldoen, wil ek u graag uitnooi om aan hierdie studie deel te neem en as deelnemer aan die fokusgroep u ervarings te deel. Hierdie fokusgroepbespreking sal deur ’n kundige persoon gelei word en die verwagte maksimum tydsduur sal een en ’n half uur wees. Voor die aanvang van die fokusgroepbespreking sal u gevra word om skriftelik ingeligte toestemming te gee, maar u deelname aan hierdie navorsingstudie is heeltemal vrywillig en u kan u deelname te enige tyd staak. Alle pogings sal aangewend word om die vertroulikheid van die deelnemers te beskerm en data wat ingesamel word, sal slegs vir navorsingsdoeleindes gebruik word. Navorsingsresultate kan gepubliseer word in (‘n) geakkrediteerde vaktydskrif(te). U deelname aan hierdie studie word opreg waardeer aangesien die resultate van hierdie studie kan bydra tot die bevordering van gesondheidsorg verskaf deur primêre gesondheidsorgfasiliteite in die Vrystaat.

Baie dankie vir u oorweging in hierdie verband. U is welkom om die navorser te kontak vir verdere inligting of enige navrae in verband met die navorsingstudie. U kan ook die Sekretariaat van die Navorsingsetiekkomitee van die Fakulteit Gesondheidswetenskappe, UV,

kontak by telefoonnommer (051) 401 7794 indien u vrae het oor u regte as deelnemer aan ‘n navorsingstudie.

Vriendelike groete

Dr. S van Zyl

Hoofnavorser

Departement Basiese Mediese Wetenskappe

Fakulteit Gesondheidswetenskappe

Kontaknommer: 051 401 788

E-pos adres: gnfssvz@ufs.ac.za

APPENDIX H: Request for medical students to participate in focus group discussions

RESEARCH TITLE: CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE (UFS-HSD2017/1435)

Dear Mr/Mrs/Ms,

I, Dr Sanet van Zyl, am conducting research to develop a risk assessment and health promotion framework for the following chronic diseases of lifestyle (obesity, cardiovascular diseases, hypertension and diabetes mellitus). You are cordially invited to participate in this study.

Medical students who will be eligible to participate in the study will include:

- ✓ male and female
- ✓ registered students in the MBChB programme offered in the FHS, UFS
- ✓ who have completed community-based education (CBE) training in
- ✓ Semester 7 and 8, in the rural town of Trompsburg, Xhariep district or
  Semester 9 and 10, in the MUCPP clinic in the urban Mangaung district

A focus group is a method of data collection in which one or two researchers and several participants meet as a group to discuss a given research topic. If you fulfil the above-mentioned criteria, I would like to invite you to participate in this study and, as a member of the focus group, share your experiences. A skilled interviewer will conduct this focus group discussion, and the expected maximum duration will be one and a half hours. Before the focus group discussion, you will be asked to give written informed consent, but your participation in this research study is completely voluntary, and you can withdraw from participation at any time. Every effort will be made to protect participants' confidentiality, and data collected will only be used for research purposes. Research results can be published in (a) reputable journal/s. Your participation in this study is valued as results from this study may contribute positively to health promotion in primary health care settings in the Free State.

Thank you very much for your consideration in this regard. You are welcome to contact the researcher for further information or if you have any questions about the research study. You may also contact the Secretariat of the Health Sciences Research Ethics Committee, UFS, at telephone number (051) 401 7794 if you have questions about your rights as a research subject.

Yours sincerely

Dr S van Zyl

Principal investigator

Department of Basic Medical Sciences

Faculty of Health Sciences

Contact number: 051 401 7880

Email address: gnfssvz@ufs.ac.za

APPENDIX I: Informed consent form: community member participating in the research

Dear Mr/Mrs/Ms

You have been asked to participate as a focus group member in the following research study:

RESEARCH TITLE: CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE (UFS-HSD2017/1435)

The principal investigator, Dr Sanet van Zyl, has informed you about the study, supplied you with a request for participation letter concerning the details of the study and has invited you to participate in the research as mentioned above.

Your participation in this research study is completely voluntary. Should you decide not to participate in this study, there will be no penalty. If you decide to participate in this study, you will be able to terminate participation at any moment during the study. You will not be penalised or discredited in any way.

You will also receive a signed copy of this document if you decide to participate in this study. Once the study is completed, results may be published in accredited medical journal(s) and/or presented at applicable scientific forums. The research reports will not disclose or reveal the personal identity of participants.

You may contact Dr Sanet van Zyl, the researcher, at (051) 401 7880 if you have questions about the research. Alternatively, you may contact the Secretariat of the Health Sciences Research Ethics Committee, UFS, at telephone number (051) 401 7794 if you have questions about your rights as a research subject.

I confirm that the researcher has explained the purpose of the study to me as well as the information enclosed in this form. I understand what my involvement in the study means, and I voluntarily agree to participate.

Print name of Participant: _____

Signature of Participant: _____

Date: _____

If illiterate:

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of Witness: _____ AND Thumb print of Participant:

Signature of Witness: _____

Date: _____

Print name of Researcher: _____

Signature of Researcher: _____

Date: _____

Statement by the researcher/person taking down consent:

I have accurately read out the information sheet to the potential participant, and to the best of my ability, ensured that the participant understands the proceedings of the research. I confirm that the participant was given an opportunity to ask questions and that I have answered to the best of my ability. I confirm that the consent has been given freely and voluntarily and that a copy of this Informed Consent Form has been provided to the participant.

Print name of Researcher/person taking down the consent: _____

Signature of Researcher/person taking down the consent: _____

Date: _____

SEHLOMATHISO SA I: Foromo ya tumello eo o e utlwisisang ka botlalo: setho sa setjhaba se nkang karolo diphuputsong

Monghadi/Mofumahadi/Mofumahatsana ya ratehang

O kopilwe ho nka karolo jwalo ka setho sa sehlopha se tsepamisitseng maikutlo:

SEHLOOHO SA DIPHUPUTSO: MAFU A SA PHEKOLEHENG A BAKWANG KE MOKGWA WA HO PHELA: TEKOLO YA KOTSI E KA BANG TENG LE MORALO WA NTSHETSOPELE YA TSA BOPHELO BO BOTLE BAKENG SA TLHOKOMELO YA MOTHEO YA TSA BOPHELO BO BOTLE, MAEMONG A MAPOLASING LE DITOROPONG; PROVENSENG YA FREISTATA

(UFS-HSD2017/1435)

Mofuputsi ya ka sehloohong, ngaka Sanet van Zyl, o o tsebisitse ka diphuputso tsena, o o file lengolo la kopo ya ho nka karolo, le nang le dintlha tsa diphuputso, mme o o memme ho nka karolo diphuputsong tsena tse boletsweng ka hodimo.

Ho nka karolo ha hao thutong ena ya diphuputso, ke boithaopo ba hao kahohlehohle. Ha ho ka etsahala hore o nke qeto ya ho se nke karolo thutong ena, ha ho na ho ba le kotlo. Ha o ka nka qeto ya ho nka karolo diphuputsong tsena, o ka kgona ho fedisa qeto eo ya ho nka karolo nako e nngwe le e nngwe nakong ya diphuputso. Ha o na ho ahlolwa kapa ho na ho nyenyefatswa ka tsela efe kapa efe.

Hape o tla fumana khopi e saennweng ya tokomane ena ha o nka qeto ya ho nka karolo diphuputsong tsena. Ha diphuputso di phethetswe, diphetho tsa diphuputso di ka phatlalatswa jenaleng/dijenaleng tsa kalafo tse molaong, hape/kapa di ka hlahiswa diforamong tsa thuto ya mahlale tse tshwanetseng. Diripoto tsa diphuputso ha di na ho hlahisa kapa ho na ho utolla dintlha tsa boitsebiso tsa bankakarolo.

O ka ikopanya le ngaka Sanet van Zyl, mofuputsi, ho (051) 401 7880 ha o na le dipotso mabapi le diphuputso. Ntle le moo, o ka ikopanya le bangodi ba Health Sciences Research Ethics Committee, UFS nomorong ya mohala ya (051) 401 7794 ha o na le dipotso mabapi le ditokelo tsa hao jwalo ka motho ya nkang karolo diphuputsong.

Ke netefatsa hore mofuputsi o ntlhaloseditse lebaka la diphuputso hammoho le tlhahisoleseding e kenyelleditsweng foromong ena. Ke a utlwisisa hore ho nka karolo ha ka diphuputsong tsena ho bolelang, mme ke dumela ho nka karolo ka boithaopo.

Lebitso le ngotsweng la Monkakarolo: _____

Mosaeno wa Monkakarolo: _____

Letsatsi/Mohla: _____

Haeba monkakarolo a sa tsebe ho bala le ho ngola:

Ke netefatsa hore ke bone hantle ha foromo ena ya tumello e ballwa monkakarolo ya nepahetseng, mme motho enwa o bile le monyetla wa ho botsa dipotso. Ke netefatsa hore motho enwa o fane ka tumello a lokolohile.

Lebitso le ngotsweng la Paki: _____ LE Kgatiso ya monwana

o motona wa letsoho la Monkakarolo:

Mosaeno wa Paki: _____

Letsatsi/Mohla: _____

Lebitso le ngotsweng la Mofuputsi: _____

Mosaeno wa Mofuputsi: _____

Letsatsi/Mohla: _____

Seteitemente sa mofuputsi/motho ya ngolang tumello:

Ka ho nepahala, ke balletse monkakarolo leqephe lena la tlhahisoleseding, mme hape ka bokgoni ba ka bohle ke entse bonnete ba hore monkakarolo o utlwisisa ditsamaiso tsa diphuputso. Ke netefatsa hore monkakarolo o ile a fuwa monyetla wa ho botsa dipotso, le hore ke arabile ka bokgoni ba ka bohle. I confirm that the consent has been given freely and voluntarily and that a copy of this Informed Consent Form has been provided to the participant. Ke netefatsa hore tumello ena e fanwe ka bolokolohi le boithaopo, le hore khopi ya foromo ena eo dintlha tsa yona di utlwisisehang ka botlalo, e filwe monkakarolo.

Lebitso le ngotsweng la Mofuputsi/Motho ya ngolang tumello: _____

Mosaeno wa Mofuputsi/Motho ya ngolang tumello: _____

Letsatsi/Mohla: _____

AANHANGSEL I: Toestemmingsvorm: Gemeenskaplede wat deelneem aan die navorsingstudie

Geagte Mnr / Mev / Mej

U is gevra om deel te neem as ’n fokusgroeplid aan die volgende navorsingstudie:

NAVORSINGSTITEL: CHRONIESE LEEFSTYLSIEKTES: ’n RISIKOBEPALING- EN GESONDHEIDSBEVORDERINGRAAMWERK VIR 'N LANDELIKE EN STEDELIKE PRIMÊRE GESONDHEIDSORGFASILITEIT IN DIE VRYSTAATPROVINSIE (UFS-HSD2017/1435)

Die hoofnavorser, dr. Sanet van Zyl, het u ingelig oor die studie, u voorsien van ’n inligtingsvorm wat die besonderhede van die studie verduidelik en u uitgenooi om aan bogenoemde navorsingstudie deel te neem.

U deelname aan hierdie navorsingstudie is heeltemal vrywillig. Indien u besluit om nie aan hierdie studie deel te neem nie, sal daar geen nadelige gevolge wees nie. As u besluit om aan hierdie studie deel te neem, mag u op enige stadium u deelname aan die studie staak. U sal op geen manier gepenaliseer of gediskrediteer word nie.

U sal ’n getekende afskrif van hierdie dokument ontvang as u besluit om aan hierdie studie deel te neem. Sodra die studie voltooi is, kan resultate in geakkrediteerde mediese vaktydskrif(te) gepubliseer word, en/of voorgedra word by toepaslike wetenskaplike forums. Die navorsingsverslae sal nie die persoonlike identiteit van deelnemers openbaar nie.

U is welkom om die navorser, Dr S van Zyl, te kontak vir verdere inligting of enige navrae in verband met die navorsingstudie. U kan ook die Sekretariaat van die Navorsingsetiekkomitee van die Fakulteit Gesondheidswetenskappe, UV, kontak by telefoonnommer (051) 401 7794 indien u vrae het oor u regte as deelnemer aan ‘n navorsingstudie.

Ek bevestig dat die navorser die doel van die studie aan my verduidelik het asook die inligting wat in hierdie vorm ingesluit is. Ek verstaan wat my betrokkenheid in die studie behels en ek stem vrywillig daartoe in om deel te neem.

Naam van Deelnemer: _____

Handtekening van Deelnemer: _____

Datum: _____

As ongeletterd:

Ek bevestig dat die toestemmingsvorm korrek aan die potensiële deelnemer voorgelees is, en dat die individu die geleentheid gehad het om vrae te vra. Ek bevestig dat die individu vrywillig toestemming verleen het.

Naam van Getuie: _____ EN Duimafdruk van Deelnemer:

Handtekening van Getuie: _____

Datum: _____

Naam van Navorser: _____

Handtekening van Navorser: _____

Datum: _____

Verklaring deur die navorser/persoon wat toestemming afneem:

Ek het die inligtingsvorm aan die potensiële deelnemer gelees, en na die beste van my vermoë het ek seker gemaak dat die deelnemer die navorsingsproses verstaan. Ek bevestig dat die deelnemer geleentheid gehad het om vrae te vra en dat ek vrae na die beste van my vermoë beantwoord het. Ek bevestig dat die toestemming vrylik en vrywillig verkry is en dat 'n afskrif van hierdie ingeligte toestemmingsvorm aan die deelnemer verskaf is.

Naam van navorser/persoon wat toestemming afneem: _____

Handtekening van navorser/ persoon wat toestemming afneem: _____

Datum: _____

APPENDIX J: Informed consent form: primary health care teams, health care workers and MBChB students participating in the research

Dear Dr/Mr/Mrs/Ms

You have been asked to participate as a focus group member in the following research study:

RESEARCH TITLE: CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE (UFS-HSD2017/1435)

The principal investigator, Dr Sanet van Zyl, has informed you about the study, supplied you with a request for participation letter concerning the details of the study and has invited you to participate in the research as mentioned above.

Your participation in this research study is completely voluntary. Should you decide not to participate in this study, there will be no penalty. If you decide to participate in this study, you will be able to terminate participation at any moment during the study. You will not be penalized or discredited in any way.

You will also receive a signed copy of this document if you decide to participate in this study. Once the study is completed, results may be published in accredited medical journal(s) and/or presented at applicable scientific forums. The research reports will not disclose or reveal the personal identity of participants.

You may contact Dr Sanet van Zyl, the researcher, at (051) 401 7880 if you have questions about the research. Alternatively, you may contact the Secretariat of the Health Sciences Research Ethics Committee, UFS, at telephone number (051) 401 7794 if you have questions about your rights as a research subject.

I confirm that the researcher has explained the purpose of the study to me as well as the information enclosed in this form. **I understand what my involvement in the study means, and I voluntarily agree to participate**.

Print name of Participant: _____

Signature of Participant: _____

Date: _____

Print name of Researcher: _____

Signature of Researcher: _____

Date: _____

Statement by the researcher/person taking down consent:

I have accurately read out the information sheet to the potential participant, and to the best of my ability, ensured that the participant understands the proceedings of the research. I confirm that the participant was given an opportunity to ask questions and that I have answered it to the best of my ability. I confirm that the consent has been given freely and voluntarily and that a copy of this Informed Consent Form has been provided to the participant.

Print name of Researcher/person taking down the consent: _____

Signature of Researcher/person taking down the consent: _____

Date: _____

SEHLOMATHISO SA J: Foromo ya tumello eo o e utlwisisang ka botlalo: dihlopha tsa motheo tsa tlhokomelo ya tsa bophelo bo botle, basebeletsi ba tlhokomelo ya tsa bophelo bo botle le baithuti ba MBChB ba nkang karolo diphuputsong

Monghadi/Mofumahadi/Mofumahatsana ya ratehang

O kopilwe ho nka karolo jwalo ka setho sa sehlopha se tsepamisitseng maikutlo:

SEHLOOHO SA DIPHUPUTSO: MAFU A SA PHEKOLEHENG A BAKWANG KE MOKGWA WA HO PHELA: TEKOLO YA KOTSI E KA BANG TENG LE MORALO WA NTSHETSOPELE YA TSA BOPHELO BO BOTLE BAKENG SA TLHOKOMELO YA MOTHEO YA TSA BOPHELO BO BOTLE, MAEMONG A MAPOLASING LE DITOROPONG; PROVENSENG YA FREISTATA

(UFS-HSD2017/1435)

Mofuputsi ya ka sehloohong, ngaka Sanet van Zyl, o o tsebisitse ka diphuputso tsena, o o file lengolo la kopo ya ho nka karolo, le nang le dintlha tsa diphuputso, mme o o memme ho nka karolo diphuputsong tsena tse boletsweng ka hodimo.

Ho nka karolo ha hao thutong ena ya diphuputso, ke boithaopo ba hao kahohlehohle. Ha ho ka etsahala hore o nke qeto ya ho se nke karolo thutong ena, ha ho na ho ba le kotlo. Ha o ka nka qeto ya ho nka karolo diphuputsong tsena, o ka kgona ho fedisa qeto eo ya ho nka karolo nako e nngwe le e nngwe nakong ya diphuputso. Ha o na ho ahlolwa kapa ho na ho nyenyefatswa ka tsela efe kapa efe.

Hape o tla fumana khopi e saennweng ya tokomane ena ha o nka qeto ya ho nka karolo diphuputsong tsena. Ha diphuputso di phethetswe, diphetho tsa diphuputso di ka phatlalatswa jenaleng/dijenaleng tsa kalafo tse molaong, hape/kapa di ka hlahiswa diforamong tsa thuto ya mahlale tse tshwanetseng. Diripoto tsa diphuputso ha di na ho hlahisa kapa ho na ho utolla dintlha tsa boitsebiso tsa bankakarolo.

O ka ikopanya le ngaka Sanet van Zyl, mofuputsi, ho (051) 401 7880 ha o na le dipotso mabapi le diphuputso. Ntle le moo, o ka ikopanya le bangodi ba Health Sciences Research Ethics Committee, UFS nomorong ya mohala ya (051) 401 7794 ha o na le dipotso mabapi le ditokelo tsa hao jwalo ka motho ya nkang karolo diphuputsong.

Ke netefatsa hore mofuputsi o ntlhaloseditse lebaka la diphuputso hammoho le tlhahisoleseding e kenyelleditsweng foromong ena. Ke a utlwisisa hore ho nka karolo ha ka diphuputsong tsena ho bolelang, mme ke dumela ho nka karolo ka boithaopo.

Lebitso le ngotsweng la Monkakarolo: _____

Mosaeno wa Monkakarolo: _____

Letsatsi/Mohla: _____

Lebitso le ngotsweng la Mofuputsi: _____

Mosaeno wa Mofuputsi: _____

Letsatsi/Mohla: _____

Seteitemente sa mofuputsi/motho ya ngolang tumello:

Ka ho nepahala, ke balletse monkakarolo leqephe lena la tlhahisoleseding, mme hape ka bokgoni ba ka bohle ke entse bonnete ba hore monkakarolo o utlwisisa ditsamaiso tsa diphuputso. Ke netefatsa hore monkakarolo o ile a fuwa monyetla wa ho botsa dipotso, le hore ke arabile ka bokgoni ba ka bohle. I confirm that the consent has been given freely and voluntarily and that a copy of this Informed Consent Form has been provided to the participant. Ke netefatsa hore tumello ena e fanwe ka bolokolohi le boithaopo, le hore khopi ya foromo ena eo dintlha tsa yona di utlwisisehang ka botlalo, e filwe monkakarolo.

Lebitso le ngotsweng la Mofuputsi/Motho ya ngolang tumello: _____

Mosaeno wa Mofuputsi/Motho ya ngolang tumello: _____

Letsatsi/Mohla: _____

AANHANGSEL J: Toestemmingsvorm: primêre gesondheidsorgspanne, gesondheidsorgwerkers en MBChB-studente wat deelneem aan die navorsingstudie

Geagte Mnr / Mev / Mej

U is gevra om deel te neem as ’n fokusgroeplid aan die volgende navorsingstudie:

NAVORSINGSTITEL: CHRONIESE LEEFSTYLSIEKTES: ’n RISIKOBEPALING- EN GESONDHEIDSBEVORDERINGRAAMWERK VIR 'N LANDELIKE EN STEDELIKE PRIMÊRE GESONDHEIDSORGFASILITEIT IN DIE VRYSTAATPROVINSIE (UFS-HSD2017/1435)

Die hoofnavorser, dr. Sanet van Zyl, het u ingelig oor die studie, u voorsien van ’n inligtingsvorm wat die besonderhede van die studie verduidelik en u uitgenooi om aan bogenoemde navorsingstudie deel te neem.

U deelname aan hierdie navorsingstudie is heeltemal vrywillig. Indien u besluit om nie aan hierdie studie deel te neem nie, sal daar geen nadelige gevolge wees nie. As u besluit om aan hierdie studie deel te neem, mag u op enige stadium u deelname aan die studie staak. U sal op geen manier gepenaliseer of gediskrediteer word nie.

U sal ’n getekende afskrif van hierdie dokument ontvang as u besluit om aan hierdie studie deel te neem. Sodra die studie voltooi is, kan resultate in geakkrediteerde mediese vaktydskrif(te) gepubliseer word, en/of voorgedra word by toepaslike wetenskaplike forums. Die navorsingsverslae sal nie die persoonlike identiteit van deelnemers openbaar nie.

U is welkom om die navorser, Dr S van Zyl, te kontak vir verdere inligting of enige navrae in verband met die navorsingstudie. U kan ook die Sekretariaat van die Navorsingsetiekkomitee van die Fakulteit Gesondheidswetenskappe, UV, kontak by telefoonnommer (051) 401 7794 indien u vrae het oor u regte as deelnemer aan ‘n navorsingstudie.

Ek bevestig dat die navorser die doel van die studie aan my verduidelik het asook die inligting wat in hierdie vorm ingesluit is. Ek verstaan wat my betrokkenheid in die studie behels en ek stem vrywillig daartoe in om deel te neem.

Naam van Deelnemer: _____

Handtekening van Deelnemer: _____

Datum: _____

As ongeletterd:

Ek bevestig dat die toestemmingsvorm korrek aan die potensiële deelnemer voorgelees is, en dat die individu die geleentheid gehad het om vrae te vra. Ek bevestig dat die individu vrywillig toestemming verleen het.

Naam van Getuie: _____ EN Duimafdruk van Deelnemer:

Handtekening van Getuie: _____

Datum: _____

Naam van Navorser: _____

Handtekening van Navorser: _____

Datum: _____

Verklaring deur die navorser/persoon wat toestemming afneem:

Ek het die inligtingsvorm aan die potensiële deelnemer gelees, en na die beste van my vermoë het ek seker gemaak dat die deelnemer die navorsingsproses verstaan. Ek bevestig dat die deelnemer geleentheid gehad het om vrae te vra en dat ek vrae na die beste van my vermoë beantwoord het. Ek bevestig dat die toestemming vrylik en vrywillig verkry is en dat 'n afskrif van hierdie ingeligte toestemmingsvorm aan die deelnemer verskaf is.

Naam van navorser/persoon wat toestemming afneem: _____

Handtekening van navorser/ persoon wat toestemming afneem: _____

Datum: _____

APPENDIX K: Focus group discussion: schedule (agenda)

CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE

9. **Welcome and scene-setting**
10. **Outline purpose of the research study**
11. **Validation of participant's availability and contribution**
12. **Discuss time frame (duration no longer than one and a half hours)**
13. **Ground rules**
    - Confidentiality
        - The facilitator will explain the confidential nature of the discussions.
        - Participants will be requested not to reveal the content of the discussions outside the focus group discussion room.
        - Participants will be informed that coded numbers will be used to identify participants during the focus group discussions. Participants will be assigned a number (identifier) that will be displayed on a number tag; this will correspond with a seating chart indicating participants and their corresponding number.
        - A request to record the discussion for recollection purposes will be made.
        - Participants will be informed about the note-keeping responsibility by the researcher, safekeeping of the recordings, and that transcription will be done word for word.
        - No information will allow individual subjects to be linked to specific statements.
    - Respect for privacy will be emphasised
        - Participants will be requested not to reveal the identity of other participants outside the focus group discussion room.
        - Participants will be requested to value each other's contributions by listening to everyone's contribution and refraining from criticising other contributions
        - Participants will be informed that they are not obligated to answer questions
14. **Discussions as per focus group discussion guide**
15. **Conclusion**
    - Confidentiality and respect for privacy will again be emphasised at the end of focus group discussions.
    - Participants' valued contributions will be emphasised.
    - The way forward with the research project will be explained.
    - Availability of researcher to answer questions.

16. **Debriefing session**
    - Immediately after each focus group discussion, the note-taker (researcher) will conduct a debriefing session with the facilitator. The following will be noted:

- Important nonverbal communication,
- Group dynamics observed during the discussion,
- Questions that are not effective,
- Information that either contradicts/confirms data collected in previous sessions,
- New topics that arose during the focus group discussion.

APPENDIX L: Focus group discussion guide

1. FOCUS GROUP DISCUSSION: COMMUNITY MEMBERS: GUIDE

You have been diagnosed with either overweight and/or high blood pressure (hypertension) and/or high blood sugar (diabetes) that are chronic diseases.

QUESTION 1: Which factors do you think can contribute to the development of obesity and chronic disease(s) like high blood pressure and high blood sugar?

Additional probing question(s) if deemed necessary

- Perceived risk factors (increased body weight; physically inactivity, unhealthy diet, tobacco use, alcohol use)

QUESTION 2: How do you think lifestyle factors such as diet, smoking, and physical activity can contribute to the development of chronic disease(s) like obesity, high blood pressure, and high blood sugar?

QUESTION 3: How can a mother's unhealthy lifestyle (e.g., an unhealthy diet, smoking, physical inactivity) contribute to the development of chronic diseases such as high blood pressure and high blood sugar later on in the life of her child/children?

In order to improve your health, you need to visit your health care facility (clinic) and participate in health-promoting activities.

QUESTION 4: What do you know about your disease?

Additional probing question(s) if deemed necessary

- What information did you receive during your clinic visits or home visit?
  - Information about chronic disease
  - Information regarding healthy lifestyle choices (importance of achieving and maintaining healthy body weight; increase physical activity, importance of a healthy diet, avoid tobacco use)
  - Information regarding health promotion activities in the community
- Which member of the primary health team (doctor/community health worker/health promotor/nurse/dietician) contributed most to your knowledge of your disease(s)?
- Which member of the primary health team (community health worker/health promotor/nurse/) visited you at home?
- What other factors contributed most to your knowledge of your disease(s)?
  - Insight into a range of possible contributions (i.e., radio, television, pamphlets, advertisements, food packaging)

QUESTION 5: Besides medicine, what other service/advice have you received at your primary health care facility regarding your chronic disease?

<u>Additional probing question(s) if deemed necessary</u>

- Insight into a range of services (i.e., health education), including advice on the importance of a healthy lifestyle, lifestyle modification and other health care measures (referral, manage complications, for example, self-management support, information on health promotion activities in the community).

QUESTION 6: What is the importance of attending scheduled follow-up visits to manage your obesity and/or chronic disease (hypertension and diabetes)?

QUESTION 7: Which factors make it difficult to access your local health care services?

QUESTION 8: What is your experience of health care quality at your primary health care facility?

<u>Additional probing question if deemed necessary</u>

- Which factors make it difficult for you during your follow-up visits at your local primary health care facility to experience optimal and quality health care?
    - Insight into optimal treatment and service delivery to patient

2. FOCUS GROUP DISCUSSION: PRIMARY HEALTH CARE TEAM AND HEALTH CARE WORKERS: GUIDE

Risk factors for chronic diseases of lifestyle

QUESTION 1: Which operational protocols/guidelines are available to address risk factors for chronic diseases of lifestyle?

Additional probing question(s) if deemed necessary

- Awareness of protocols/guidelines to reduce physical inactivity and promote physical activity in the individual/community.
- Awareness of protocols/guidelines to reduce unhealthy eating and promote healthy eating in the individual/community.
- Awareness of protocols/guidelines to reduce the burden of tobacco use in the individual/community.
- Awareness of protocols/guidelines for the prevention of non-communicable diseases in the individual/community.

QUESTION 2: What is your opinion regarding the practical implementation of these guidelines?

Additional probing question(s) if deemed necessary

- Adequate training provided
- Realistic guidelines
- Support to achieve goals

Chronic diseases of lifestyle

QUESTION 3: Which national policies and operational protocols/guidelines for managing obesity and following chronic diseases of lifestyle, hypertension and diabetes are available in this primary health care facility?

QUESTION 4: How do you feel about training provided to you to implement chronic disease of lifestyle intervention programmes?

Additional probing question(s) if deemed necessary

- Adequate training provided
- Realistic intervention programmes

QUESTION 5: What is your opinion about an integrated approach to address lifestyle diseases?

Additional probing question if deemed necessary

- Integrate shared risk factors for lifestyle diseases (unhealthy diet, physical inactivity, smoking) with maternal programmes

Chronic diseases of lifestyle prevention and intervention programmes: Barriers/practical implementation issues

QUESTION 6: In your experience, which barriers and/or practical implementation issues are experienced that hinder the effective implementation of chronic diseases of lifestyle prevention and intervention programmes at this PHC facility?

QUESTION 7: Which areas of good practice exist?

<u>Additional probing question if deemed necessary</u>

- Which areas still need improvement?

3. FOCUS GROUP DISCUSSION: MEDICAL STUDENTS: GUIDE

Regarding your CBE rotation

QUESTION 1: What is your opinion about the information provided in the MBChB programme regarding obesity and the associated risk factors for the following chronic diseases of lifestyle (CDL): hypertension and diabetes?

QUESTION 2: What is your opinion about the information provided in the MBChB programme of CDL intervention programmes for chronic diseases of lifestyle (with specific reference to overweight, hypertension and diabetes) and the implementation thereof in a primary health care setting?

QUESTION 3: Which operational protocols/guidelines to address risk factors for chronic diseases of lifestyle were displayed at the primary health care facility?

Additional probing question(s) if deemed necessary

- Protocols/guidelines to reduce physical inactivity and promote physical activity in the individual/community.
- Protocols/guidelines to reduce unhealthy eating and promote healthy eating in the individual/community.
- Protocols/guidelines to reduce the burden of tobacco use in the individual/community.
- Protocols/guidelines for the prevention of non-communicable diseases in the individual/community.

QUESTION 4: Which areas of good practice, with reference to the effective implementation of CDL prevention and intervention programmes, did you observe during your rotation in the PHC facility?

QUESTION 5: Which prevention and intervention programmes observed in the primary health care facility integrated shared risk factors for lifestyle diseases (unhealthy diet, physical inactivity, smoking)?

Additional probing question(s) if deemed necessary

- What is your opinion about an integrated approach to address lifestyle diseases?
- Integrate shared risk factors for lifestyle diseases (unhealthy diet, physical inactivity, smoking) with maternal programmes.

QUESTION 6: What is your opinion regarding adequate opportunity to understand and experience acute management of chronic diseases of lifestyle (e.g., hypoglycaemia in a diabetic patient)?

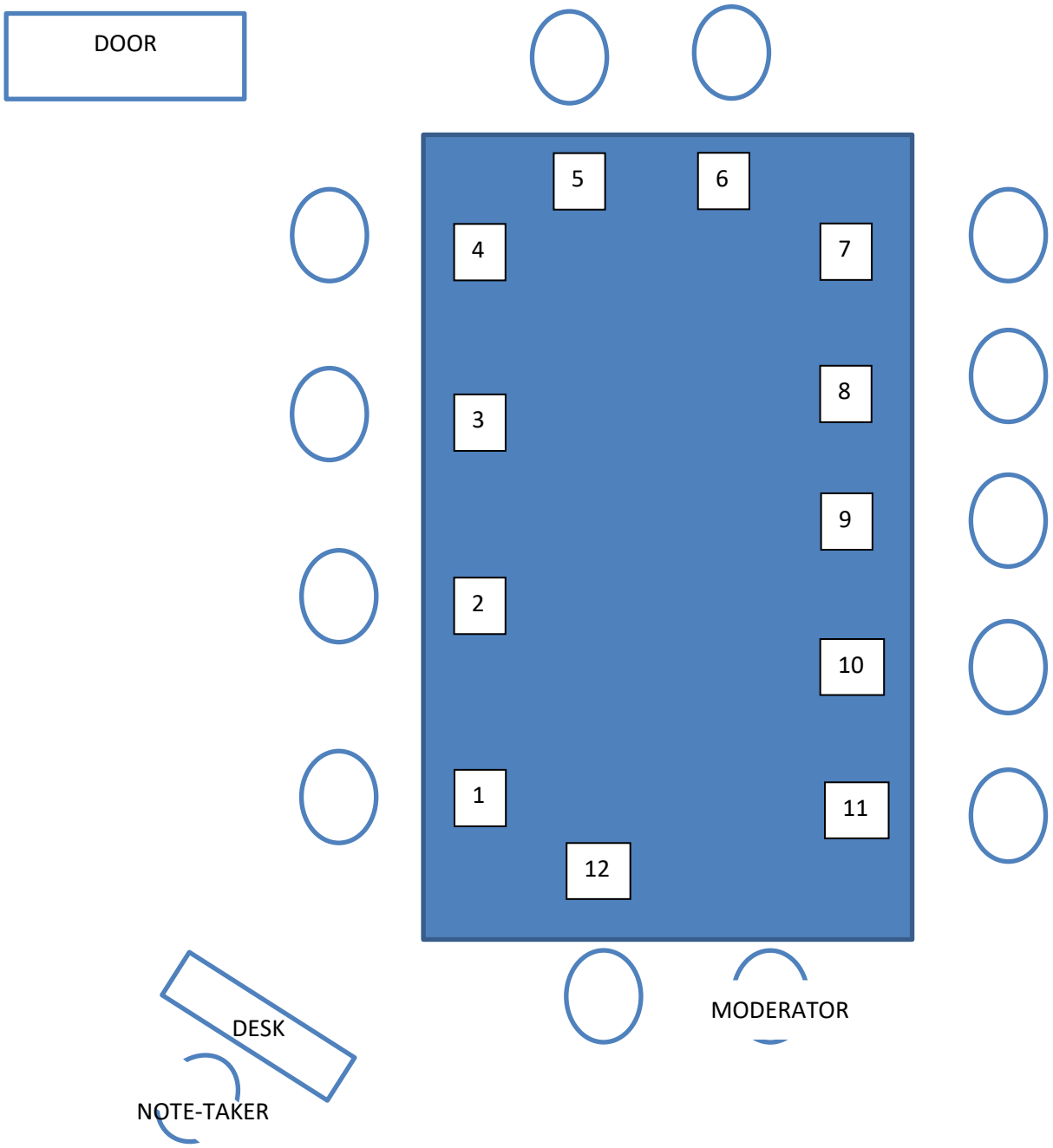
QUESTION 7: What is your opinion regarding adequate opportunity to understand and experience ongoing management of chronic diseases of lifestyle (e.g., identify chronic complications in a patient with hypertension)?

APPENDIX M: Focus group discussions seating arrangements

Date: 6 September 2018
Focus Group Category: Medical students (Group 1 - semester 7 & 8)

Start time: 12h45
End time: 14h15

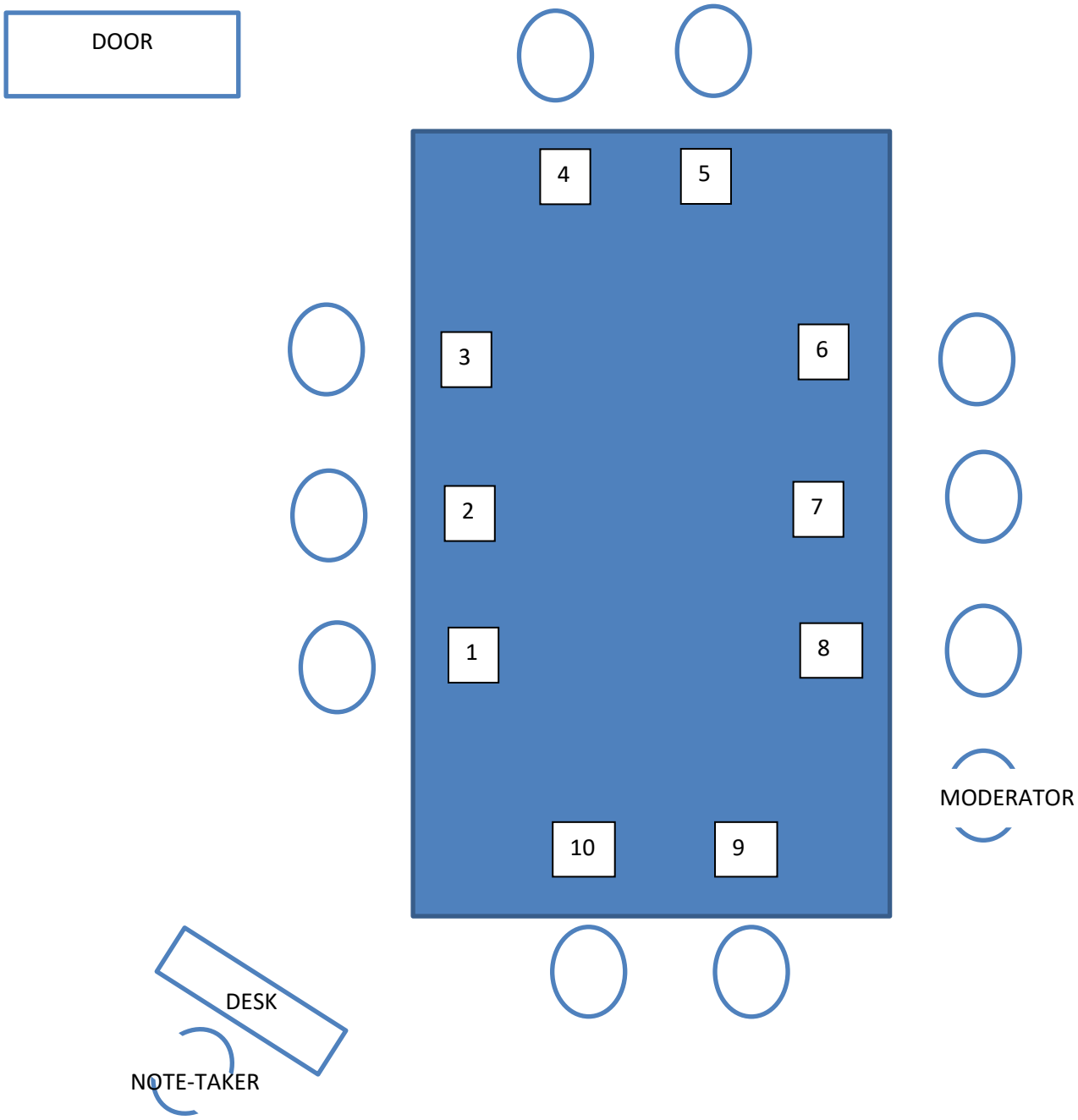
Moderator: Prof. M Labuschagne
Note-taker: Dr S van Zyl



Date: 26 September 2018
Focus Group Category: Medical students (Group 2 - semester 9 & 10)

Start time: 12h45
End time: 14h15

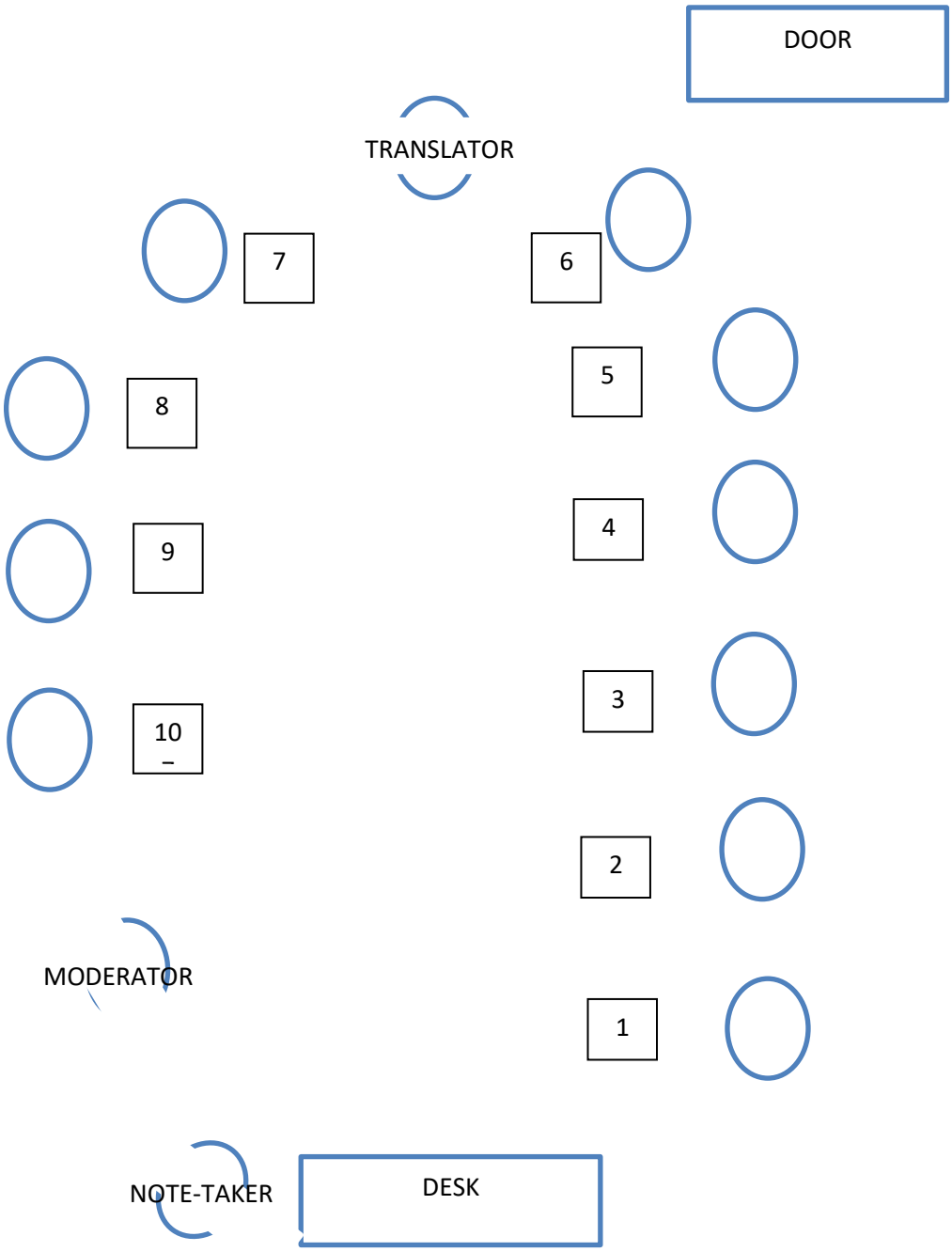
Moderator: Prof. M Labuschagne
Note-taker: Dr S van Zyl



Date: 15 April 2019
Focus Group Category: Community members (Urban)

Start time: 08h30
End time: 09h15

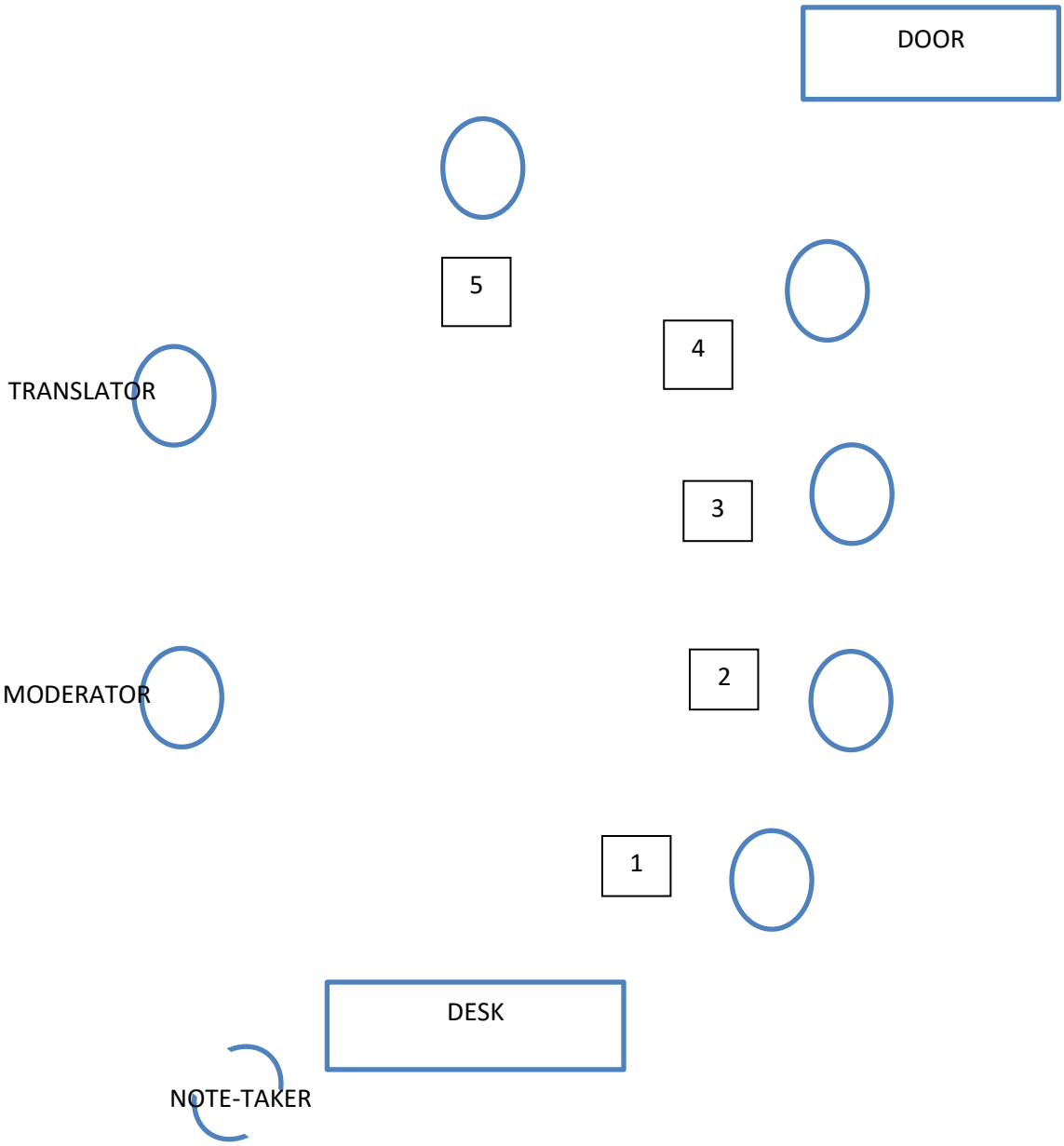
Moderator: Prof. M Labuschagne
Translator: Dr N Moopela
Note-taker: Dr S van Zyl



Date: 15 April 2019
Focus Group Category: Primary Health Care team and Health Care Workers (Group 1 - Urban)

Start time: 09h35
End time: 10h50

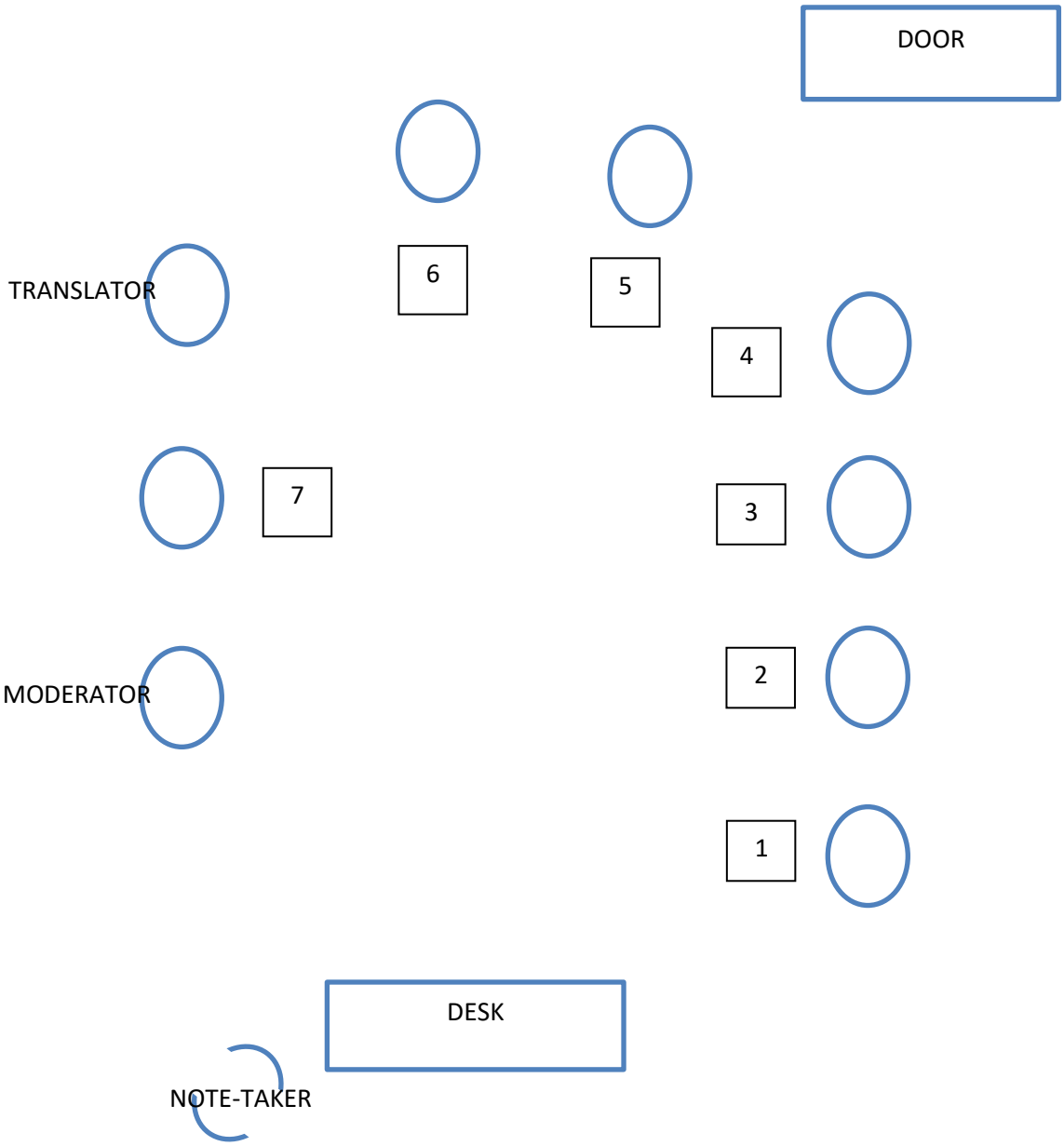
Moderator: Prof. M Labuschagne
Translator: Dr N Moopela
Note-taker: Dr S van Zyl



Date: 15 April 2019
Focus Group Category: Primary Health Care team and Health Care Workers (Group 2 - Urban)

Start time: 11h10
End time: 12h20

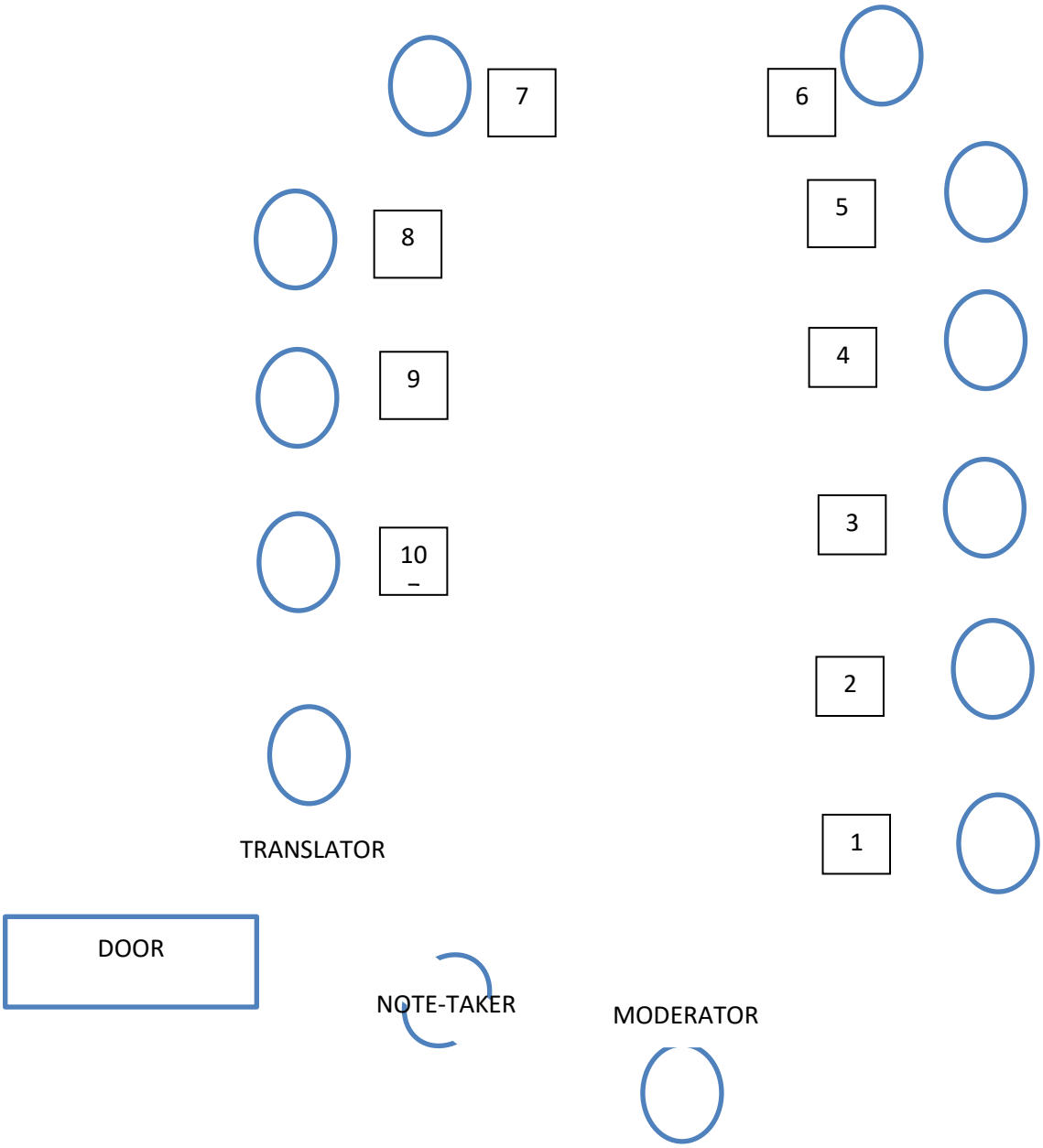
Moderator: Prof. M Labuschagne
Translator: Dr N Moopela
Note-taker: Dr S van Zyl



Date: 21 October 2019
Focus Group Category: Community members (Rural)

Start time: 09h30
End time: 10h45

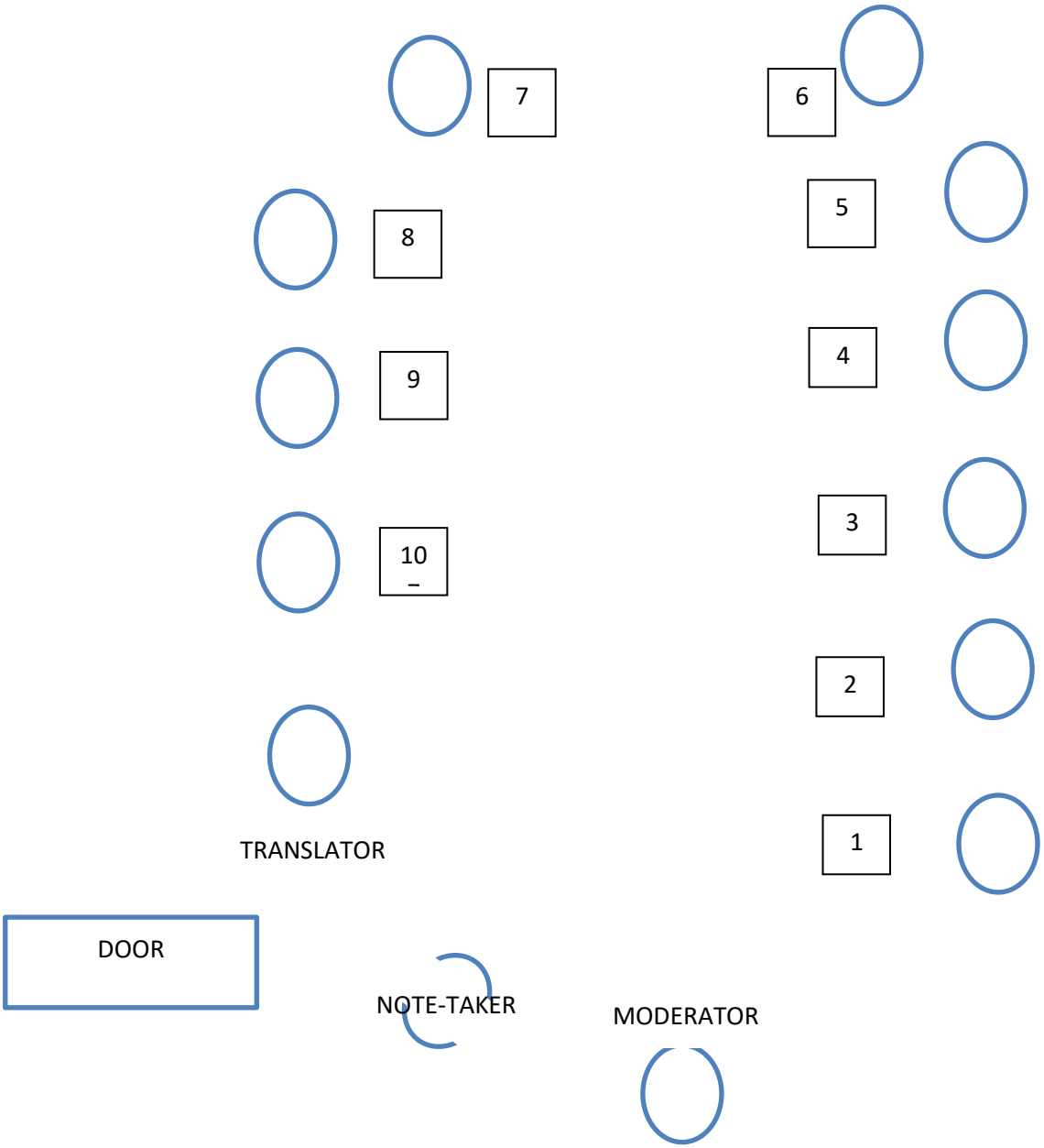
Moderator: Prof. M Labuschagne
Translator: Dr M Ntsapi
Note-taker: Dr S van Zyl



Date: 21 October 2019
Focus Group Category: Primary Health Care team and Health Care Workers (Rural)

Start time: 11h00
End time: 12h15

Moderator: Prof. M Labuschagne
Translator: Dr M Ntsapi
Note-taker: Dr S van Zyl



APPENDIX N: Focus group discussions example transcription

FOCUS GROUP DISCUSSION

Focus Group Category: Medial students (Group 1 - semester 7 & 8)
Date: 6 September 2018
Venue: UFS, Faculty of Health Sciences, Simulation unit debriefing room

Moderator: Prof. M Labuschagne
Note-taker: Dr S van Zyl

The following table contains the details of the transcribed focus group discussion for the Medial students (semester 7 & 8), including field notes made by the note-taker during this focus group discussion. The number allocated to each participant is indicated as Participant Medical Student Group1 (Abbreviation: PMSG1), followed by participant number in column 1.

FACILITATOR PARTICIPANT	RESPONSES	FIELD NOTES and OBSERVATIONS
Facilitator	You all know about the ethics and ethics committee and .. so that is the confidentiality. Dr Sanet also said that if at any time you want to withdraw, you are allowed to do that uhmm.. and then please do not use names. We know each other but for the confidentiality sake, so if you want to say so, then you say number 11 and then you say what you want to say. If someone want to say … give your number, but I will also facilitate that. Then the other thing is, please one person at a time…uhmm especially for the recording, if three people are talking at the same time it is hectic…very difficult to find out what have been said…so.. give each person the time. If you want to say something just indicate to me so then I will know who is next, but I, I will facilitate the whole process. And then please turn off your cell phone, because it is really disturbing if the cell phone rings and.. so that is and then umm.. Dr Sanet also said that she will be here and it is just to keep records. I am also going to make some notes if necessary…umm but everything will be recorded and then it will be transcribed, so it will be typed out word by word and then it will be send so that we can make sure that everything is right. And then, there is no right or wrong answers ..so you give your own opinion, it is not what you think should be said, you give your own opinion ..if you said..if you saw something terribly wrong in the clinic, say it, if you saw something that was wonderful in the clinic also say it. So give your opinion and if you think something should change in the programme, that they should spend more time on something, please say it. That is the purpose of this study is to make it better.. so ..uhmm and if there is anything that you are uncertain about, you can talk .. say that..uhmm and as I said there is no right or wrong answer it is your own opinion. Is there any questions?	Participants have settled down and everyone looks eager to contribute to the discussion. Participants nod heads in agreement with statement. A few participants adjust cell phone settings Silence
Note-taker	Just .. uhmm the sequence of the numbers for you guys who are looking at the back of the little boards, it is one and umm, two, three, four, five, six, seven, eight, nine, ten and eleven… that you just know the sequence.	Participants attentive and indicate with head nods that

		they understand the instruction
Facilitator	Ok so .. let start. I am going to ask you the first question and uhmm.. and please be umm.. so .. What is your opinion on the information that was provided in the MBChB programme regarding obesity and the associated risk factors for the following chronic disease of lifestyle: hypertension and diabetes? So what was the information you received in the MBChB programme? Your opinion on that information.	Participants portray positive body language
PMSG1 No.3	I'm … I think what they mention was adequate but also when there are like gaps you get to fill them in during your rotation .. .. so I think the information is definitely adequate but also you don't realise like how real it is until you get a patient right in front of you and then you see everything that you were learning about. So for me, I'm always really impressed about like when you get a patient who it is really typical of what you have learned about in class.	PMSG1 No.3 immediately responds
Facilitator	So you see in practice what you were taught.	
PMS1 No.3	Yes.	
Facilitator	Ok. Any other ideas?	
PMSG1 No.4	Doctor , I was just also saying, that yes, a lot of the risk factors that we are taught about is true but I think on the list we can refocus on the latest research regarding like epigenetics and things like that is actual very actual at the moment, hot topic. I don't think a lot of students really know about that and if you looking at South Africa in the whole and the communities we are working there was a lot of things in the past that had an influence on people's genetics today and we don't understand why.	Participant 11 nod head in agreement
Facilitator	Ja,ja ..ok…. No.11.	
PMSG1 No.11	U'm, just to continue what no. 4 said… our information that we get is adequate but, and not just pertaining to this specific topic, our university does not focus on updated information, a lot of our notes that we get is very outdated and it brings conflict especially when you do oral examinations and things like that then you do not have the newest information available to you.	
Facilitator	No.1.	
PMSG1 No.1	U'm I just like to follow on as well, but I feel like that is also because of the described text book. For example, I got most of my information for hypertension and diabetes from Davidsons but the epidemiology is more specific, I don't know, like an American based or Eastern based and you don't get epidemiology for this country or the stats for this country, which makes it different.	A number of participants nod heads in agreement
Facilitator	So, so.. in your opinion the handbooks are more for first world countries and not …	
PMSG1 No.1	Yes, specifically with regards to the stats and the treatments….. in those two I think it would …the … pathophysiology does not changes, those things do not changes.	
Facilitator	Any other ideas?	
PMSG1 No.5	Just one thing I can..	PMSG1 eager to respond
Facilitator	No.5	
PMSG1 No.5	I think they do teach quite a lot about obesity and, but later on when we get to the clinic like they emphasising … for pre-clinical years they emphasising obesity for example, but once you get to a clinic it is just completely not … like it is a risk factor anymore, nobody cares about it, they just say everybody is obese deal with it. So that is also quite a problem.	

PMSG1No.3	I think also what is lacking for me like when we got to Trompsburg and were in a rural setting there something that they teach us like; do this, tell a person to exercise, tell a person to eat healthy, but they don't consider the person's background and if you say the person has to eat healthy and they don't have food but you don't teach them like how to maybe make a garden and stuff. So there is a lot of thing they tell us tell the patient do this and this and this but we have to individualise the patients and I..I don't think they emphasised on that much.	
Facilitator	That's a good point. Any other opinions on this? No.8.	PMSG8 eager to respond
PMSG1 No.8	I was … in our texts books the clinical setting, I mean the pre-clinical setting we get a lot of information pertaining to how to treat certain diseases and how they are monitored….controlled basically. Say for diabetes for instance, but when you get to the clinic there is one or two glucometers for the clinic. The patients don't have any way of testing glucose at home. Think just the difference between what is clinically prescribed and what is actually performed. It would be nice to just get the different perspectives beforehand to prepare yourself and may be just get a better feel of how things are going in South Africa.	
Facilitator	Any other ideas? No. 7.	PMSG7 raises hand
PMSG1 No.7	I also think, don't think that a standardised approach have been followed pertaining to these patients. As he already said, the glucometers, though some clinics may test it and in practices it is not always used, in some practice not at all and even if it is, practice at one place it is not standardised practice through all the clinics.	
Facilitator	Umm ok… No.10.	
PMSG1 No.10	Also I think what might help in our context is to be taught maybe what every level of health care's role is in these lifestyle diseases, because we were not really sure what can the clinic do … about especially when we went on home visits and should the patient we found, a patient with a glucose of 22, should they be taken to the clinic as soon as possible, to the hospital, should the doctor be notified, what's the……uhmm	Uncertain, struggle to find right words
Facilitator	So there is no specific guidelines on the different levels?	Facilitator
PMSG1 No.10	Or maybe there is, but I don't know ….. we were not aware of this, we don't really know what stock the clinic has… can they treat something acutely ….	
Facilitator	Anybody disagree with …what was said? Okay, so let's move on to the next question. What is your opinion about the information that was provided in the programme of the chronic diseases of lifestyle interventions? So here we focus on what was taught about the interventions for chronic health styles diseases.	
Facilitator	No.10.	
PMSG1 No.10	I think there is a strong emphasis's on medical treatment which are supposed also like No. 3 said it's probably the same in most countries in the world, but then we don't, we don't have a uniquely South African syllabus on how to risk health style modification in South Africa… so the medical treatment I think we were taught about … but then how to treat, modify the risk factors that is lacing.	
Facilitator	No.11.	
PMSG1 No.11	And we learn about all these treatments but it is very rare that the treatment is actually available. So it is not of any use to us at this level where we are right now because we need to know about the prevention methods and protocols that are appropriate for our setting	

	and as mentioned in the previous question that we discussed, there are no protocols, especially in Trompsburg and in the rural areas as what to do with a patient when you find something that is abnormal for example a high glucose at a lifestyle club. What do you do with the patient? Or this patient has a hypertensive urgency, what do you do with the patient? And it make it specifically difficult if the facilitator is not with you. In one specific instance, we had a lifestyle group where we were there and the doctor was not with us and could not get hold of the doctor or the programme facilitator in the region and it's very distressing if you don't know what to do and you have identified a problem.	
Facilitator	No.6.	
PMSG1 No.6	I like to add what no. 10 and no. 11 said. Umm I think they teach us a lot about the risk factors for developing chronic lifestyle diseases and they teach us as students a lot about it and I think a lot of health care workers. But I don't think they emphasised it enough in the community outside of the health care centre. Especially our rural communities, they don't know what diabetes is, they hear something about a high blood sugar but they don't know what it is, they don't know what hypertension is. They don't know how important it is to just maybe exercise, just go for a walk or bring down their daily portion intake when it comes to diet food. So I think this is also a problem in the community in terms of promoting a better and a healthier lifestyle because that is where it all starts and I don't think they know how important this is.	
Facilitator	No.1.	
PMSG1 No.1	I just also feel that we get taught often the medical.. but we don't get emphasised the dosages, so we get there and when you write a script and then like ok… Pharmapress.. do I just give 20 or start at 10 and then give 20.. then you add two extra drugs because … I don't know what to do…so also I think it is just about me learning it properly in the undergrads, …in pre-clinicals I didn't think it was necessary then.	Body language and facial expression convey anxiety experienced. PMSG1 No.11 also wanted to contribute to conversation, raises hand.
PMSG1 No.11	I think we did get taught all of these medication and their dosages in first year or second year somewhere, but I think we were taught of lot of inappropriate medications and so you were flooded with a million medications that you don't need to know and their dosages and you learn the wrong things and instead of having it more focused and more appropriate, umm ja…I think maybe it would be helpful if in our .. there would be a Pharmacology revision module in our clinical years, …	
Facilitator	More in your clinical years	
PMSG1 No.11	Yes that it is more directed.	
Facilitator	You've all talked about medication now, were you taught any other interventions, except medication? You've mentioned exercise, the other interventions or do you think you were taught only medications or some other interventions as well?	
Facilitator	No.5	
PMSG1 No.5	The problem is they tell us like you have to have a proper diet and you tell your patients he has to have a proper diet and you know a proper diet consist of some meat, some veggies whatever, but in the South Africa setting it is really impossible for them to afford that? So I think	

	it doesn't help they teach us the patient has to eat salmon once a week and chicken twice a week and this and this …	
Facilitator	.. and in Trompsburg there is no salmon ..	Laughter all around the room
PMSG1 No.5	..exactly, so they have to tell us … this the patients can afford and we have to work according to that.	
Facilitator	No.6	
PMSG1No.6	They also taught us the importance of screening for chronic lifestyle disease. I think the only problem with that, especially in our rural clinics, there's no equipment, I mean they use it in a week and the delivery is in three more weeks … so what do they do in the meantime.. there is nothing to screen the patients, while I think that is very important in preventing a lifestyle disease, for it begins to escalate …	
Facilitator	No.2 and then 9	
PMSG1 No.2	One thing that was positive in Trompsburg was with these lifestyle groups. Sometimes we got guest speakers in, as well, coming from Bloemfontein or other parts of the country and specifically, when we were there, someone came in on how to start a vegetable garden in the whole of Trompsburg … how he.. He kind of started a competition within the whole community to start them trying to be sustainable instead of buying their food from the vendors.. so in that sense that was positive that they are trying to get things that is sustainable into the rural community as well.	
Facilitator	No. 9	
PMSG1 No. 9	And I think, like everyone has mentioned, we get taught other ways like lifestyle modification but a lot of emphases is put on a medical interventions and I realise this at the clinic. The first thing .. like a child comes in with a cough or whatever, you want to give antibiotics or something and the sisters always insist on give health education, give health education, the whole time and you realise that especially in the rural communities. The medication usually is not there and they struggle and have to rely on other remedies. So like everyone has been saying now, is it is very important that they customise the interventions for a South African setting.	
Facilitator	Ja, Okay … No. 7	
PMSG1 No. 7	I also believe, regarding the control of the interventions, there is no … very seldom.. equipment and there is very poor control of the intervention, to monitor if it is effective because yes, you were told medical treatment, know medical treatment ..it is supposed to be controlled.. evaluate it.. ja.. the efficiency. I think it is quite lacking due to not having the equipment, not having the manpower to basically see all those patients and serve the whole community …	
Facilitator	Ja, Ok … No. 4	
PMSG1 No. 4	I just want to say a few things about intervention. Firstly the medication patients get, especially in rural settings and in Bloemfontein, patients don't know why they have these different medications. A lot of them don't know this is for their high blood lipids, … or fat..ja.. to put it in a more understandable way for them, or this is for their blood pressure and this you have to drink for your diabetes. Patients don't know, they just don't know. They know these names and they don't know why they have to drink it, so I think then they don't use it as it is prescribe because then they don't really think it is necessary. And another thing with regard to prevention and everything that have been said is .. somehow we need to change our populations staple food and I know it is a big thing and it is going to be difficult, but	Passionate expression

	we are in a medical field and we know a lot of people that's in different other departments on campus. I really think that we should talk with maybe the agricultural people on campus and different people to see if we can't get cheaper food for our poor patients and for the entire country in the whole. Change of bread maybe, or change like "mieliepap" they use, I mean it is all that children eat from when they are very little and do you understand… that's cheap .. so I think we must look at the bigger picture, really try and change our entire country with regards to really go to the food, really go and change the basic.	A number pf participants nod heads in agreement
Facilitator	You've mentioned now to employ other professions as well. I want to know from you, your inter-professional interventions are you…do you think you are adequately trained on say for instances dietetics or the other professions' roles in the management of the patient? I see a lot of people …	A lot of participants nod their heads in agreement PMS1 No. 4, 10, 11 and 6 indicate to facilitator that they would like to respond
Facilitator	No. 4	
PMSG1 No. 4	Dr, I think like even in hospital when I get to a patient that is a known diabetic and you see…I saw the other day yoghurt on the sideboard and I didn't know if this yoghurt is actually allowed in a diabetics diet or not. Then I needed to go consult either google or went to the dietetics because we have never been told and sometimes even these interventions like these lifestyles is in our slides but they don't get like to stop there, they just pass on, but I don't feel that we are adequately trained specifically dietetics and when to refer accordingly ……	
Facilitator	No. 10	
PMSG1 No. 10	Ja, I think definitely our training with regards to other health professions is very lacking and okay I've heard that some of the others, they get lectures from our lecturers for example about the effects of certain medications because occupational therapists and dieticians and physiotherapists they need to know when they are treating patients, what medication. So they do get a few lectures from our lectures, not just about pharmacology, but I think we had maybe one lecture in first year from the dietetic, no lectures from physiotherapy, none from occupational therapy and maybe one or two from nursing and I think we could learn a lot more about when to refer, what they can help us.. help the patient with and so on.	
Facilitator	I'll be with you No. 11. I just want to add on to that question. When you were in Trompsburg, did you have inter-professional interactions there? Yes – a lot of people nodded yes. No. 6 you wanted to say … I'll be with you...	A number of participants nod heads in agreement PMS1 No. 11 raises hand
PMSG1No. 6	Yes, when we were in Trompsburg I realised for the first time actually how important the referral system is because we had our patients we needed to visit and they have multiple problems .. musculo-skeletal…endocrine.. metabolic all of those and sometimes I didn't even know where to refer someone with a problem, which I could not help, and the occupational therapists we worked with, taught us to … where we should refer the patients to and it was really fascinating how many referrals we wrote a day, it was really extraordinary actually ….	
Facilitator	No. 11, you wanted to say something?	

PMSG1 No. 11	Just continue on what no. 10 said about the inter-professional roles and things ...umm... the IPE has really broadened my personal vision as no. 6 also mentioned, but I think it is not enough because it focused on so few aspects and I think it would be helpful if we could maybe have lecturers from say OT and physio within each rotation that we have. Maybe just one lecturer from the Allied Health Sciences - pertaining specifically to that group of patients that we are dealing with ..say now at Obs and Gyne for whatever reason if a patient needs a referral, dietician referral or a physio referral, it would be nice in that rotation just to have one lecture from Allied Health Sciences and not from a doctor telling us this is what they do… from that specific Allied Health Sciences and just ….. and it's not a lot it could be an half hour lecture where they just give a broad overview of that specific conditions and that specific patient. I think in one afternoon we could see all of the Allied Health Sciences, so that we have just a broader vision of how they are involved….	PMS1 No. nods head
Facilitator	No. 9	
PMSG1No. 9	Also with what she said ..what no. 11 said. I think it should be introduced from a very … like from the beginning already because we start as MBChB … and then it is the fourth year and then they are ..oh! but there are others now you must suddenly work with them .. but no it is true…so if we are taught from the beginning that we are working together then I don't think it should be a problem later. When I was in Trompsburg we didn't have IPE we were the only ones there so we didn't do a lot of the community …. we didn't do any community outreach … ja … we .. uhmm …ja.. So what we did was having presentations in the clinic …and who are the people that come to the clinic, they are either already on medication or they are sick that day … and those were the people that get this information or any information regarding lifestyle prevention or anything because we have always been taught that prevention is better than cure, but now people that come there are already sick so now the information is now being late. Now if we are not in Trompsburg are there still community outreach? Are there still health classes or educational talks given ….. are there? So I think we all know it is important to prevent, but in practice it's not really been done.	Laughter all around the room
Facilitator	Any other opinions on this? Okay so the next one is, which protocols or guidelines did you see was displaying in the clinics while you were there?	
Facilitator	No. 2	
PMSG1 No. 2	One protocol was the standard needle sticking injuries that are at every clinic. The protocol is up, but what was fascinating to see is .. but not all of the sisters and not all of the health workers in the clinic were aware as how to go about it… it felt like some students knew more as to how to go about it as they … they just assumed… you go do a rapid test, if it's negative you will be fine. Luckily, we have systems in place as well in our logbooks and stuff where you call *Infective diseases*, are guided through exactly what occurred … for the needle stick injuries and like for .. as there is a lot of neonatal exams on babies and infants ..so those vaccinations schedule are also very well displayed I think in the clinic.	
Facilitator	Any other, especially lifestyle decisions. No.1.	
PMSG1No. 1	No just the HIV and pregnancy as well.	
Facilitator	No.6.	
PMSG1 No. 6	Oh yes, I wanted to add on his comments about the vaccinations especially *the road to health* booklets and protocol. I think in especially	

	in the rural clinics in Trompsburg, they really follow up the children very nicely, so I'm impressed with that.	PMS1 No. 7 shows agreement nods head
Facilitator	Okay ..and umm .....so it was more focused on children and HIV, needle sticks but not really information about non-communicable diseases?	
PMSG1 No. 5	We have seen …uhmm	
Facilitator	No.5.	
PMSG1 No. 5	….diabetes posters in a lot of the clinics but I think that it is as far as it goes. I have not seen any of obesity posters or healthy diet .. You see a little dietetics things about eating salmon, once again it is way out of context.	Laughter all around the room
Facilitator	No.9.	
PMSG1 No. 9	When we were in Trompsburg, we actually did our clinical presentation on malnutrition and correct diet because we did see that there was nowhere any mention of it anywhere in the clinic and when we asked the sisters what do they think is important to the community, what do they need to know, they said they don't know anything about diet and malnutrition in adults or in children and that we should educate them on that.	
Facilitator	Ok…No.12 you are so quiet?	
PMSG1No. 12	I was just thinking about their posters, because we also did that, but now another example of that is - you present and you are obviously doing your presentation display, but presentations are not put up somewhere….whereby we found there is … on some ja …so it is like we do all these things.... but the question is are they actually getting put up where necessary. For one, we also talked about depression and how different cultures sees depression differently, so a lot of aspects are not… I think we focus more on the diabetes, hypertension, but then we don't really focus on the holistic individual as a person. We focus more, you get hypertension, restrict your salt intake but what happens if you are depressed, what happens when you are suicidal, what happens because you are sick, because you are burnout or whatever, what happens if stress is causing you your illnesses, we don't really focus on ….. .	
Facilitator	.. the holistic, the person. Just out of curiosity – I just wanted to know the posters you saw were there a lot of pictures, explaining it or was it only written.	
A number of participants respond simultaneously	Mostly written More written In fine print	Laughter all around the room
Facilitator	What is your opinion on that? No.12 and then No.3	PMS1 No. 12 and 3 both eager to answer, indicate it by raising hand
PMSG1No. 12	The other problem that we experienced, it's all written in English and you live in a community where no one can read, or they know Sesotho or only know Afrikaans.. then the protocols everything is in English. So yes, information is there but can your patient actually understand what is said?	PMS1 No. 3 nods head in agreement
Facilitator	Yes, No.3	
PMSG1No. 3	**Umm**…also another thing, I know with me even if I see ten posters on a wall, I will not just stop and look at the posters, or unless someone.. or unless it is attention-grabbing or someone sort of draws my attention to it. So, also I think pictures would make more sense,	

	especially in a rural setting, cos now.. for us.. when we did our presentation, we did it on the diabetic foot and mostly it was picture's, then we would explain from the pictures, there was very little wording. So, you could see that they understood more, we even showed…instead of telling them, this is how you wash your feet. We actually went there with a bucket, and we showed them, wash in between, this is how you dry it. Some people switch off if you just keep on talking and talking, you can switch of eventually, so rather demonstrate it. I don't think, even the staff they don't have time, they just want to get through their patients. So.. ye…	
Facilitator	No.7	
PMSG1No. 7	Just regarding the placement of the posters or the protocol. A lot of time the posters, if there are posters, is mainly in the consulting room where the patients is only with the doctor for about ten minutes and in those ten minutes at the doctor they are more focus on the doctor because they need information. So perhaps, putting it in the waiting room would be more effective.	
Facilitator	Ok, No.11 and then No.6	
PMSG1 No. 11	I think it would be nice as well if students actually went to the people in the community and did a questionnaire with them to find out how much they actually know, because a lot of the times we think, we know what they don't know, but they might know a lot about hypertension now already because they only hear about hypertension, but they might not know that much about diabetes or obesity. So, I think it would be very effective if a questionnaire could be done in the rural setting to find out what the people know about and what they don't know about.	
Facilitator	Ok, No.6	
PMSG1 No. 6	Yes, I want, I want to add on number 7. I think if the posters are in the consulting rooms maybe they should take … or a practical solution would be, to take the patient to the poster or show them the poster and when you are giving the health education, show them the picture, show them step by step what they should do. Just to make it more easier for them to understand. Not just listen but have a visual aspect as well.	
Facilitator	Any other ideas, No. 8	
PMSG1 No. 9	I think of instead of implementing these forms of health education about preventable diseases such as type 2 diabetes and obesity on a level where if it ..say in the clinic.. a person is already most of the time has something wrong with him, he goes to the clinic for a reason. I think that maybe a possible idea would be, to increase the amount of this knowledge presented to us at school level .. for those of us , I know a lot of us is still disadvantage and still today don't attend school .. for example, one child in a household attend school and in grade 7 or 8 life education or LO as it was, there is a little paragraph or thing , just like on diabetes.. this is what it is, this is what it can do to you, this is what can be looked after, how it can be prevented, things you have to look out for. Then that person in that household can tell his parents, his friends, his grandparents and immediately you get a much larger exposure of that information.	
Facilitator	Any other ideas. Ok, so which prevention and intervention programmes observed in the primary health care facility integrated shared risk factors for lifestyle diseases. So, uhmm, as an example, say for instance, in the antenatal clinics, do you see integration of this chronic lifestyle diseases in	Silence

	different specialties or settings? Is it integrated there, did you see anything?	
Facilitator	No.4	
PMSG1 No. 4	Prof, I cannot remember of a specific time, but I just think what happens a lot, for instance, a patient comes to your antenatal clinic or it is a child may be coming to the clinic, due to the lack of staff and you don't have a lot of time, …a lot of the doctors or the sisters can see …. well the mom maybe obese or the grandma is here for her pneumonia but actually she is obese and she has all this risk factors, but due to time, we do not take that extra five or ten minutes and just quickly check the blood pressure again, do her glucose, screen her .. and just eliminate those risk factors before she even gets the disease. And, I think that is the problem due to staff and time.	
Facilitator	Ok, so staff and time is a big issue. No.11	
PMSG1 No. 11	I know that in the clinic at Springfontein all patients first have to go to the observation room before they are seen by a nurse or a doctor .. uhmm ..and there vitals get taken in this observation room and a general examination is done on the patients.. screen.., which I think is very good because at the time you get to the doctor, the doctor can see even though you are not complaining of headaches or any other associated symptoms, you do have a high blood pressure and you are not on medication. So, I think that was very effective.	
Facilitator	No.6 and then No.1	
PMSG1No. 6	Just something that I really appreciated when we were in Trompsburg, for our CBE programme, then we as students, with our occupational therapist, went as a group and we had, like…they have a diabetes club which meet up every week and we gave.. well we started by checking all of the patients in the club's blood pressure and their glucose levels. So I think … first of all that is a great way of using us as students to help with the screening load of the patients and secondly we gave them a PowerPoint presentation, on their level, to give them information especially on the risk factors which cause diabetes and on our home visits we did that as well. So I think in the community of Trompsburg that was very well implemented.	
PMSG1 No. 1	So, I just think on a specialty level I feel that sometimes, the vitals are always taken at clinics, but when it gets to the rate of the specialist, it does not get look at, at all. You come in with a problem, they only sort out that problem and I feel that it is when we are missing the…because then we are not screening at all ..so then why are we taking vitals ….?	
Facilitator	So what you say is that the integration of these vitals that are being taken and the attention that is given to that..is not … happening as it should?	
PMSG1 No. 1	I think more at Obs and Gyne it is happening.. but it is because it has further implication.	
Facilitator	No.3 and then No.9… Was your hand up? … No.9	PMS1 No. 3 shows with head nod that there is no further contribution
PMSG1No. 9	Also the patients are not really been told why their blood pressure gets taken or why.. I feel that if everything was explained.. "I am taking your blood pressure because I am trying to see if you have high blood pressure" and explaining in that moment what it is, what to look out for.. No 6 already mentioned uhmm the load on the staff is too much,	

	so there is no time to sort of like explain everything .. you just want to get through the line.. so that is another thing.	
Facilitator	Ok, anything else on integration? No.3	
PMSG1 No. 3	I also just want to add, I saw a patient this morning and the patient had preeclampsia and she had no idea what was going on and she had been admitted for two days already. So I think it is really important to take some time or whenever, just let the patient know so that they can be able to pass on the information to the next doctor then … don't have to start from scratch. But also if the patient knows what is going on and the dangers of the disease that they have then they can better take care of themselves. I am not saying that you should scare them, but just let them know or otherwise if you tell a person that you have high blood pressure and then you don't tell them about all the complications then …. I have seen a lot of people that have high blood pressure but they continue doing and living the way that they have been living before and carry on with their lives because they don't know the implications…. what does that mean for you… and also all the symptoms of micro and macrovascular complications, they don't get told all of that. They you just tell them you have high blood pressure and take your pills and carry on with life. So I think just that is a big factor.	
Facilitator	So communication and patient education is lacking. No.11 and then 10.	
PMSG1 No. 11	Just to continue on what nr.3 is saying, I think another problem, especially in our South African setting is that even though most of our patient do not have a formal education, uhmm.. doctors tend to underestimate the level of intelligence of our patients and then they just don't tell the patient what is wrong with them or explain it to the patient, because even though you might need to use layman terms, this patient still has a brain and they still will understand you. So, I think that is a big problem that a patients intelligence gets underestimated.	
Facilitator	No.10	
PMSG1No. 10	Like no.3 said I almost feel like in my experience patient education and education about risk factors is almost the last resort in our medical environment. If someone has hypertension then that gets treated but they don't necessary gets counselling and then suddenly when they have all these complications, then they get told .. Ok, no you should not .. get exercise, do this, do that. Someone that smokes, someone who has now lost their leg ..got amputated at Pelonomi primarily because they have smoked for the past 40 years, I mean they would have presented to a clinic 30 years ago with something else so may by if they have been told every time but now suddenly they get told if you don't stop smoking you going to lose your other leg or it will kill you. Or someone with chronic alcohol abuse, now only when their liver starts to really develop a lot of problems then we say ok, no but the big thing is the alcohol abuse.	
Facilitator	So you feel that this information should be given much earlier and communication … it goes back to communication. No 7 and then no 3.	
PMSG1 No. 7	I also think … regarding going late to hospital, ….they often present very late and when they usually presented with hypertension they now present at the ophthalmologist due to complications… so I think also in the system maybe we can pick it up before specialist level they should have been picked up long time ago …. talk to the patient give them the information because even if that patient goes home there is family members, there is always someone else and you can basically address it at home, you can prevent the progression of it to a specialist level.	
Facilitator	No.3 and then No.4	

PMSG1No. 3	I also just wanted to say there is one thing what we usually miss, especially in a rural setting, this thing of communication, we forget that some people actually contribute their symptoms to witchcraft or something like that and then they don't go to the hospital because they think.. O no … it is nothing or somebody is doing whatever to them. So, I think a lot of people can present to the hospital if they know what is going on, or I don't know, anticipate the particular disease instead of something happening and then they think ..O, no.. it is this or that. So they know from the start …..	
PMSG1 No. 4	I just want to add to what nr 7 said, I think we can really look at it, especially for future sake, and especially for the rural area. We focus a lot on women and children's life and people love to take responsibility of their own health and the mom's take care of those booklets and it does not matter where the baby goes, to what hospital whether it is Pelonomi or another province. If you open that booklet, it tells you a lot about that child … the growth, nutrition the health status etc. I do think that we shall really try to implement it on a national level even, especially for patient above 35 or 40, a special booklet which they can carry with them like an ID booklet. Every time you go to the clinic your blood results are there, if you had a papsmear, then to write it in. If the doctor examined your breast on this date, tell look I found a nodule there and there, this size or whatever the case may be.. because then we know that when a patient goes to the clinic, a doctor … they would do a proper examination and any change or any abnormalities will be noted and when the patient presents again the person… some change in the blood pressure suddenly.. then change this or that. Uhmm, I know it might cost money but I think we should not take excuses.	PMSG1 No. 4 very excited while contributing to discussion
Facilitator	It is maybe cheaper than treating the complications.	
PMSG1 No. 4	Because you can do like a neurological examination also maybe check the motor, sensory motor .. so it will be like an entire patient profile basically that goes with you.	PMSG1 No. 4 very excited when sharing this suggestion. No. 11 also eager to contribute
Facilitator	No.11	
PMSG1 No. 11	Just to continue on what no.3 said and this might be a very difficult suggestion and I don't know if it culturally acceptable but, I think we could maybe try and work together with community healers or sangomas and maybe give them some health training, some health education… so that they are able to identify patients that are maybe too scared to come to the clinic or hospital and if they can identify a real problem with this patient, they could maybe speak to this person and say listen I think you should go to the clinic to see someone at the clinic. I think that could help in a big way as well. Especially with the patients presenting so late or thinking that it something else.	PMSG1 No. 5 and 3 also indicated that they are eager to participate and listen with attention to no.11
Facilitator	No. 5	
PMSG1 No. 5	Just to add to that, I have seen multiple patient with high blood pressure and diabetes, and then they stop their medication because the traditional leaders have told them that they are cured ... so it is definitely something that should be looked into and implemented.	
Facilitator	No. 3	
PMSG1 No. 5	This is also something close to home. My grandmother is a traditional healer but she is also a nurse. So, at least with her it is an advantage because if someone comes and they think it is something spiritual or whatever she can identify. She even have HIV test at home that if you	

	agree then she can test you. So stuff like that, it can be of an advantage and I think it is something that could work although it will take a lot of time, because I mean it is difficult to change someone's way… but I think definitely going to the traditional..uhmm traditional healer ..or maybe having like a community thing where they come if they can and just educate them ..like of things that are of danger so if they identify, they can rather send the patient to a clinic or just suggest it.	Silence
Facilitator	Any other ideas on this integration? Which areas of good practice did you see? What is good things? We have talked about a lot of problems, but did you see any good things happening there?	Silence before PMSG1 No. 5 responds
PMSG1 No. 5	If we speak about Trompsburg, specifically there is a very good screening programme for the school children. I think that would be amazing if they could ever implement it in the country on a national level.. but I know it is impossible, but is just like a way.. they can do something like that, it is really good for mental health and for physical health for the school children.	
PMSG1 No. 7	I also think there is a very close relationship between the health care workers and their community, which is very good…they will go the extra mile for …just to help a patient who cannot come … especially in Trompsburg there is a lot of difficulty with transport and admin, a lot of difficulty arranging appointments and keeping those appointments .. So I think due to the close relationship, they will come more earlier and they really … you can see the difference between…ja.. being in Bloemfontein and being in Trompsburg.	
Facilitator	So you think it is better there than here ?	
PMSG1 No. 7	I think the relationship between.., yes and that definitely reflects, I think in the healthcare system .. as well..	
Facilitator	Ok, wonderful. No. 6	
PMSG1 No. 6	I also liked the home visits we did in Trompsburg, and I know in a big place like Bloemfontein that is not possible with our big population here, but in the small towns, which is far from a big hospitals, I think it is really a good practice to visit, especially in the elderly who cannot just walk to the clinic or uhmm,, just to visit them and screen them at home and give them the education… where you have almost a private consultation with them and..ja.. just to educate them on their level at home..that is really nice.	No 11 and 9 pay full attention, nod and also eager to contribute
Facilitator	No. 11 and then 9	
PMSG1 No. 11	To add on to that, I think in the small communities, especially the health care workers not just the nurses, the health care workers have a very good relationship with the people in the town and the patients and then they know each other and I think it makes it so much easier to treat them because you are much more ..uhmm .. you would much rather listen to someone who you trust than some random person, walking in there and telling you what to do…… So I think there is a good interpersonal relationship that has been built between the health care workers and the community.	Laughing while making the statement
Facilitator	No. 9	
PMSG1 No. 9	I know with the TB patients at Trompsburg every morning they go there to get your medication and if you don't pitch, they go to your house, find out what is wrong and maybe you are sick that day or whatever.. you get a consultation from home or they make a plan to make sure that you get your next dose, so that is also like a tight way of making sure that patients are taking care of themselves.	
PMSG1 No. 12	I just want to add on, on the TB patients as well, where you get patients who struggle with compliance, that person know where you live, so	Laughter all around

	you better come every to the clinic so they can see that you drink your medication, then you go home after that. So as much as patients are a bit on the fence about it, they still come because you know where I life. And another thing is also that they are actually not afraid to ask questions especially if you ask them: Do you have a thing to ask?... and they are je, not really or whatever, especially your lifestyle groups they are really well informed. You guys what would you like to ask and they would say je we know everything .. Are you sure? Hypertension, diabetes, good life, we know it all, surprise us. So it is interesting to see something like that, those who are actually in the system, are actually benefitting very well from it … so they are very ja ..	
Facilitator	No. 3	
PMSG1 No. 3	Just on what no 12 have said, It was nice to see at the antenal clinic, all the patients knew the danger signs of pregnancy, they could tell you word for word because they are so well informed and that is very nice you hardly see that here in Bloemfontein	
Facilitator	Ok, No. 5	
PMSG1 No. 5	And also one thing is they have a reward system there, if you attend the clinic you get stickers and then you can go buy stuff with the stickers. It is very nice to see, I think that is actually something they can implement on a national scale.. they have like special shops for people who attend ..because it is going to save money, uhmm by the end of the day.. anyways.	
Facilitator	So, you think that token shop works well.	Everyone verbally and non-verbally show that they are in agreement.
Facilitator	So in your opinion regarding adequate opportunity to understand and experience acute management of chronic diseases of lifestyle. You have mentioned something about a patient with a bit of high blood pressure, so what is your.. do you think you are adequately educated to manage acute conditions of chronic lifestyle diseases?	
Facilitator	No. 6	
PMSG1 No. 6	I think the problem is, we have been having a lot of lectures on how to do this, so I think our theoretical information may be up to date but .. we have never been in a situation where let say, …well I can't speak for the rest … I myself, I have never been in a situation where I am at casualties and someone comes in with a diabetic ketoacidosis and .. I don't think in that situation I would be able to .. I don't know. I don't think on a practical level we had a lot of exposure on acute situations like this.	Difficult to express the feeling of insecurity
Facilitator	No. 11	
PMSG1 No. 11	In contrast, I have seen two or three patients in the periphery with a diabetic ketoacidosis that came in and the doctor that was working in that situation clearly revised the protocol with me, how to treat the patient, but unfortunately it was only for that, for example, the high blood pressure there was no protocol and especially in Trompsburg they don't sit down and tell us, listen here … we sending you into the town go screen.. But they don't tell us what to do if we find a high blood sugar or blood pressure, who to call when you find a high blood pressure or high blood sugar. So you find these things but , there is no protocol given to us, saying if the patient have high blood pressure and you find other things, phone this person… or if it is so severe phone the ambulance, here is the ambulances number and they don't tell us	

	which services will be given to us when in acute situations, especially in the rural clinic.	Seems anxious when she share the information
Facilitator	No 1	
PMSG1 No. 1	I think the protocols are followed well at Botshebelo though, we had very good experiences. It is only unfortunately that they are out of stock. They don't compromise.	PMSG1 No. 5 nods head in agreement
Facilitator	Any other ideas? No 5	
PMSG1 No. 5	This might be unrelated. Certain things occur commonly or you are at greater risk for it at peripheral and rural areas, especially where the houses are .. I had a patient who came in with a scorpion sting and nobody in that clinic knew how to identify whether the scorpion was poisonous or not and no one knew how to treat it. So, it is not a chronic condition and it is not lifestyle but I think it should be important that the community learns about acute emergency conditions that are relevant to the setting.	
Facilitator	Ok, so we have talked now about the acute management, what is your experience on ongoing management of chronic diseases of lifestyle?	
Facilitator	No 3	
PMSG1 No. 3	It was just something that I saw at Botshebelo and I still think about it now. There was a day when a lot of patient of the HIV clinic would come in, but they are all together in one room and they all look at each other.. drawing blood for viral load and CD4 count…that for me was just pathetic, because maybe it can help in a way that you can support each other or what, what, what .. but if you think about it, there is a teenager there and the room is filled with older people who can discriminate against that person and also where is the confidentiality? Now the whole community knows that you are HIV positive.. because everyone of them, there was about fifty of them in one big room, everyone of them were there for the viral load and CD4 count.. so that was a bad experience.	
Facilitator	No 5	
PMSG1 No. 3	I think the ongoing management, it differs from condition to condition because like in Trompsburg for example we sat with the doctor we checked each patients blood pressure and the medication they are on. If the blood pressure is too high we adjust the medication every time, but you don't check the patients weight, once again, you don't check is the patient is losing some weight or the BMI is above 40 and it is dangerous, you just check the weight actually and you just move on.. you don't care about that at all, so it is completely condition dependent.	
Facilitator	No 8	
PMSG1 No. 8	I feel a lot of the consultations, when you follow up the chronic patients, there is a sort of monotony behind it. If the patients come in, say retroviral disease, you check the viral load and say yes it is good come back next month. There is no incentive for the patient, like you tell the patient, well done your CD4 is up, your viral load down, you are doing a good job.. . you are managing your disease ..the same with hypertension and diabetes. There is no … I want to say ..education to the patient that they are either controlling or not controlling their disease, they just come back every how many months time just for the check up. I feel that is something that is definitely lacking.	
Facilitator	No 11	
PMSG1 No. 11	I saw a patient in the clinic at Springfontein that has longstanding diabetes and hypertension and heart problems and she came in with signs and symptoms of heart failure but there was no ECG stickers in	

	the clinic, so there is no way of checking, looking at her heart and you can't just send… Call an ambulance to come fetch the patient and she gets to the hospital but no ECG was done you have no idea what the exact condition the patient is in and now you are putting them on an ambulance … you don't know when the ambulance is coming. I think that is a big problem if something as simple and cheap as ECG stickers are not available in the clinic.	
Facilitator	No 6	
PMSG1 No. 6	Another problem which I experienced, especially in the hospitals is when a patient gets admitted and you go through their problem list then they would say, or you would see they have hypertension, which is not controlled under their current medication and then you ask them do they use their medication, do they follow up at the clinic and then they will tell you, yes they go to the clinic but there is never a doctor when they are there, there is only sisters and I mean even a qualified sister is not always qualified to prescribe certain medications or adjust the dosage of their medication to improve their disease and I know it is difficult, we have a shortage of doctors and the health staff is not always qualify to do what the doctor can do, but I think that contributes to the problem which certain patients are experiencing when following up a chronic condition.	
Facilitator	No 4	
PMSG1 No. 4	I just want to say regarding like the patients and their medication. I don't think we are really taught … or we are taught the adverse effects of drugs, but you don't ask every single patient do you get muscle pains, do you get … and we don't do kidney functions for certain medications, they actually should get .. I am actually referring now to things like diabetes, hypertension, cholesterol and lifestyle diseases. I think we should emphasise on that and really ask about adverse effect of the medicine we put our patients on...And another thing with regards to patients or with follow up patients or treating patients and ongoing management, there is a lot of newer drugs actually available we don't really learn about because it is not available in the state, but are actually available in the private or in other countries, and I think we should also just try to stay updated.	A lot of participants raised hands and are eager to response
Facilitator	No 2, then no 11 and then no 1	
PMSG1 No. 2	In terms of ongoing management, I feel like those lifestyle group therapy are aimed in terms of that. They identify the hypertensive patients or diabetic patients and they make sure that every week they come together… and lets say one of the patient this week suffered from some sort of problem, they discuss it there so that everyone gets educated together… in the sense, if I feel this, I must go to the hospital because he felt this way and he went to the clinic. So those lifestyle group in place are aimed at, I feel, on the ongoing management quite well there.	
Facilitator	So that address a kind of health dialogue? So it is a conversation?	Everyone verbally and non-verbally indicate that they agree with the statement
Facilitator	No 11	
PMSG1 No. 11	What I want to say has kind of more to do with the protocol and for us as students …I know this is back tracking ….but it is just important to mention it. Within the red bag that we get to go to the clinics or where ever, there is dipstix in the bag. But we go to the rural area	

	with this mindset .. resources are very limit, don't do things unnecessarily … I think …and we all know that in the hospital a patient comes in you do a dipstix on the patient, but especially with a home visits, you know that you are supposed to do it but then you think but resources .. so I think it should just be clarified to everyone that if you see a patient do a dipstix, no matter if there is no indication, no matter if the patient does not have symptoms or anything. I think that it should just be emphasised and I think at the lifestyle group maybe as well, patients could get a urine dipstick there.	
Facilitator	It can be a logistic nightmare …	
PMSG1 No. 11	It can be …but I think for screening purposes..	Participants all laugh
Facilitator	No 1	
PMSG1 No. 1	Prof I just feel that, with regards, to the chronic management of them, I feel people fall through the cracks because usually it is the older people that have diabetes and hypertension and combined and they just don't ever come back to the clinic, no one ever follows them up. They are not going to bring you, it is not like our settings here. That way I feel they are actually doing an injustice to our community. The community health workers really do help but someone got to say this person needs their medication.	
Facilitator	Any other opinions ideas? No 11	
PMSG1 No. 11	Maybe they can keep a log book at the clinic of the patients on chronic treatments, and as much as the patients file get ticked that the patients take medication in the clinic, I think that there should be a logbook in the clinic where specific, just for that patients, to see if they come for their treatment, if they come for their follow ups. In that way you can see if a patient has not come in two months … maybe what is wrong with that patient then you can do a specific home visit for that patient and go see why didn't they come.	
Facilitator	No.9	
PMSG1 No. 9	I think also maybe involving the family in taking care of the patient because like no 1 said, most patients fall through the cracks but if there is a grandchild or daughter or someone who is there to ensure that grandma goes to get her high blood or anti-hypertensives then it should help, because in Trompsburg I had a lady she was 65 and she has not come to get her anti-hypertensives and the only reason she was there that day is because now she has headaches and she feels very light headed and she thinks it is because she has been stress lately so she just want to have that check out but what about her hypertension she did not have her antihypertensives for two months. So if someone else .. because most of them like number 1 mentioned are the older population and they usually take care of other people and that is what they care about, that is what they focus on. So, if the rest of the family could then be given the task to take care of them, I think that could be like a way to ensure that there is control.	
Facilitator	So, thank you very much, I think we can wrap up now. Is there any burning issues that anyone would like to mention now? Thank you very much for this. Dr Sanet is also very glad ..	
Note-keeper	Grateful, for your wonderful contributions. I am sure and I hope that you going to see, when you are a doctor in a rural or urban area, because this study will look at the rural and urban setting, that you are going to see that some of the policies has changed or some practices has changed due to your input today. Your voice is heard	

	and it is very, very valuable. Thank you for your time, we really appreciate it.	

FOCUS GROUP DISCUSSION

Focus Group Category: Medial students (Group 2 - semester 9 & 10)
Date: 6 September 2018
Venue: UFS, Faculty of Health Sciences, Simulation unit debriefing room

Moderator: Prof. M Labuschagne
Note-taker: Dr S van Zyl

The following table contains the details of the transcribed focus group discussion for the Medial students (semester 9 & 10), including field notes made by the note-taker during this focus group discussion. The number allocated to each participant is indicated as *Participant Medical Student Group 2 (Abbreviation: PMSG2),* followed by the participant number in column 1).

FACILITATOR PARTICIPANT	RESPONSES	FIELD NOTES and OBSERVATIONS
Facilitator	Okay, Dr Lynette … Sanet has explained to you all the ground rules, so what we are going to do, we are just going to have a discussion. There is no right or wrong answers, you just give your opinions on the platform with what you saw in the clinics and so on. And then for confidentiality sake we will not use names, so we will just use the number in front of you and I am just here to facilitate the conversation, you must talk. I am just here to keep you …….. Okay, so the first thing we want to know, want to have your opinion on, is regarding the CBE rotation, community based education. What is your opinion about the information that was provided in the MBChB programme? So what they taught you, information you got regarding obesity and associated risk factors for chronic diseases of lifestyle like hypertension and diabetes. So do you think the information received in your training was enough regarding obesity and then diabetes and hypertension?	Participants are ready to start the discussion.
Facilitator	No. 10	A few second silence before PMSG2 No. 10 responds
PMSG2 No.10	Yes, I think it was enough, because I remember we were in a group with other disciplines the OT's, nurses and stuff, and we were the ones who knew everything about all the chronic diseases. Diabetes, hypertension, everything that started from clinical skills. So we were very confident in that ..ye.	
Facilitator	So you felt comfortable?	
PMSG2 No.10	Yes	
Facilitator	Any other ideas? No.10	
PMSG2 No.10	It is just that in terms of management it changes quite a lot from doctor to doctor..so there is no, I think we were saying with no.1 the other day that .. you know the EML clinical guide, if they could have just started that in the second year, then you know this is how this is managed, we use these drugs although they are rare ones, because in pharmacology we studied everything and we don't see any of that so the non-practical drugs that could have… they could just highlight this	

	is what we use in South Africa…you start with this and then you move to this or what …so by this time you have master it.	
Facilitator	No.9.	No. 9 nods head in agreement and eager to respond
PMSG2 No.9	Ja, that is what I was going to say …	
Facilitator	No.9.	A number of participants laughs about no.9's eagerness to answer
PMSG2 No.9	I agree with No.10 regarding the management ..even our teaching did not really focus that much, like you knew you have to study management but there was not.. like an algorithm of management that was provided during the teaching…so ..even now I say sometimes I am not even comfortable when I am face with a patient for example I saw a patient with diabetes today for two seconds I thought, how will I treat her and I did not feel comfortable at the starting point , so , ja…	No. 1 raises her hand
Facilitator	Okay, No.1.	
PMSG2 No.1	I think in the beginning, yes we do need the foundation of the basic medical sciences, but when it comes to the more system base teaching, I feel like there was just too much information put on at the same time and then there was not a good structure in exactly how to treat it in the clinical sense of it and when we were… we had to go into the clinical phase of our degree we were just expected to know automatically, exactly how everything is suppose to be … so I feel like there was a bit of a gap there between the theory and then the practical application where you were just expected to know by heart now, how to do everything.	PMSG2 No.5 verbally agrees with statement A few second of silence
Facilitator	So you say that your theoretical knowledge is good but the application thereof uhmm can be problematic.	Participants shake heads in agreement with statement
PMSG2 No.1	Ja, and I think also an example I could put forward is that, an example with pharmacology when we were taught pharmacology, for a certain drug you would hear different kind of diseases just popping out randomly, then you do not know the clinical significance why this is mentioned like example magnesium sulphate was mentioned and then the lecturer talked about eclampsia or pre-eclampsia, it is just a condition in pregnancy and I had no background of exactly what it is and I feel that things should be applied in a way that it would present in a clinical setting earlier on in our degree while we are just more theoretical, so we would know what a patient would look like when we get to that …	Eager to respond
Facilitator	No. 5	
PMSG2 No.5	It is just when ..because you are taught in a tertiary institution, you always just see complications of , whatever the lifestyle diseases but we were never actually taught, if you are a GP and you see or newly diagnosed patient, you know hypertension or whatever, how do you go about and everything, managing hypertension emergencies or like DKA's and stuff, we have never actually been given lectures if you are a GP and the first person to diagnosed just tell me, if somebody is just newly diagnosed with diabetes you just know that she is not controlling	

	on metformin and medication and you never know how?, when do you start?, with what?	
Facilitator	and why?…	
PMSG2 No.5	Hmmm	No. 5 agree and nods head
Facilitator	So I want you think back about your CBE rotation, all of your worked in the primary clinics in Thrompsburg, places like that. So and that is exactly what you have kind of said that a lot of training is based on tertiary care but not at what you are experiencing there.. did I summarise that right?	Participants agree verbally and non-verbally
Facilitator	Uhmm any other opinions on this? No.4.	
PMSG2 No.4	It was just one day I felt … some of the situations in our CBE rotation where there were emergencies particularly with hypertension and diabetes.. .that patients came in … or talks we were going to give on how to manage something better and it was well done with all the other disciplines but when it came to an emergencies and someone had a very high blood pressure or there glucose was sitting at about 2, then there were little resources to manage the immediate situation, which was concerning because as medical students and not having other doctors around there were only nurses sisters otherwise, it was a bit concerning because I felt that I have to do something to help and there were not resources or that they try to use it as a teaching opportunity to tell us what we would like to give them or how we would like to fix it, but we could not.	Participant seems anxious and distress when she shared the information
Facilitator	Ja, Okay.. So how did you feel at that stage.	
PMSG2 No.10	Well terrified actually.. because you have this person sitting in front of you and they have got symptoms of having a very high blood pressure and you realise that they could actually have a stroke and now you have no equipment to manage this. And I think as well we have a very lovely emergency book that I feel I am using a lot more now but that has not been emphasised enough initially … and I feel like having that emphasised earlier and have students take that with them maybe and then knowing what to do in the case of those emergencies in a primary health care setting. Like we as doctors as well, like people has mentioned already, then as a GP's you know what to have with you, what steps to follow because we have never been in that situation before	Other participants agree verbally and nod their heads
Facilitator	Thank you, anything else? No.3	
PMSG2 No.3	I just remember we were at the clinic last year and we were only students, there was not a doctor and they just handed us these stakes of files, the prescriptions that needed to be rewritten for the next six months.. and then you don't even see the patient you just see their blood pressure is sky high and now you don't know what to do then, and they only going to see the doctor maybe in six months again. Now you must decide can you change a drug, which one do you change, should you refer them, should you not refer them and then afterwards sometimes the doctor just comes and signs even though you have told him you are a bit worried ….. so that was also bit scary and deciding should you maybe change the 12 to 25 or just do something at least…	Participant shows a scary face to illustrate her feelings - other participants starts to laugh

		at her facial expressions.
Facilitator	No. 8	
PMSG2 No.8	I think also just linking with what said no. 3 has said the fact that our CBE experience, it was definitely beneficial towards us and I feel also it would be nicer if it was beneficial to the patients themselves. I thought like the fact that we were there, we were just like signing those prescription forms and like …the patient did not benefit much of the time situation as well, because there were pressure on that one doctor that looked after us … ….(facilitator "them").. ja and on top of that us as well. It should actually be more beneficial to the patients themselves, not just us and saying we did our CBE, it would actually be nice if the patients also benefit.	A few minutes of silence with no further contribution.
Facilitator	Okay, so the next question is….What is your opinion about the information that was provided in the programme of chronic diseases of lifestyle interventions programmes? So some of you already toughed on that …so did you see any intervention programmes that was started or are in place in the clinic?	
PMSG2 No.3	Just adding on as well.. an example of an intervention programmes they have ,,,Is those follow ups where a patients have to see students and being referred to certain specialist for example … we saw patients that have depression and was never refer to or see a pshycologist. But when we came back after six month when the patient have been told to see that person but they haven't seen that person ….. then they write another referral go see the psychologist but they don't see them. What is our benefit, we write a referral then there was no intervention.. the intervention was put in place but it just need to be followed through.	
Facilitator	So how did you feel, what is your feeling about that?	
PMSG2 No.6	I will say it is just the importance of actually us being a benefit to the patient. We don't want to just be there and say we had community based education but the patient is coming back and they still have the same problem ..and it is months ago and there still have not been an intervention.	Body language and facial expression convey disappointment experienced
Facilitator	No 5, thank you.	
PMSG2 No.5	Still when we were in Trompsburg, they had a diabetes lifestyle club that they actually started. So, what would happen is like they meet up, I think once every week on a Thursday and they bring along their books where they monitor their blood glucose and every time they were controlling well … there get points, there were a point system that was happening there and at the end of the whole year, we were the last group that went there, we threw them a party, type of a closing party for the year and all the people came with the points and then they converted those points into money – almost like tokens- so that they could buy something from the store…token shop and that actually motivated them to control well……	Participant seems exited while sharing this information
Facilitator	So what do you think about that intervention programme?	
PMSG2 No.5	I think it was very good because people was controlling nicely… At some point things just went smooth sailing, I don't even know how, but there were actually people that did not have problems with blood glucose for a very long time .. three or four, five months and they were very happy.	Laughter all around the room
Facilitator	No 3	
PMSG2 No.3	Just the same about those clinics, the people just decide what they want to hear next about their diseases. One week they wanted to hear	Some participants

	about exercise and the next week we had to present to them the effect of diabetes on their eyes. …so they get to decide what they want to know. I think it helps that they are sort of friends because they are together once a week and .. uhmm I think it is just like a big support system and they are like in control of the information around them and they just want to motivate each other….and I think that is very nice.	show agreement with the statement
Facilitator	I will give you a change now.. I just want to ask something else…did all of you rotate in MUCPP? Did you see any of those intervention programmes there?	All the participants knot heads to indicate that they did rotate at the urban clinic. A number of participants agree verbally indicated "no" and shake their heads "to confirm it.
PMSG2 No.8	Our experience at MUCPP …… so my exposure was at the diabetic and HIV clinic or we had obstetrics rotations there as well … but I don't remember intervention programmes.	
Facilitator	So if you compare Thrompsburg and MUCPP what do you think?	PMSG2 No. 8 don't respond verbally but looks puzzled, participants laugh at her facial expression of hopelessness and after a few second silence PMSG2 No. 5 responds
PMSG2No.5	I think when comparing the two, I say the system at MUCPP do the patients injustice, because a lot of them are presenting already complicated …. and then again they must refer the patients. I know the question was not asked directly to me, you asked how she feels, but I feel rather powerless because these thinks are theoretically put inplace, they are put on paper and there are protocols but they are not followed, you know. So for example you look at a patients file and then out of the 100% information that is required from the medical or personal division, 40% or 30% is charted down or if it is charted down some of it is charted wrong. It is just a great mismanagement of our patients and there is a lack of empathy in my opinion ….	PMSG2 No. 1 and 2 verbally agree and also indicate that they would like to contribute to the conversation
Facilitator	Thank you very much, this is very valuable things, this information. No 1 and then no 2.	
PMSG2 No.1	Regarding the rural, the diabetic clinic, the group that we also saw in Trompsburg because we were also part of that and then they chose, what they want to hear. . I think it makes the patient more compliant, because they feel that they are somehow more in control of their treatment… you are not just bombarding them with information over	

	a long period of time. Instead of sitting with the patient, because we were told as a doctor when they see a patient they must counsel them about their disease but in all honesty, if I am told that I have a certain disease today and you give me all the information about the disease, the only thing I am going to remember is the diagnosis and I am going to forget everything else. So they can always looking forward to the information and they can keep growing on it and if they forget somewhere along the line we will revert back to starting with complications of diabetes. With us when we were there they wanted to know more about diet, something they have been told but you still need to reinforce it as time goes by. Even the aspect of a budget for a diabetic in their social circumstances.. so ..ja	
Facilitator	So what you actually say is that in Trompsburg you saw health dialogue, there was a conversation between the health care providers as well as the patients. It is not counseling, I tell you to do this.. so it is more a health dialogue …Do you think it is more effective this way? Number 1	PMSG2 No. 1 nods head in agreement
PMSG2 No. 1	I think people just don't like to be told what to do, so whenever you give them.. even if it is an illusion them being in control, they feel in control and then they will be more compliant. They will feel that it is their decision to be compliant.	
Facilitator	No 2 you wanted to say something	
PMSG2 No. 2	Yes, I also actually wanted to say something what I saw in Trompsburg with the home visits what we did, so it was not just about the patient who came to us for help. We also showed the patients that we care for them and went into their homes and just to find out of the challenges what they face with regards to their illnesses in their houses …	PMS1 No. 10 and 6 eager to answer and raise hands
Facilitator	Ja, ..nr 10 and then nr 6	
PMSG2 No. 4	I think it easier in Trompsburg to have these system what they have, because in Trompsburg people don't really have much to do in Trompsburg…compare to Bloemfontein, people are always asking for a letter for work, or things like that, they are people on the go and also the patient load is much more than in Tompsburg. The doctor to patient ratio is a bigger ratio. Yes, I think it is easier in Trompsburg especially with all the students there at Trompsburg. This is a different vibe and you know there we spend a lot of time with a patient, here it is about finishing the clinic, get the signature and go home, but in Trompsburg we know that we are living her .. you meet the people, they are more appreciate of us, they want to know more about our personal life, it is nicer in Trompsburg it is more relaxed because of the rural environment, here it is ongoing….difficult	Laughter all around the room Laughter all around the room
Facilitator	No 6	
PMSG2 No. 6	What I would like to say is also the home visits. When you go there you would supply the patient, for example with bandages for example we saw a patient with critical limb ischemia so we taught them how to care for their limbs and you can give them supplies so I also think was a good intervention.	
Facilitator	Anything else on the intervention. No 8	
PMSG2 No. 8	Just to support what nr 4 just said regarding the fact in Trompsburg we were able to follow up our patients, the intervention programme, but at MUCPP you just walk in and there is a whole room full of patients and you cannot sit down with every patient as you would like to do…	
Facilitator	So, so it has to do with the patient load and the amount of health care providers.. so going on the next question which operational protocols or guidelines of CDL were displayed that address the risk factors of	A few participant indicated that

	chronic diseases of lifestyle were displayed? Did you see any physical displays in the clinics .. posters or …? No 1 and then No 10	they want to answer
PMSG2No. 1	It is only in few clinics, I remember I saw a diabetes poster in the cardio clinic at Internal Medicine. Some of it is just random and you don't know why this poster is here and you are not rotating there so it is not of importance to you at that time… Okay this is interesting…and then another problem is with being in a specialist environment ….specialist have there own way about teaching about management. So that algorithm is not what you have been told during the lecture and another thing is that with many of the specialist especially the consultants, they also work in private, so you will always hear "in private they will use" or "in America they will use …", but here in South Africa there is not .. I feel that it is unnecessary information that I do not need right now - for me because I am not planning to go to UK any time soon…. ja there is not a set way, I think there should just be consensus on what should the students be taught, from which source for example the EML, I feel like it should be started from a very young age … ever since we have actually been exposed to it, I feel that everything could have just been so much easier.	Participants laugh Participants laugh
PMSG2 No. 10	Like the Crytococcus meningitis, I has always been a mindboggling thing, you trying to cram it, study for it, even now that you study it for Internal Medicine - it was a stress factor – now it is just a simple.. it is an infection you treat it, this is how you diagnose it and it is easy, but it is because we have never been exposed to a simpler way. I feel sometimes people are just trying to make things difficult.	Participants laugh
Facilitator	No 7	
PMSG2No. 7	I am not sure if we are talking about TB as well?	
Facilitator	Yes, any posters, any information to patient.	
PMSG2No. 7	Ja, I have seen a lot of TB posters in MUCPP especially on the windows, it is always – stop TB, and even in other languages. I think there can be in more languages, but I have never seen anything about hypertension anywhere.	
PMSG2 No. 3	I can remember at MUCPP, we did not walk through the whole clinic, but I remember one of the walls was painted, like hand painted and I remember that was about vaccinations. So I think some of the other walls were also painted with that information, but I did not really look at them.. and then I know at Poli B clinic there were posters yes between every single door there was a poster. I just remember the smoking ones.. that was very good- they tell you all the bad things that smoking does to you. I think there were also a poster about diabetes and I cannot remember the other ones .. I think they try to put the posters up for counseling and just giving information.	
Facilitator	Can I throw in a question? How effective do you think those posters are?	Participants laugh, participants 5, 9, 4 indicated that they are eager to respond
PMSG2No. 1	Okay, no 5, no 4 and then no 9	
Facilitator		
PMSG2 No. 5	I don't think at all. None of the patients, you will never see one patient reading anything on the wall. Sometimes they are only in English and some don't know how to read English. I don't remember even one time	Many participants verbally agree

	that I have never ever seen a patient even looking as if they are interested.. or even asking what does it say – no, nobody ask, I don't think they are effective at all.	
PMSG2 No. 4	I completely agree with no 5 and that was something that concern me being in Trompsburg. With us being here, although our classes have been in English, it is not one of the languages spoken to most patients I have ever seen and there was a nice diabetic poster put up by the students in the clinic in Trompsburg. Like no 5 and everyone said it is completely useless because it is in a language that they do not understand and with information that they do not know how to use and it is not always applicable. It is just there because you have to make a poster, it is not applicable to their specific diet or their culture or anything. And I feel that is something that surely lack in that rotation. We should have been taught some of those things…. What food is available to the patients, what are the cultural norms and teaching us conversational language that you can actually get ideas across to your patient .. without having to abandon the conversation thing…	Other participants verbally agree with this statement
PMSG2 No. 9	I actually agree with what no 4 saying about the diet of the patient, because a lot of these posters have nice diagrams … half of your plate must be veggies and a quarter must be meat and a quarter of something else, but you are not sure if the patients have that available. So I feel eduation on what they should eat must focus on what you have and then the portion size of what you have. I think the posters cater a lot on the professionals, you think "yo it is cool", you take a photo and you read it .. even the jargon they use on the posters, it is not a laymen's jargon ….	Laughter all around the room
Facilitator	No 10	
PMSG2 No. 10	Yes, I will just suggest, while the patients are waiting, there should be a medical student with someone .. and tell them "let me tell you about…." Like in Trompsburg. They just sit there and nothing is happening and someone can change their life's, the doctor said .. the doctor came to speak to me: "Ye, Ye put away that bun". Even my own mother …"No, the doctor said this, it is more effective than I have read this".	A few participants agree verbally
Facilitator	No 7	
PMSG2No. 7	We actually did that when we rotated in Trompsburg. We had a topic we talked to the patients about and we had like slides or a poster and we actually verbalised what the poster said and it was a good interaction.	
Facilitator	Where did you see the posters, are there posters in the waiting area?	
A number of participants respond simultaneously	At MUCPP, I think there are posters	
PMSG2No. 5	Everywhere you look there are posters, but some of the posters where made in 2001. The edges are completely falling off, it just looks ugly. You don't want to look at them, if you are bored maybe you will. It does not grab your attention. It is so old and outdated. And I think people just like medical professionals, instead of counceling a patient, they say "ag, there is a poster, they will read the poster and then they will know everything about their disease". I think they use it as an excuse to council the patient and to inform them about everything.	PMS1 No. 3 nods head in agreement
Facilitator	Can I just throw in something else? What do you think about video's, playing video's in the waiting area?	

PMSG2No. 8	I think that will be more effective but I just think it could be, especially if it is in the patients language. Quickly just a comment on the posters… maybe it is just me. I have not seen a lot of posters at Trompsburg compare to MUCPP and maybe it is just me, but I don't remember seeing a lot of posters at Trompsburg compare to MUCPP.	
Facilitator	No 9	
PMSG2No. 9	Video's sound like a great idea, however, the fact that someone need to maintain the video, the staff already complain that they are overwork and now they need to find somebody who is a computer guru…. Like n0 10 said, it will be more personal if someone actually speaks a video again it is passive intake of information, with somebody there that can interact… calls no 10 and ask no 10 a question: "o doctor I don't understand …" and you explain something like that…	
Facilitator	No 1	
PMSG2No. 1	The more personal the interaction .. there are some clinic's , not the clinic's we are talking about now, where the nurse will come in the waiting area and assist the patient and even in Trompsburg were given the assignment of ….they can ask you direct questions and people can directly ask you.. a video will be very general and it will be very difficult with language barriers for example where you have different languages. If I can speak three different languages, I can actually communicate with those groups of patients at the same time.	
Facilitator	So we come back again to communication, dialogue. So, another question is, what is areas of good practice with reference to the effective implementation of chronic disease of lifestyle prevention and intervention programmes that you observed….so, did you see the implementation of these programmes in the clinic's where you rotated? No 10	PMSG2No. 10 and 9 indicate that they want to contribute
PMSG2No. 10	Can I talk about TB again? I liked at Trompsburg that the patients have to come and take their medication at the clinic.. yes… it was to ensure compliance, although the patients did not like it, but they came and they knew what medication they took. Half the patient here, like 70% don't even know the name of the medication, they just know the time and the route …	Participants laughs
Facilitator	No 9	
PMSG2No. 9	I think also to answer your question, the last time I saw effective, control over a broad amount of patients, was at Trompsburg, but here (MUCPP) for every well controlled you see six uncontrolled.. so you know, so there is not really .. ja, poor control . ..	
Facilitator	No 1	Silence
PMSG2No. 1	I also agree with what number 9 said, with us when we were at the clinics, I think all the patients were out of control with regards to diabetes and hypertension.. it is a majority … many people are not either being compliant or they are not being taught properly. There is definitely something that is lacking in the system currently. I just want to say about that, we even, in our minds right now, a blood pressure of 155 is normal, we don't realise that, no - it is not normal, it is just common but it is not normal. So know no drugs get changed in such situation and we are pushing the blood pressure higher and higher because of a lack of control. I think another thing that is happening, especially with hypertension patients, a lot of them say "no, I don't have that thing" .. why are you not taking antihypertensive medication … "no, I don't have that thing", they are also convinced that diabetes will kill them but hypertension would not, so they are Okay with having hypertension or skipping a pill or two or three…for the whole week until they get like a headache	Participants laughs and nods heads in agreement

	and then they will say o my gosh I forgot to take my treatment so I quest again the fact that our patients are not educated and the fact that our patients does not understand what is happening to them. You know we just mention these drugs Adalat, Aldomet Mammy and then she don't understand it and then she just remember that she must take a green one and a white one, but then she has four white ones, so she could have been taking the same pill twice.. so ja	
Facilitator	No 3	
PMSG2No. 3	I also remember some of these I think it was a diabetes, hypertension clinic the patients was supposed to have this yearly follow-up form where blood should be taken every year, it should be arranged to check their eyes, all of these things should be done yearly and then with some of the patients I could not find one in the file. For a patient I must have done it myself I look for results and the last was done in 2012 and they should actually be done every year. So, it feels that sometimes the patient maybe thinks "the doctor don't care about my diabetes, why must I care". So, they don't do the things they are supposed to do at the clinic. It shows that..ag, it is just another thing don't worry about it and then the patient gets the same attitude.	Some participants laughs and nods heads in agreement
Facilitator	No 4 and then no 7	
PMSG2No. 4	I think like no 10 mentioned as well, the issue of it is very common, patients don't seems to take it very seriously, they think well, my family all have this and you just take the medication but when I try to ask some of them, "what do you think will happen if you don't take your medication or what is going to go wrong, if your sugar is too high for too long" and they don't understand why it is necessary to take the medication and I feel that is a big part of the problem like everyone has mentioned, having not time spend enough time with these patients, they don't understand. So if I did not understand, why would I take my medication and ja it is concerning because you can see where there is an issue, but again as it has been mentioned you feel powerless because you know there is a problem but there is nothing you can do about it particularly.	
Facilitator	No 7	
PMSG2No. 7	Just on what no 3 was saying, just a fault on our part, we have these patients having these carry cards, where they write their blood glucose levels or their blood pressure levels but sometimes you find that their cards are incomplete, so I just ask myself what are the point of having these things, if you are not going to be consistent and fill it in every time the patient comes	
Facilitator	So I just want to go back to the question, we asked .. so did you see anything good.. Participants "o, good" No 3	Participants laughs
PMSG2No. 3	I think the intention of having all these carry cards and all these forms that they make specific for these patients, I think they try and do good with them. At some of the clinics there were the poster up to quickly screen the patients eye. They had all these things for us to do, but I don't think it gets done everyday. So I think the intention is there. Sometimes they have all of these screening resources for all of these patients, so I think sometimes they do try there is just too many patients .. so it does not get implemented everywhere	
Facilitator	No 6 and then no 8	
PMSG2No. 6	Just like no 10 has mentioned about the patients like TB patients having to go to the clinic to get their treatment, it is also sometimes for some patients at MUCPP clinic, where they come everyday and they just	

	check that Okay, you did take your medication and for those that don't come they just check that they have been given their month supply for example, I think with that it is something they are trying to do	
PMSG2No. 8	I think the good that I saw, was just what someone else had already mentioned at a previous question the weekly gatherings and discussions that the patients had, like we had experienced in Trompsburg, that was good because it seems that the patients was really up to control their blood sugars and control their diet properly.. that was one good thing that I saw , ye..	
Facilitator	No 4	
PMSG2No. 4	At MUCPP I definitely saw patients who were near the end of their TB regiment or who were getting their hypertension medication and were better controlled tan what they were previously. I think a big problem that a lot of us had found it just the problems and the defaulting of treatment and lack of understanding is overwhelming, and so it seems to almost drown out the stuff that goes right because you almost expect it to go wrong, so you have to have plan A-Z, when something starts going wrong now what am I going to do, because it is more common to have it gone wrong than to let it go right almost.	
Facilitator	The next question is which prevention and intervention programmes observed in the primary health care facility integrated shared risk factors for lifestyle diseases, so what is your opinion about and integrated approach? So, so for instance hypertension, do you see that they integrate the information about hypertension in the Obstetrics and Gynecology clinic?	A few second of silence
PMSG2No. 4 Facilitator	Interventions with regards to other specialties? Ja, integration.	
PMSG2No. 4	I think with the specialties everybody does their own thing, so if a patient is seen at Obs and Gyne it is treated their and if a patients is seen elsewhere .. if a patient .. like the Psychiatrist always complain that no matter what medical problem the patient has, as long as in their file somewhere they see that he has schizophrenia or something they sommer revert back to that place and now the patient will get treated there. I think ..it is a specialist thing, everybody wants to get as little patients as possible so they want get rid of the patient as soon as possible …so there is not a lot of integration. But with regards to that in the clinical..in the clinics and the primary care setting, we are always taught about a multi- disciplinary approach with regards to chronic illnesses, where a patient must be taken to dietician …..I don't think we see that a lot in the clinics.. nothing …Ja, because even with, back in Trompsburg where we were working with the nurses, referral were a problem and then even if you refer a patient, I remember there were a patient who had eye problems with diabetes, I think we were there last year September or August round about and the patient had a date for next year, so already ..will always be a thing especially in the rural areas where a patient can not have an integrated approach	
Facilitator	No 3	
PMSG2No. 3	I do remember at Obs and Gyne they did have dietitians and the patient that where seen on that day was taken to the back to be seen by the dietitian and they had a consultation and some of these consultations were longer than an hour. So I think in some places they are trying	
Facilitator	So there are some pockets, where it happens… Ypur hand was up… no10	No 3 agree verbally

PMSG2No. 10	If you have to sit down with the patient, it is about time. The people are too many. If a patient is admit here you can go and speak to him, but in the primary health care it is oversaturated	
Facilitator	No	
	Just like no 10 said now the fact that there is very little time, and then the resources as well in terms of staff is a big issue, and probably along with that is they are not entirely aware of what to check in each and every patient. So if you have a diabetes patient now, you should be checking their hypertension and there weight and give them a whole lot of advice. I think although we have the knowledge, if you are in that situation and you have 10 minutes or you are trying to get through when the whole clinic is full, you are going to start to forgetting things and became tired. I think maybe having a checklist, that we can even start to do, that you know that there is some vital things you make sure you always do and that it always get locked in the file. As if being mentioned before almost half of the information is missing and at least if you have that vitals you can see trends in patients treatment and also what you need to have a better look at and that you can focus you history or examination further on something but at least you have a starting point and you are not forgetting those important things even if you are tired.	
Facilitator	No 5	
PMSG2No. 5 Facilitator PMSG2No. 5	When we were rotated at policlinic B at the diabetic clinic there, each patient will come in and the sisters will know that the patient will first start that their blood pressure is taken and then The finger prick glucose is done and then they take you for the urine and do the dipstix and then they do the Snellen chart and then only the patient is seen so in some clinics there is actually some intervention that is working …… … a very good system So each and every patient, you know what he finger prick glucose was, urine Okay today.. they even weight the patient everytime that the patient comes.	A lot of participants agree
Facilitator	So it only two additional questions we can discuss. Please if you want to go on with any interventions or collaborations that you have seen. Lets go on to the next question. What is your opinion or understanding regarding adequate opportunity to understand and experience <u>acute</u> management of chronic diseases of lifestyle? You have mentioned that in the beginning when you saw acute conditions of chronic diseases… so maybe you can elaborate a little bit on that…. No 1	1.01
PMSG2No. 1	We have had some exposure to that, I think mostly in the casualty setting, then we ere there, we will see like someone with an hypertensive emergency, ….but it was not that much exposure as well because even in that setting you don't see much chronic conditions.	
Facilitator	Yes, No 10 and then No 9	
PMSG2No. 10	At Trompsburg I remember we were at a clinic, I cannot remember which clinic, but this lady came next day when we started with the doctor and then she had a DVT and nobody acted whooo.. but we all know that DVT is an emergency and this lady had presented the day before. So I think even …I don't know if there was a referral problem	

	or a lack of insight from the sisiters side, it was clearly a DVT, so when we saw the patient it has been 24 hours and the patient was still in pain and nobody is doing anything but we all know what to do as medical students. So, ja we get expose but sometimes it is like not the reaction you think people would have, you know they are not on top of it …	Participants agree verbally with the statement
Facilitator	No 9, you also wanted to	
PMSG2No. 9	Yes, I think from what I have seen, especially from what number 1 said about casualties. Casualties, there are doctors there but at clinics the sisters is impatient with emergencies even if it take four hours or eight hour to refer a patients you know that you have wrote in the patients file that you have referred.. full stop …that they should have managed that from the clinic's side. So, I feel like somethings should be put in place to equip the sisters as well working at the clinics at least to understand or kick start the management of the acute sick	1;03 Participants agree verbally with the statement
Facilitator	Mmm number, who was first No3	
PMSG2No. 3	For me it is a bit diffent, and then a lot of these patients present at clinic's first with their acute problems and sometimes even if they (clinic's) don't manage it completely they do something before they get referred. So sometimes we see the patient at the hospital, half the management has already been done – so that you don't always recognise the full picture and even if it was not done, sometimes they are too late or the problem is gone by now….. so you don't get a nice experience of all the emergencies…it is either halfway gone or halfway treated.	
Facilitator	Ja… No 2	
PMSG2No. 2	Yes, I just wanted to talk about my experience of a patient we saw .. but it was not an emergency immediately. This patient had ovarian cancer and she was in severe, severe pain and it was very bad and the pharmacy only had Tramadol as the strongest analgesia and I think also these small clinics don't have enough resources to manage emergencies sometimes.	
Facilitator	No 4	
PMSG2No. 4	I think a very concerning thing when I was in Trompsburg and..we actually had one of these talks, presenting a patient and one of them had came in with a very high blood pressure and she had headache and blurry vision and she really was not feeling very well and it is a bit of a struggle actually to convince the people who was facilitating everything to let me take this women to the clinic to get an antihypertensive for her because they wanted to start with the talk. And it was concerning because I was wondering about this and like it has been mentioned so far, there is no sort of feeling of urgency when these thing happen.. now I have to convince you because the patient cannot see, because she had blurry vision… it is not a good idea to start.., we need to get medication for her and it should not have to work that way, ja …	Participants agree verbally with the statement Participant now use deperate tone of voice
Facilitator	Ja, I hear what you say ..So it have to do with acute care	
PMSG2No. 4	There is no care in the clinics, it is definitely there in casualties. It is definitely there in casualty, if I see a patient I know what to do ,what to look up even if I am not sure, but in the clinics there is none of that.	Participants agree verbally with the statement

Facilitator	So you can sit with a big problem but if you are number 8, you will sit and wait One of participants: …As long as you are not bleeding out today	Participants agree verbally with the statement
Facilitator	On the other hand we have now talked about the acute management of CDL, what was your experience on the ongoing management of chronic diseases of lifestyle? No10 and then no9	
PMSG2No. 10	I think for the ongoing management, there is no insight. So we don't ..it is a lack of insight to say …this is wrong you must do this, they just repeat	
PMSG2No. 9	Okay, from my side also I would like to add to what No 10 said with the fact that the patient see no 10 and then No 9 a month later and no It totally disrupt the professional relationship is disrupted. When the patient left home they say they are going to see doctor so and so and now they get to the hospital and now, why would I tell a doctor who does not know me my problems. So the complications I am experience with my hypertension or diabetes and the doctor that start today he is only interested in mommy is something wrong right now, no – Okay copy what no 10 already said, you copy the script you don't verify if it is the correct script, you go for the most resent one and the most recent script is in January, right – you also you don't know who to call because that person is not there anymore…	
Facilitator	So if you see something going wrong in the management, there is no real interventions?..No 1	
PMSG2No. 1	With that, I think there will be some changes that will be made, either there is an increase in the dose of the medication but then there is not enough time to talk to patient and find out why re you not controlling, what do you think is wrong, what do you think is the problem and establish a bond with the patient. Because we at the diabetes clinic, black men have a certain stereotypical way of thinking so he is not going to come and tell us now even his male associated complications, that make him stresses out and he is actually going to have poor control again, you know all those things. It comes back to where a patient does not really trust the system and then we see that manifesting. And I feel that… I know it with my grandmother, sometimes they get shared of disappointing the doctor If they have been with the same doctor for a long time. So now our patient know it is just students who is gping to see us, they are not going to say anything. So know the glucose is 10, 15 or 20 because she knows this student is not going to deal with it today .. so it gets to that point that even patients are not true because of the system	
Facilitator	No 8	
PMSG2No. 8	I think regarding, specifically at Trompsburg and Botshabelo. One thing that was quite disheartening to me, the fact is the patients have problems they wanted to discuss with the doctor but the doctor was not there and then he would come after we have copied the script down and then he will just come to put a stamp in and I remember I telling the doctor – O doctor this patient has this and this and he said: You know what they will come with all kind of problems what they have or tell us that whole story and we understand the staff situation, the problem is that we are very understaffed, our system is very understaffed. Even though we could try to help this way but you won't	

	get through all the patients with a thorough evaluation for every single patient. So I don't know how we are going to help unless we actually increase the number of doctors.	
Facilitator	No 6	
PMSG2No. 6	With just what no 8 was saying about the doctor come and put a stamp there, it cause a problem because you know that there is a problem that needs to be fix but you can not physically fix it because you are not qualified to do anything, all you can do is to report to the doctor and when you do they just say they are coming up with stories they just want attention. So it is a bit if a problem you know.	
Facilitator	No 2	
PMSG2No. 2	Also with the chronic management of our patients, it is very difficult in our clinics, because also our patients see different doctors the whole time and sometimes you get a file and you don't know where this whole thing started. You don't know how correct the diagnosis is and it is really, really difficult. I remember we I once saw this patient , the patient dermtatomiosistis and I think the patient saw it in her file and she come to me and say to the other lady next door this thing does not go away, you have it for the rest of your life, she was very concerned. She was so confused, so ja it is very difficult because you are never sure how correct the other doctor was with the diagnosis.	
	No 10	
PMSG2No. 10	Also with the control, nothing changes, that is disheartening to the patient, I am still on five hypertension drugs and my blood pressure is good but I must still take it. So there is no reward for the patients and lack of insight again to say, if blood pressure has control this long remove this one.	
Facilitator	Any other ideas… so in conclusion what is your feelling about community based education and chronic lifestyle diseases. No 6	
PMSG2No. 6	Community health education actually helped us to see that we are going to see. I think the setting that we have here in Bloemfontein is a bit realistic for where you unless you going to be a registrar. But for now it show us what our realities are already like.	
Facilitator	No 8	
PMSG2No. 8	It is very important that CBE is very helpful, it helps us to see this is where the problem start and this is what we trying to do. What we see here at the tertiary institution is level 3 or 4 of the primary problem so it help for us to see where it starts and it is just important for us to improve primary health care, that we don't see so many complications. I think this is where it start, even in our primary….. from third year, the education has been actually lacking - we do/are being taught that but just an reinforcement of primary and preventative measures as well, that can be improved and be a lot better.	
Facilitator	No 2	
PMSG2No. 2	CBE was very helpful to us and I also learned that we must be examples to our patients and especially the sisters with regards to obesity. You see hypertension patients and diabetic patients – so we must also help our patients, we life in communities with our patients they look at us, our lifestyle, I cannot tomorrow be there tomorrow with our patient and say don't eat that, while I was eating it..	laughter all around
Facilitator	Any other comments	

Facilitator	Thank you very much for your time, Doctor Sanet is going to do a wonderful study and I think your input can really make a difference and hopefully you have started the journey….	
Participant	A revolution…	laughter all around
Facilitator	Thank you	

APPENDIX O: Focus group discussions example analysis medical students

Summary and analysis: Overarching concepts/themes, main themes and sub-themes identified during data analysis

OVERARCHING CONCEPT/THEMES	MAIN THEME	SUB-THEMES	CATEGORIES
ACADEMIC KNOWLEDGE OF CDL	1. Responsiveness of the MBChB curriculum to the growing burden of CDL	1.1 Quantity of CDL curriculum content	Satisfied with quantity of information Content relevant for real-world setting
		1.2 Quality of CDL curriculum content	Information for SA context not available/outdated Not adequately prepared for the reality of the primary health care setting
		1.3 Transition from theory to practice	Gap between theoretical knowledge and clinical application in primary health care settings Training is based on tertiary care but not on what is experienced in primary clinics
	2. Knowledge of CDL protocols/guidelines, prevention and intervention programmes	2.2 Alignment of theoretical content with needs in primary health care settings.	Focus in foundational phase primarily on treatment and not behavioural prevention Focus on tertiary and private care health setting Need clarification on specific roles and responsibilities of different levels of health care workers before BE rotations
ATTITUDES AND EXPERIENCES IN RURAL AND URBAN PRIMARY HEALTH CARE SETTINGS	3. Evaluation of the effectiveness of CDL programmes	3.1 Health promotion and education programmes: challenges and barriers	Language and educational barriers, education information not relevant for context, information out of date, poster display not optimal, focus not on holistic health care.
			Progammes focus on communicable disease (on need example: stick injury, HiV, TB, immunisation) Lack of integration of shared risk
		4.2 Prevention and intervention programmes: challenges and barriers	Poor risk prevention due to: Late presentation due to inadequate risk prevention, cultural barriers, traditional beliefs (traditional healers), information incomplete Individualised care due to: inadequate due to lack of resources, high patient load and staff shortage
			More focused on communicable diseases (HIV, TB) Effective prevention and intervention programmes observed in rural primary health care setting (Difference urban vs rural): poor patient education and compliance, interventions not followed through, interventions not effective, lack of continuous care (incomplete files), staff shortage, patient load, lack of continuous care (different physicians (rural)
		4.3 Areas of good practice Differences observed between Rural vs. urban	Prevention programmes: policlinic diabetes clinic (urban), antenatal clinics (urban and rural), specialist clinics (urban) Successful health dialogue and intervention programme for diabetes (rural) CDL intervention programme - diabetes lifestyle group -point and reward system (rural) Individual interaction and care (rura)l
	4. Exposure to the acute and ongoing management of CDL	4.1 Exposure to the management of acute complications of chronic diseases of lifestyle.	Insecurity due to lack of opportunity to observe management of acute conditions of chronic lifestyle diseases Difference observed between management in rural and urban settings: casualty (urban - resources and staff available) primary care clinic setting (rural – protocol of referral not clear, staff management problematic, obstacles to acute care in clinics include lack of resources (personnel, consumables) to manage acute complications
		4.2 Exposure to the ongoing management of chronic diseases of lifestyle	Interventions and control focused on communicable diseases (HIV, TB) Poor control diabetes and hypertension (Difference urban vs. rural) Lack of patient education of disease control, patient education not relevant to socioeconomic context, lack of consumables to diagnose complications, lack of health care providers (physicians), patient load (difference between urban and rural), incomplete patient records, follow up adverse effects of treatment, updated management (new drugs)
DEVELOPMENT OF PROFESSIONAL ATTRIBUTES AND COMPETENCIES	5. Reflection on CBE and IPE experience: Observations of advantages, difficulties and successes	5.1 Help to contextualise CDL in communities Earlier exposure to IPE	Broaden the vision of community setting: Need for earlier exposure to IPE in curriculum and knowledge of the different roles of Health Professionals
		5.2 Development of graduate competencies	Communicator, collaborator, Health activist, role models Desire to contribute, mutual benefit (student and patient) important
		5.3 Psychological impact of exposure during CBE/IPE in primary health care setting	

		5.4 Students suggestions	Self-management: role of the patient in disease management (patient empowerment) Students involvement in health education (home visits: screening) Patient involvement in health education Tracking system - Involve family

OVERARCHING CONCEPTS/THEMES	MAIN THEMES	SUB-THEMES	CATEGORIES	QUOTE	GROUP (PARTICIPANT)
CDL: STUDENTS' KNOWLEDGE	**MBChB curriculum** Responsiveness of the MBChB curriculum to the growing burden of CDL			*I think what they mention was adequate*	*PMSG1 No.3*
				I think the information is definitely adequate	
			Pre-clinical preparation: Satisfied with quantity of information		
		Quantity and relevance of current CDL curriculum content		*our information that we get is adequate*	*PMSG1 No.11*
		Satisfied that they receive information of a broad range of CDL diseases in the curriculum that is relevant for the Free State clinical setting.		*the pre-clinical setting we get a lot of information pertaining to how to treat certain diseases and how they are monitored….*	*PMSG1 No.8*
				I think they teach us a lot about the risk factors for developing chronic life style diseases and they teach us as students a lot about it	*PMSG1No. 6*
		(*****Recurrent theme - Psychological impact)		*Yes, I think it was enough, because I remember we were in a group with other disciplines the OT's, nurses and stuff, and we were the ones who knew everything about all the chronic diseases. Diabetes, hypertension, everything that started from clinical skills. So we were very confident in that ..ye.*	*PMSG2 No.10*
			Preparation for the real world setting	*when there are like gaps you get to fill them in during your rotation …*	
				you don't realise like how real it is until you get a patient right in front of you and then you see everything that you were learning about…..	*PMSG1 No.3*
				I'm always really impressed about like when you get a patient who it is really typical of what you have learned about in class.	
				Ja, and I think also an example I could put forward is that, an example with pharmacology when we were taught pharmacology, for a certain drug you would hear different kind of diseases just popping out randomly, then you do not know the clinical significance why this is mentioned like example magnesium sulphate was mentioned and then the lecturer talked about eclampsia or pre-eclampsia, it is just a condition in pregnancy and I had no background of exactly what it is and I feel that things should be applied in a way that it would present in a clinical setting earlier on in our degree while we are just more theoretical, so we would know what a patient would look like when we get to that …	*PMSG2 No.1*
		Quality and relevance of current CDL curriculum content:		*we can refocus on the latest research regarding like epigenetics and things like that is actual very actual at the moment, hot topic.*	*PMSG1 No.4*
		Integrate research and community engagement in teaching and learning activities (Engaged scholarship)			
				South Africa in the whole and the communities we are working there was a lot of things in the past that had an influence on people's genetics today and we don't understand why.	*PMSG1 No.4*
		Focus on treatment management information that relates to the SA context	* Information for SA context not available/outdated	*described text book…my information for hypertension and diabetes from Davidsons but the epidemiology … you don't get epidemiology for this country or the stats for this country*	*PMSG1 No.1*
				our university does not focus on updated information, a lot of our notes that we get is very outdated and it brings conflict specifically with regards to the stats and the treatments.	*PMSG1 No.11*
				notes that we get is very outdated do not have the newest information available	*PMSG1P11*

			Not adequately prepared reality of primary health care setting in South Africa and treatment management (******Recurrent theme – Not prepared for reality of primary care setting)	*It is just that in terms of management it changes quite a lot from doctor to doctor..so there is no, I think we were saying with no.1 the other day that .. you know the EML clinical guide, if they could have just started that in the second year, then you know this is how this is managed, we use these drugs although they are rare ones, because in pharmacology we studied everything and we don't see any of that so the non-practical drugs that could have… they could just highlight this is what we use in South Africa…you start with this and then you move to this or what …so by this time you have master it.* *It is only in few clinics, I remember I saw a diabetes poster in the cardio clinic at Internal Medicine. Some of it is just random and you don't know why this poster is here and you are not rotating there so it is not of importance to you at that time… ok this is interesting…and then another problem is with being in a specialist environment ….specialist have there own way about teaching about management. So that algorithm is not what you have been told during the lecture and another thing is that with many of the specialist especially the consultants, they also work in private, so you will always hear "in private they will use" or "in America they will use …", but here in South Africa there is not . I feel that it is unnecessary information that I do not need right now - for me because I am not planning to go to UK any time soon…. ja there is not a set way, I think there should just be consensus on what should the students be taught, from which source for example the EML, I feel like it should be started from a very young age … ever since we have actually been exposed to it, I feel that everything could have just been so much easier.*	*PMSG2 No.10* *PMSG2No. 1*
		(*****Recurrent theme - Psychological impact)		*I agree with No.10 regarding the management ..even our teaching did not really focus that much, like you knew you have to study management but there was not.. like an algorithm of management that was provided during the teaching…so ..even now I see sometimes I am not even comfortable when I am facing a patient for example I saw a patient with diabetes today for two seconds I thought, how will I treat her and I did not feel comfortable at the starting point , so , ja…* *Like the Crytococcus meningitis, it has always been a mindboggling thing, you trying to cram it, study for it, even now that you study it for Internal Medicine - it was a stress factor – now it is just a simple.. it is an infection you treat it, this is how you diagnose it and it is easy, but it is because we have never been exposed to a simpler way. I feel sometimes people are just trying to make things difficult* *Think just the difference between what is clinically prescribed and what is actually performed. It would be nice to just get the different perspectives before-hand to prepare yourself and may be just get a better feel of how things are going in South Africa.* *I just also feel that we get taught often the medical.. but we don't get emphasised the dosages, so we get there and when you write a script and then like ok… Pharmapress.. do I just give 20 or start at 10 and then give 20.. then you add two extra drugs because … I don't know what to do…so also I think it is just about me learning it properly in the undergrads, …in preclinicals I don't think it was necessary then* *What we see here at the tertiary institution is level 3 or 4 of the primary problem so it help for us to see where it starts and it is just important for us to improve primary health care, that we don't see so many complications. …..we do/are being taught that but just an reinforcement of primary and preventative measures as well, that can be improved and be a lot better.* *It is very important … CBE is very helpful, it helps us to see this is where the problem start and this is what we trying to do. What we see here at the tertiary institution is level 3 or 4 of the primary problem so it help for us to see where it starts and it is just important for us to improve primary health care, that we don't see so many complications. I think this is where it start, even in our primary….. from third year, the education has been actually lacking - we do/are being taught that but just an reinforcement of primary and preventative measures as well, that can be improved and be a lot better.* *I think in the beginning, yes we do need the foundation of the basic medical sciences, but when it comes to the more system base teaching, I feel like there was just too much information put on at the same time and then there was not a good structure in exactly how to treat it in the clinical sense of it and when we were… we had to go into the clinical phase of our degree we were just expected to know automatically, exactly how everything is suppose to be … so I feel like there was a bit of a gap there between the theory and then the practical application where you were just expected to know by heart now, how to do everything.*	*PMSG2 No.9* *PMSG2 No. 10* *PMSG1 No.8* *PMSG1 No.1* *PMSG2No. 8* *PMSG2No. 8* *PMSG2 No.1*
CDL: STUDENTS' EXPERIENCES IN THE PRIMARY HEALTH CARE SETTINGS	***MBChB program: CDL transition from theory to practice***	Application of theoretical knowledge in the clinical and primary health care environment. Training is based on tertiary care but not on what is experienced in primary clinics.	Primary health care setting: CBE and Psychological impact Gap between theoretical knowledge and clinical application.		

		Essential connections between foundational knowledge and applied knowledge – challenge for integrated curriculum		*It is just when ..because you are taught in a tertiary institution, you always just see complications of , whatever the lifestyle diseases but we were never actually taught, if you are a GP and you see or newly diagnosed patient, you know hypertension or whatever, how do you go about and everything, managing hypertension emergencies or like DKA's and stuff, we have never actually been given lectures if you are a GP and the first person to diagnosed just tell me, if somebody is just newly diagnosed with diabetes you just know that she is not controlling on metformin and medication and you never know how?, when do you start?, with what?*	*PMSG2 No.5*
				It is very important … CBE is very helpful, it helps us to see this is where the problem start and this is what we trying to do. What we see here at the tertiary institution is level 3 or 4 of the primary problem so it help for us to see where it starts and it is just important for us to improve primary health care, that we don't see so many complications. I think this is where it start, even in our primary….. from third year, the education has been actually lacking - we do/are being taught that but just an reinforcement of primary and preventative measures as well, that can be improved and be a lot better.	*PMSG2No. 8*
				for pre-clinical years they emphasising obesity for example, but once you get to a clinic it is just completely not … like it is a risk factor anymore, nobody cares about it, they just say everybody is obese… deal with it.	*PMSG1 No.5*
				practice at one place it is not standardized practice through all the clinics.	*PMSG1 No.7*
				tell a person to eat healthy, but they don't consider the persons background and if you say the person has to eat healthy and they don't have food but you don't teach them like how to maybe make a garden and stuff.	*PMSG1No. 3*
				So there is a lot thing they tell the patient do this and this and this but we have to individualise the patients and I..I don't think they emphasized on that much.	
				They also taught us the importance of screening for chronic lifestyle disease. I think the only problem with that, especially in our rural clinics, there's no equipment, I mean they use it in a week and the delivery is in three more weeks so what do they do in the meantime.. there is nothing to screen the patients, while I think that is very important in preventing a lifestyle disease for it begins to escalate …	*PMSG1No. 6*
CDL prevention programs: constrains and barriers	Challenges and service needs	Poor risk prevention and Contextualised and individualised care due to - ** inadequate resources - high patient load - ***staff shortage	*we get a lot of information pertaining to how to treat certain diseases and how they are monitored….controlled basically. Say for diabetes for instance, but when you get to the clinic there is one or two glucometers for the clinic*	*PMSG1 No.8*
				I think the intention of having all these carry cards and all these forms that they make specific for these patients, I think they try and do good with them. At some of the clinics there were the poster up to quickly screen the patients eye. They had all these things for us to do, but I don't think it gets done everyday. So I think the intention is there. Sometimes they have all of these screening resources for all of these patients, so I think sometimes they do try there is just too many patients .. so it does not get implemented everywhere	*PMSG2No. 3*
				I also believe, regarding the control of the interventions, there is no … very seldom equipment and there is very poor control of the intervention to monitor if it is effective because yes you were told medical treatment, know medical treatment is supposed to be controlled..evaluate it.. ja.. the efficiency. I think it is quite lacking due to not having the equipment, not having the manpower to basically see all those patients and serve the whole community …	*PMSG1No. 7*
				If you have to sit down with the patient, it is about time. The people are too many. If a patient is admit here you can go and speak to him, but in the primary health care it is oversaturated	*PMSG2No. 10*
CDL: protocols/guidelines and intervention programs	Students not equipped for the uniquely South African primary setting (* Recurrent theme)	Information provided in the programme not focused on SA setting	*strong emphasis's on medical treatment which are supposed also like No. 3 said it's probably the same in most countries in the world, but then we don't, we don't have a uniquely South African syllabus on how to risk health style modification in South Africa… so the medical treatment I think we were taught about … but then how to treat, modify the risk factors that is lacking.*	*PMSG1No. 10*
		Focus on treatment and not behavioural changes	*The problem is they tell us like you have to have a proper diet and you tell your patients he has to have a proper diet and you know a proper diet consist of some meat, some veggies whatever, but in the South Africa setting it is really impossible for them to afford that so I think it doesn't help they teach us the patient has to eat salmon once a week and chicken twice a week and this and this*	*PMSG1No. 5*
	Promote a holistic integrated primary health care approach that focuses on the complementary roles of different health	Not aware of specific roles and responsibilities of different levels of health care workers	*….. so they have to tell us this … patient can effort and we have to work according to that.*	

		professionals involved in the care of patients with CDL *Need for treatment management refresher courses in clinical years*	Theoretical information not aligned with what is observed in primary health care setting due to resource constrains (Recurrent theme – **inadequate resources)	*And I think like everyone has mentioned, we get taught other ways like lifestyle modification but a lot of emphasis is put on a medical interventions and I realise this at the clinic. The first thing like a child comes in with a cough or whatever you want to give antibiotics or something and the sisters always consist on give health education, give health education, the whole time and you realise that especially in the rural communities the medication usually is not there and they struggle and have to rely on these remedies. So like everyone has been saying now is it is very important that they customise the interventions for a South African setting.* *is only in few clinics, I remember I saw a diabetes poster in the cardio clinic at Internal Medicine. Some of it is just random and you don't know why this poster is here and you are not rotating there so it is not of importance to you at that time… ok this is interesting…and then another problem is with being in a specialist environment ….specialist have there own way about teaching about management. So that algorithm is not what you have been told during the lecture and another thing is that with many of the specialist especially the consultants, they also work in private, so you will always hear "in private they will use" or "in America they will use …", but here in South Africa there is not . I feel that it is unnecessary information that I do not need right now - for me because I am not planning to go to UK any time soon…. ja there is not a set way, I think there should just be consensus on what should the students be taught, from which source for example the EML, I feel like it should be started from a very young age … ever since we have actually been exposed to it, I feel that everything could have just been so much easier.* *Also I think what might help in our context is to be taught may be what every level of health care's role is in these lifestyle diseases, because we were not really sure what can the clinic do about especially when we went on home visits and should the patient/we found a patient with a glucose of 22 should they be taken to the clinic as soon as possible, to the hospital, should the doctor be notified, what's the……umm* *we don't really know what stock the clinic has- can they treat something acutely ….*	*PMSG1No. 9* *PMSG2No. 1* *PMSG1No. 10* *PMSG1No. 10*
		Psychological impact during clinical rotation in primary health care facilities (Anxiety, distress and discomfort experienced) (*****Recurrent theme - Psychological impact)	(Recurrent theme - **inadequate resources No treatment protocols for acute complications of CDL Lack of supervision	*And we learn about all these treatments but it is very rare that the treatment is actually available. So it is not of any use to us at this level where we are right now because we need to know about the prevention methods and protocols that are appropriate for our setting and as mentioned in the previous question that we discussed, there are no protocols especially in Trompsburg and in the rural areas as what to do with a patient when you find something that is abnormal for example a high glucose at a lifestyle club. What do you do with the patient? Or this patient has a hypertensive urgency what do you do with the patient? And it make it specifically difficult if the facilitator is not with you.* *one specific instance we had a lifestyle group where we were there and the doctor was not with us and could not get hold of the doctor or the programme facilitator in the region and it's very distressing if you don't know what to do and you have identified a problem.* *I just also feel that we get taught often the medical.. but we don't get emphasised the dosages, so we get there and when you write a script and then like ok… Pharmapress.. do I just give 20 or start at 10 and then give 20.. then you add two extra drugs because … I don't know what to do…so also I think it is just about me learning it properly in the undergrads, …in preclinicals I don't think it was necessary then* *I think they teach us a lot about the risk factors for developing chronic life style diseases and they teach us as students a lot about it and I think a lot of health care workers. But I don't think they emphasised it enough in the community outside of the health care centre. Especially our rural communities, they don't know what diabetes is they hear something about a high blood sugar but they don't know what it is, they don't know what hypertension is. They don't know how important it is to just may be exercise just go for a walk or bring down their daily portion intake when it comes to diet food. So I think this is also a problem in the community in terms of promoting a better and a healthier lifestyle because that is where it all starts and I don't think they know how important this is.*	*PMSG1No. 11* *PMSG1No. 1* *PMSG1No. 6*
CDL: Health promotion and educational programmes	Health promotion lacking and not contextualise		Not effective communication		

			I just want to say a few things about intervention is firstly the medication patients get especially in rural settings and in Bloemfontein, patients don't know why they have these different medications. A lot of them don't know this is for their high blood lipids, … or fat..ja.. to put it in a more understandable way for them, or this is for their blood pressure and this you have to drink for your diabetes. Patients don't know, they just don't know, they know these names and they don't know why they have to drink it so I think then they don't use it as it is prescribe because then they don't really think it is necessary.	*PMSG1No. 4*
			And a other thing with regard to prevention and everything that have been said .. is somehow we need to change our populations staple food and I know it is a big thing and it is going to be difficult, but we are in a medical field and we know a lot of people that's in different other departments on campus. I really think that we should talk with may be the agricultural people on campus and different people to see if we can't get cheaper food for our poor patients and for the entire country in the whole. Change of bread maybe, or change like "mieliepap" they use, I mean it is all children eat from when they are very little and do you understand… that's cheap .. so I think we must look at the bigger picture really try and change our entire country with regards to really go to the food really go and change the basic. Passionate expression lot of members nod their heads in agreement	*PMSG1No. 4*
		*** Recurrent theme –staff shortage)	*Also the patients are not really been told why their blood pressure gets taken or why.. I feel that if everything was explained.. "I am taking your blood pressure because I am trying to see if you have high blood pressure" and explaining in that moment what it is, what to look out for.. No 6 already mentioned uhmm the load on the staff is too much, so there is no time to sort of like explain everything .. you just want to get through the line.. so that is another thing.*	Improve effective communication
		Importance oof health education to empower patients	*I also just want to add, I saw a patient this morning and the patient had preeclampsia and she had no idea what was going on and she had been admitted for two days already. So I think it is really important to take some time or whenever, just let the patient know so that they can be able to pass on the information to the next doctor then … don't have to start from scratch. But also if the patient knows what is going on and the dangers of the disease that they have then they can better take care of themselves. I am not saying that you should scare them, but just let them know or otherwise if you tell a person that you have high blood pressure and then you don't tell them about all the complications then …. I have seen a lot of people that have high blood pressure but they continue doing and living the way that they have been living before and carry on with their lives because they don't know the implications…. what does that mean for you… and also all the symptoms of micro and macrovascular complications, they don't get told all of that. They you just tell them you have high blood pressure and take your pills and carry on with life. So I think just that is a big factor.*	
			Like no.3 said I almost feel like in my experience patient education and education about risk factors is almost the last resort in our medical environment. If someone has hypertension then that gets treated but they don't necessary gets counselling and then suddenly when they have all these complications, then they get told .. Ok, no you should not .. get exercise, do this, do that. Someone that smokes, someone who has now lost their leg ..got amputated at Pelonomi primarily because they have smoked for the past 40 years, I mean they would have presented to a clinic 30 years ago with something else so may by if they have been told every time but now suddenly they get told if you don't stop smoking you going to loose your other leg or it will kill you. Or someone with chronic alcohol abuse, now only when their liver starts to really develop a lot of problems then we say ok, no but the big thing is the alcohol abuse.	
	Health information – practical problems observed and possible solutions	Health educational material – posters:	*….diabetes posters in a lot of the clinics but I think that is as far as it goes. I have not seen any of obesity posters or healthy diet .. You see a little dietetics things about eating salmon, once again it is way out of context (laughing)..ja…*	*PMSG1No. 5*

	display not optimal Information not effectively communicated -language and educational barriers -do not focus on holistic health care -not relevant for contex -Information out of date -****Focus on communicable diseases	*I was just thinking about their posters, because we also did that, but now another example of that is - you present and you are obviously doing your presentation display, but presentations are not put up somewhere....whereby we found there is ... on some ja ...so it is like we do all these things.... but the question is are they actually getting put up where necessary. For one we also talked about depression and how different cultures sees depression differently, so a lot of aspects are not... I think we focus more on the diabetes, hypertension, but then we don't really focus on the holistic individual as a person, we focus more, you don't get hypertension, restrict your salt intake but what happens if you are depressed, what happens when you are suicidal, what happens because you are sick, because you are burnout or whatever, what happens if stress is causing you your illnesses, we don't really focus on .... .* *When we were in Trompsburg we actually did our clinical presentation on malnutrition and correct diet because we did see that there was nowhere any mention of it anywhere in the clinic and when we asked the sisters what do they think is important to the community, what do they need to know, they said they don't know anything about diet and malnutrition in adults or in children and that we should educate them on that.* ***Facilitator: ..** the holistic, the person. Just out of curiosity – I just wanted to know the posters you saw were there a lot of pictures , explaining it or was it only written.* ***Participants answer together "**mostly written", "More written, **....** in fine print" Participants laugh* *The other problem that we experienced, al written in English (Participants 3 agree) and you live in a community where no one can read , or they know Sesotho or only know Afrikaans.. then protocols everything is in English, so yes information is there but can your patient actually understand what is said.* *Umm**...a**lso another thing, I know with me even if I see ten posters on a wall, I will not just stop and look at the posters, or unless someone.. or unless it is attention grabbing or someone sort of draws my attention to it. So, also I think pictures would make more sense, especially in a rural setting, cos now.. for us.. when we did our presentation, we did it on the diabetic foot and mostly it was picture's, then we would explain from the pictures, there was very little wording. So, you could see that they understood more, we even showed...instead of telling them this this is how you wash your feet. We actually went there with a bucket, and we showed them, was in between, this is how you dry it. Some people switch off if you just keep on talking and talking you can switch of eventually, so rather demonstrate it. I don't think, even the staff they don't have time , they just want to get through their patients. So.. ye...* *Just regarding the placement of the posters or the protocol. A lot of time the posters if they are posters is mainly in the consulting room where the patients is only with the doctor for about ten minutes and in those ten minutes at the doctor they are more focus on the doctor because they need information so perhaps put it in the waiting room, would be more effective.* *It is only in few clinics, I remember I saw a diabetes poster in the cardio clinic at Internal Medicine. Some of it is just random and you don't know why this poster is here and you are not rotating there so it is not of importance to you at that time... ok this is interesting...and then another problem is with being in a specialist environment ....specialist have there own way about teaching about management. So that algorithm is not what you have been told during the lecture and another thing is that with many of the specialist especially the consultants, they also work in private, so you will always hear "in private they will use" or "in America they will use ...", but here in South Africa there is not . I feel that it is unnecessary information that I do not need right now - for me because I am not planning to go to UK any time soon.... ja there is not a set way, I think there should just be consensus on what should the students be taught, from which source for example the EML, I feel like it should be started from a very young age ... ever since we have actually been exposed to it, I feel that everything could have just been so much easier.*	*PMSG1No. 12* *PMSG1No. 9* *PMSG1No. 12* *PMSG1No. 3* *PMSG1No. 7* *PMSG2No. 1* *PMSG2 No. 3 nods head in agreement*

	Everywhere you look there are posters, but some of the posters where made in 2001. The edges are completely falling off, it just looks ugly. You don't want to look at them, if you are bored maybe you will. It does not grab your attention. It is so old and outdated. And I think people just like medical professionals, instead of counceling a patient, they say "ag, there is a poster, they will read the poster and then they will know everything about their disease". I think they use it as an excuse to council the patient and to inform them about everything.	*PMSG2No. 5*
	The more personal the interaction .. there are some clinic's , not the clinic's we are talking about now, where the nurse will come in the waiting area and assist the patient and even in Trompsburg were given the assignment of ….they can ask you direct questions and people can directly ask you.. a video will be very general and it will be very difficult with language barriers for example where you have different languages. If I can speak three different languages, I can actually communicate with those groups of patients at the same time.	*PMSG2No. 1*
	Ja, I have seen a lot of TB posters in MUCPP especially on the windows, it is always – stop TB, and even in other languages. I think there can be in more languages, but I have never seen anything about hypertension anywhere.	*PMSG2No. 7*
	I can remember at MUCPP, we did not walk through the whole clinic, but I remember one of the walls was painted, like hand painted and I remember that was about vaccinations. So I think some of the other walls were also painted with that information, but I did not really look at them.. and then I know at Poli B clinic there were posters yes between every single door there was a poster. I just remember the smoking ones.. that was very good- they tell you all the bad things that smoking does to you. I think there were also a poster about diabetes and I cannot remember the other ones .. I think they try to put the posters up for counseling and just giving information.	*PMSG2 No. 3*
		PMSG2No. 8
	I think that will be more effective but I just think it could be, especially if it is in the patients language. Quickly just a comment on the posters… maybe it is just me. I have not seen a lot of posters at Trompsburg compare to MUCPP and maybe it is just me, but I don't remember seeing a lot of posters at Trompsburg compare to MUCPP.	*Can I just throw in something else? What do you think about video's, playing video's in the waiting area?*
	Video's sound like a great idea, however, the fact that someone need to maintain the video, the staff already complain that they are overwork and now they need to find somebody who is a computer guru…. Like n0 10 said, it will be more personal if someone actually speaks a video again it is passive intake of information, with somebody there that can interact… calls no 10 and ask no 10 a question: "o doctor I don't understand …" and you explain something like that…	*PMSG2No. 9*

				None of the patients, you will never see one patient reading anything on the wall. Sometimes they are only in English and some don't know how to read English. I don't remember even one time that I have never ever seen a patient even looking as if they are interested.. or even asking what does it say – no, nobody ask, I don't think they are effective at all.	*PMSG2 No. 5*
				I completely agree with no 5 and that was something that concern me being in Trompsburg. With us being here, although our classes have been in English, it is not one of the languages spoken to most patients I have ever seen and there was a nice diabetic poster put up by the students in the clinic in Trompsburg. Like no 5 and everyone said it is completely useless because it is in a language that they do not understand and with information that they do not know how to use and it is not always applicable. It is just there because you have to make a poster, it is not applicable to their specific diet or their culture or anything. *And I feel that is something that surely lack in that rotation. We should have been taught some of those things…. What food is available to the patients, what are the cultural norms and teaching us conversational language that you can actually get ideas across to your patient .. without having to abandon the conversation thing…*	*PMSG2 No. 4*
				I think it would be nice as well if students actually went to the people in the community and did a questionnaire with them to find out how much they actually know, because a lot of the times we think, we know what they don't know, but they might know a lot about hypertension now already because they only hear about hypertension, but they might not know that much about diabetes or obesity. So I think it would be very effective if a questionnaire could be done in the rural setting to find out what the people know about and what they don't know about.	*PMSG1No. 11*
		Health information – student based initiatives *student proposals – ? integrate MSSM projects with CBE exposure in the curriculum -practical solutions*	Improve patient knowledge of health issues in primary clinics	*Yes, I want, I want to add on number 7. I think if the posters are in the consulting rooms maybe they should take, or a practical solution would be, to take the patient to the poster or show them the poster and when you are giving the health education, show them the picture, show them step by step what they should do. Just to make it more easier for them to understand. Not just listen but have a visual aspect as well.*	*PMSG1No. 6*
			Address health education in earlier in the lifetime for example school	*I think of instead of implementing these forms of health education about preventable diseases such as type 2 diabetes and obesity on a level where if it say in a clinic.. a person is… already most of the time has something wrong with him, he goes to the clinic for a reason. I think of maybe a possible idea would be to increase the amount of this knowledge presented to us on school level .. for those of us , I know a lot of us is still disadvantage and still today don't attend school .. for example one child in a household attends school and in grade 7 or 8 life education or LO as it was, there is a little paragraph or thing , just on diabetes.. this is what it is, this is what it can do to you, this is what can be looked after, how it can be prevented, things you have to look out for. Then that person in that household can tell his parents, his friends, his grandparents and immediately you get a much larger exposure of that information.*	*PMSG1No. 9*
Challenge		Non-communicable diseases protocols lacking compared to communicable diseases	Focus on immunisation, needle stick injury *** Recurrent theme (focus on communicable diseases)	*One protocol was the standard needle sticking injuries that at every clinic the protocol is up but what was fascinating to see is .. but not all of the sisters and not all of the health workers in the clinic were aware as to how to go about it… it felt like some students knew more as to how to go about it as they … they just assumed… you go do a rapid test, if it's negative you will be fine. Luckily, we have systems in place as well in our logbooks and stuff where you call infective diseases are guided through exactly what occurred … but the needle stick injuries and like very … like for .. as there is a lot of neonatal exams on babies and infants ..so those vaccinations schedule are also very displayed I think in the clinic.*	*PMSG1No. 2*
				Oh yes I wanted to add on his comments about the vaccinations especially the road to health booklets and protocol, I think in especially in the rural clinics in Tromsburg they really follow up the children very nicely	*PMSG1No. 6*

				Dr.. umm Prof. I can't remember of a specific time but I just think what happens a lot, for instance a patient comes to your antenatal clinic or it is a child maybe coming into the clinic, umm…due to the lack of staff and we don't have a lot of time ..a lot of the doctors or the sisters can see well the mom is maybe obese or the grandma is here for her pneumonia, but actually she is obese and she has all this risk factors but due to time we don't take that extra five or ten minutes and just quickly check the blood pressure again, do a glucose screen and just eliminate those risk factors before she even get gets the disease. And I think that is the problem, due to staff and time..we umm..	*PMSG1No. 4*
		Lack of integration of shared risk programmes	Challenges facing the integration of shared risk prevention and intervention programmes from being successful in the primary health care facilities - *staff and time constrains*. *** Recurrent theme –staff shortage)	*I think with the specialties everybody does their own thing, so if a patient is seen at Obs and Gyne it is treated their and if a patients is seen elsewhere .. if a patient .. like the Psychiatrist always complain that no matter what medical problem the patient has, as long as in their file somewhere they see that he has schizophrenia or something they sommer revert back to that place and now the patient will get treated there. I think ..it is a specialist thing, everybody wants to get as little patients as possible so they want get rid of the patient as soon as possible …so there is not a lot of integration. But with regards to that in the clinical..in the clinics and the primary care setting, we are always taught about a multi- disciplinary approach with regards to chronic illnesses, where a patient must be taken to dietician …..I don't think we see that a lot in the clinics.. nothing …Ja, because even with, back in Trompsburg where we were working with the nurses, referral were a problem and then even if you refer a patient, I remember there were a patient who had eye problems with diabetes, I think we were there last year September or August round about and the patient had a date for next year, so already ..will always be a thing especially in the rural areas where a patient cannot have an integrated approach*	*PMSG2No. 4*
			Theory and practice don't always align	*So, I just think on a specialty level I feel that sometimes, the vitals are always taken at clinics, but when it gets to the rate of the specialist, it does not get look at, at all. You come in with a problem, they only sort out that problem and I feel that it is when we are missing the…because then we are not screening at all ..so then why are we taking vitals ….?*	*PMSG1 No. 1*
				I do remember at Obs and Gyne they did have dietitians and the patient that where seen on that day was taken to the back to be seen by the dietitian and they had a consultation and some of these consultations were longer than an hour. So I think in some places they are trying	*PMSG2No. 3* *No 3 agree verbally*
				I also think … regarding going late to hospital, ….they often present very late and when they usually presented with hypertension they now present at the ophthalmologist due to complications… so I think also in the system maybe we can pick it up before specialist level they should have been picked up long time ago …. talk to the patient give them the information because even if that patient goes home there is family members, there is always someone else and you can basically address it at home, you can prevent the progression of it to a specialist level.	*PMSG1 No. 7*
Barriers	Prevention and interventions programmes		Late presentation - Poor prevention - Cultural believes - Interventions not followed through - traditional healers - interventions not follow through - information incomplete	*Just adding on as well.. an example of an intervention programs they have ,,,Is those follow ups where a patients have to see students and being referred to certain specialist for example … we saw patients that have depression and was never refer to or see a pshycologist. But when we came back after six month when the patient have been told to see that person but they haven't seen that person ….. then they write another referral go see the psychologist but they don't see them. What is our benefit, we write a referral then there was no intervention.. the intervention was put in place but it just need to be followed through.*	*PMSG2 No.3*
				Just on what no 3 was saying, just a fault on our part, we have these patients having these carry cards, where they write their blood glucose levels or their blood pressure levels but sometimes you find that their cards are incomplete, so I just ask myself what are the point of having these things, if you are not going to be consistent and fill it in every time the patient comes	*PMSG2No. 7*

Successes	*Areas of good practice observed: Effective prevention and intervention programmes in rural primary health care setting but more focused on communicable diseases/antenatal clinic* *Differences observed between Rural vs urban*	Good practices observed – Risk identification – rural Patient education and support programmes - rural Positive impact of rural Lifestyle support groups and home visits Good screening programs school children and antennal clinics in rural A lot of emphasize on communicable diseases (TB, HIV) and related treatment programmes in rural and urban Good relationship between health care team and rural community Areas of effective health dialogue and individualised health care – home visits - diabetes groups - reward system (Token shops)	*I know that in the clinic at Springfontein all patients first have to go to the observation room before they are seen by a nurse or a doctor .. uhmm ..and there vitals get taken in this observation room and a general examination is done on the patients.. screen.., which I think is very good because at the time you get to the doctor, the doctor can see even though you are not complaining of headaches or any other associated symptoms, you do have a high blood pressure and you are not on medication. So, I think that was very effective.*	*PMSG1 No. 11*
			I think more at Obs and Gyne it is happening.. but it is because it has further implication.	*PMSG1 No. 1*
			Just something that I really appreciated when we were in Trompsburg, for our CBE program, then we as students, with our occupational therapist, went as a group and we had, like…they have a diabetes club which meet up every week and we gave.. well we started by checking all of the patients in the club's blood pressure and their glucose levels. So I think … first of all that is a great way of using us as students to help with the screening load of the patients and secondly we gave them a PowerPoint presentation, on their level, to give them information especially on the risk factors which cause diabetes and on our home visits we did that as well. So I think in the community of Trompsburg that was very well implemented.	*PMSG1No. 6*
			One thing that was positive in Trompsburg was with these lifestyle groups sometimes we got guest speakers in as well coming from Bloemfontein or other parts of the country and specifically when we were there someone came in on how to start a vegetable garden in the whole of Trompsburg how he.. he kind of started a competition within the whole community to start them trying to be sustainable instead of buying their food from the "vends".. so in that sense there was positively that they are trying to get things that is sustainable into the rural community as well.	*PMSG1No. 2*
			Yes, I also actually wanted to say something what I saw in Trompsburg with the home visits what we did, so it was not just about the patient who came to us for help. We also showed the patients that we care for them and went into their homes and just to find out of the challenges what they face with regards to their illnesses in their houses …	*PMSG2 No. 2*
			If we speak about Trompsburg, specifically there is a very good screening program for the school children. I think that would be amazing if they could ever implement it in the country on a national level.. but I know it is impossible, but is just like a way.. they can do something like that, it is really good for mental health and for physical health for the school children.	*PMSG1 No. 5*
			Can I talk about TB again? *I liked at Trompsburg that the patients have to come and take their medication at the clinic.. yes… it was to ensure compliance, although the patients did not like it, but they came and they knew what medication they took. Half the patient here, like 70% don't even know the name of the medication, they just know the time and the route …*	*PMSG2No. 10*
			I also think there is a very close relationship between the health care workers and their community, which is very good…they will go the extra mile for …just to help a patient who cannot come … especially in Trompsburg there is a lot of difficulty with transport and admin, a lot of difficulty arranging appointments.	*PMSG1 No. 7*
			I think the relationship between.., yes and that definitely reflects, I think in the healthcare system .. as well..	
			I also liked the home visits we did in Trompsburg, and I know in a big place like Bloemfontein that is not possible with our big population here, but in the small towns, which is far from a big hospitals, I think it is really a good practice to visit, especially in the elderly who cannot just walk to the clinic or uhmm,, just to visit them and screen them at home and give them the education… where you have almost a private consultation with them and..ja.. just to educate them on their level at home..that is really nice.	*No 11 and 9 pay full attention, nod and also eager to contribute*

			To add on to that , I think in the small communities especially the health care workers not just the nurses, the health care workers have a very good relationship with the people in the town and the patients and then they know each other and I think it makes it so much easier to treat them because you are much more ..uhmm .. you would much rather listen to someone who you trust than some random person , walking in there and telling you what to do…… So I think there is a good interpersonal relationship that has been built between the health care workers and the community.	*PMSG1 No. 11*
			I know with the TB patients at Trompsburg every morning they go there to get your medication and if you don't pitch, they go to your house, find out what is wrong and maybe you are sick that day or whatever.. you get a consultation from home or they make a plan to make sure that you get your next dose, so that is also like a tight way of making sure that patients are taking care of themselves.	*PMSG1 No. 9*
			I just want to add on, on the TB patients as well, where you get patients who struggles with compliance, that person know where you live, so you better come every to the clinic so they can see that you drink your medication, then you go home after that. So as much as patients are a bit on the fence about it, they still come because you know where I life. And another thing is also that they are actually not afraid to ask questions especially if you ask them: Do you have a thing to ask?... and they are je, not really or whatever, especially your lifestyle groups they are really well informed. You guys what would you like to ask and they would say je we know everything .. Are you sure? Hypertension, diabetes, good life, we know it all, surprise us. So it is interesting to see something like that, those who are actually in the system, are actually benefitting very well from it … so they are very ja ..	*PMSG1 No. 12*
			Just on what no 12 have said, It was nice to see at the antenal clinic, all the patients knew the danger signs of pregnancy , they could tell you word for word because they are so well informed and that is very nice you hardly see that here in Bloemfontein	
			What I would like to say is also the home visits. When you go there you would supply the patient, for example with bandages for example we saw a patient with critical limb ischemia so we taught them how to care for their limbs and you can give them supplies so I also think was a good intervention.	*PMSG2 No. 6*
			Regarding the rural, the diabetic clinic, the group that we also saw in Trompsburg because we were also part of that and then they chose, what they want to hear. . I think it makes the patient more compliant, because they feel that they are somehow more in control of their treatment… you are not just bombarding them with information over a long period of time. Instead of sitting with the patient, because we were told as a doctor when they see a patient they must counsel them about their disease but in all honesty, if I am told that I have a certain disease today and you give me all the information about the disease, the only thing I am going to remember is the diagnosis and I am going to forget everything else. So they can always looking forward to the information and they can keep growing on it and if they forget somewhere along the line we will revert back to starting with complications of diabetes. With us when we were there they wanted to know more about diet, something they have been told but you still need to reinforce it as time goes by. Even the aspect of a budget for a diabetic in their social circumstances.. so ..ja	*PMSG2 No.1*
Suggestions:	Best practices:	Small groups (reward system)	*And also one thing is they have a reward system there (Trompsburg) , if you attend the clinic you get stickers and then you can go buy stuff with the stickers. It is very nice to see, I think that is actually something they can implement on a national scale. they have like special shops for people who attend ..because it is going to save money, uhmm by the end of the day.. anyways.*	*PMSG1 No.4*
		Reward system		

	Individual health booklet	*I just want to add to what nr 7 said, I think we can really look at it, especially for future sake, and especially for the rural area. We focus a lot on women and children's life and people love to take responsibility of their own health and the mom's take care of those booklets and it does not matter where the baby goes, to what hospital whether it is Pelonomi or another province. If you open that booklet, it tells you a lot about that child … the growth, nutrition the health status etc. I do think that we shall really try to implement it on a national level even, especially for patient above 35 or 40, a special booklet which they can carry with them like an ID booklet. Every time you go to the clinic your blood results are there, if you had a papsmear, then to write it in. If the doctor examined your breast on this date, tell look I found a nodule there and there, this size or whatever the case may be.. because then we know that when a patient goes to the clinic, a doctor … they would do a proper examination and any change or any abnormalities will be noted and when the patient presents again the person… some change in the blood pressure suddenly.. then change this or that. Uhmm, I know it might cost money but I think we should not take excuses.*	*PMSG1 No. 4*
		Because you can do like a neurological examination also maybe check the motor, sensory motor .. so it will be like an entire patient profile basically that goes with you.	*PMSG1 No. 4*
		I also just wanted to say there is one thing what we usually miss, especially in a rural setting, this thing of communication, we forget that some people actually contribute their symptoms to witchcraft or something like that and then they don't go to the hospital because they think.. O no … it is nothing or somebody is doing whatever to them. So, I think a lot of people can present to the hospital if they know what is going on, or I don't know, anticipate the particular disease instead of something happening and then they think ..O, no.. it is this or that. So they know from the start …..	*PMSG1No. 3*
		Just to add to that, I have seen multiple patient with high blood pressure and diabetes, and then they stop their medication because the traditional leaders have told them that they are cured … so it is definitely something that should be looked into and implemented.	*PMSG1 No. 5*
	Understand cultural beliefs and enhance collaboration with cultural health workers to enhance risk prevention	*Just to continue on what no.3 said and this might be a very difficult suggestion and I don't know if it culturally acceptable but, I think we could maybe try and work together with community healers or sangomas and maybe give them some health training, some health education… so that they are able to identify patients that are maybe too scared to come to the clinic or hospital and if they can identify a real problem with this patient, they could maybe speak to this person and say listen I think you should go to the clinic to see someone at the clinic. I think that could help in a big way as well. Especially with the patients presenting so late or thinking that it something else.*	*PMSG1 No. 11*
		This is also something close to home. My grandmother is a traditional healer but she is also a nurse. So, at least with her it is an advantage because if someone comes and they think it is something spiritual or whatever she can identify. She even have HIV test at home that if you agree then she can test you. So stuff like that, it can be of an advantage and I think it is something that could work although it will take a lot of time, because I mean it is difficult to change someone's way… but I think definitely going to the traditional..uhmm traditional healer ..or maybe having like a community thing where they come if they can and just educate them ..like of things that are of danger so if they identify, they can rather send the patient to a clinic or just suggest it.	*PMSG1 No. 5*

	ACUTE AND CHRONIC MANAGEMENT COMPLICATIONS OF CHRONIC DISEASES OF LIFESTYLE.	Exposure to management of acute complications of chronic diseases of lifestyle.	Insecurity due to lack of opportunity to observe management of acute conditions of chronic lifestyle diseases (******Recurrent theme – Not prepared for reality of primary care setting)	*I think the problem is, we have been having a lot of lectures on how to do this, so I think our theoretical information may be up to date but .. we have never been in a situation where let say, …well I can't speak for the rest … I myself, I have never been in a situation where I am at casualties and someone comes in with a diabetic ketoacidosis and .. I don't think in that situation I would be able to .. I don't know. I don't think on a practical level we had a lot of exposure on acute situations like this.*	*PMSG1 No. 6*
				In contrast, I have seen two or three patients in the periphery with a diabetic ketoacidosis that came in and the doctor that was working in that situation clearly revised the protocol with me, how to treat the patient, but unfortunately it was only for that, for example the high blood pressure there was no protocol and especially in Trompsburg they don't sit down and tell us, listen here … we sending you into the town go screen.. But they don't tell us what to do if we find a high blood sugar or blood pressure, who to call when you find a high blood pressure or high blood sugar. So you find these things but , there is no protocol given to us, saying if the patient have high blood pressure and you find other things, phone this person… or if it is so severe phone the ambulance, here is the ambulances number and they don't tell us which services will be given to us when in acute situations, especially in the rural clinic.	*PMSG1 No. 11* Seems anxious when she shares the information
			Difference between rural and urban Difference between casualty (resources and staff- available) and primary care clinic setting – protocol of referral not clear, staff management problematic	*I think the protocols are followed well at Botshabelo though, we had very good experiences. It is only unfortunately that they are out of stock. They don't compromise.* *This might be unrelated. Certain things occur commonly or you are at greater risk for it at peripheral and rural areas, especially where the houses are .. I had a patient who came in with a scorpion sting and nobody in that clinic knew how to identify whether the scorpion was poisonous or not and no one knew how to treat it. So, it is not a chronic condition and it is not lifestyle but I think it should be important that the community learns about acute emergency conditions that are relevant to the setting.* *We have had some exposure to that, I think mostly in the casualty setting, then we were there, we will see like someone with an hypertensive emergency, ….but it was not that much exposure as well because even in that setting you don't see much chronic conditions.* *Yes, I think from what I have seen, especially from what number 1 said about casualties. Casualties, there are doctors there but at clinics the sisters is impatient with emergencies even if it take four hours or eight hour to refer a patients you know that you have wrote in the patients file that you have referred.. full stop …that they should have managed that from the clinic's side. So, I feel like somethings should be put in place to equip the sisters as well working at the clinics at least to understand or kick start the management of the acute sick*	*PMSG1 No. 1* *PMSG1 No. 5* *PMSG2No. 1* *PMSG2No. 9Participants agree verbally with the statement*

			PMSG2No. 10
(*****Recurrent theme - Psychological impact	Obstacles to acute care in clinics - Lack of resources (staff, consumables) to manage emergencies/acute complications	*At Trompsburg I remember we were at a clinic, I cannot remember which clinic, but this lady came next day when we started with the doctor and then she had a DVT and nobody acted whooo.. but we all know that DVT is an emergency and this lady had presented the day before. So I think even …I don't know if there was a referral problem or a lack of insight from the sisiters side, it was clearly a DVT, so when we saw the patient it has been 24 hours and the patient was still in pain and nobody is doing anything but we all know what to do as medical students.* *So, ja we get expose but sometimes it is like not the reaction you think people would have, you know they are not on top of it …*	Participant seems anxious and distress when she shared the information Participants agree verbally with the statement PMSG2No. 4
		There is no care in the clinics, it is definitely there in casualties. It is definitely there in casualty, if I see a patient I know what to do ,what to look up even if I am not sure, but in the clinics there is none of that. *So you can sit with a big problem but if you are number 8, you will sit and wait* *One of participants: …As long as you are not bleeding out today*	Facilitator Participants agree verbally with the statement
		Well terrified actually because you have this person sitting in front of you and they have got symptoms of having a very high blood pressure and you realise that they could actually have a stroke and now you have no equipment to manage this. And I think as well we have a very lovely emergency book that I feel I am using a lot more now but that has not been emphasised enough initially … and I feel like having that emphasised earlier and have students take that with them maybe and then knowing what to do in the case of those emergencies in a primary health care setting. Like we as doctors as well, like people has mentioned already, then as a GP's you know what to have with you, what steps to follow because we have never been in that situation before *Yes, I just wanted to talk about my experience of a patient we saw .. but it was not an emergency immediately. This patient had ovarian cancer and she was in severe, severe pain and it was very bad and the pharmacy only had Tramadol as the strongest analgesia and I think also these small clinics don't have enough resources to manage emergencies sometimes.*	PMSG2 No.10 PMSG2No. 2

			It was just something that I saw at Botshebelo and I still think about it now. There was a day when a lot of patient of the HIV clinic would come in, but they are all together in one room and they all look at each other.. drawing blood for viral load and CD4 count…that for me was just pathetic, because maybe it can help in a way that you can support each other or what, what, what .. but if you think about it, there is a teenager there and the room is filled with older people who can discriminate against that person and also where is the confidentiality? Now the whole community knows that you are HIV positive.. because everyone of them, there was about fifty of them in one big room, everyone of them were there for the viral load and CD4 count.. so that was a bad experience	*PMSG1 No. 3*
			Just like no 10 has mentioned about the patients like TB patients having to go to the clinic to get their treatment, it is also sometimes for some patients at MUCPP clinic, where they come everyday and they just check that ok, you did take your medication and for those that don't come they just check that they have been given their month supply for example, I think with that it is something they are trying to do	*PMSG2No. 6*
	Exposure to ongoing management of chronic diseases of lifestyle	Interventions and control focused on communicable diseases (HIV, TB) Poor control diabetes and hypertension (Difference urban vs rural) - due to poor patient education and compliance - interventions not effective - lack of continuous care (incomplete files) Chronic management not integrated, holistic, continous health care	*I think also to answer your question, the last time I saw effective, control over a broad amount of patients, was at Trompsburg, but here (MUCPP) for every well controlled you see six uncontrolled.. so you know, so there is not really .. ja, poor control . ..* *I also agree with what number 9 said, with us when we were at the clinics, I think all the patients were out of control with regards to diabetes and hypertension.. it is a majority … many people are not either being compliant or they are not being taught properly. There is definitely something that is lacking in the system currently.* *I just want to say about that, we even, in our minds right now, a blood pressure of 155 is normal, we don't realise that, no - it is not normal, it is just common but it is not normal. So know no drugs get changed in such situation and we are pushing the blood pressure higher and higher because of a lack of control.*	*PMSG2No. 9*
			I think another thing that is happening, especially with hypertension patients, a lot of them say "no, I don't have that thing" .. why are you not taking antihypertensive medication … "no, I don't have that thing", they are also convinced that diabetes will kill them but hypertension would not, so they are ok with having hypertension or skipping a pill or two or three…for the whole week until they get like a headache and then they will say o my gosh I forgot to take my treatment so I quest again the fact that our patients are not educated and the fact that our patients does not understand what is happening to them. You know we just mention these drugs Adalat, Aldomet ….Mammy and then she don't understand it and then she just remember that she must take a green one and a white one, but then she has four white ones, so she could have been taking the same pill twice.. so ja	*PMSG2No1*
			With that, I think there will be some changes that will be made, either there is an increase in the dose of the medication but then there is not enough time to talk to patient and find out why re you not controlling, what do you think is wrong, what do you think is the problem and establish a bond with the patient. Because we at the diabetes clinic, black men have a certain stereotypical way of thinking so he is not going to come and tell us now even his male associated complications, that make him stresses out and he is actually going to have poor control again, you know all those things. It comes back to where a patient does not really trust the system and then we see that manifesting. And I feel that… I know it with my grandmother, sometimes they get scared of disappointing the doctor If they have been with the same doctor for a long time. So now our patient know it is just students who is gping to see us, they are not going to say anything. So know the glucose is 10, 15 or 20 because she knows this student is not going to deal with it today	*PMSG2No. 1*

		I also remember some of these I think it was a diabetes, hypertension clinic the patients was supposed to have this yearly follow-up forms where blood should be taken every year, it should be arranged to check their eyes, all of these things should be done yearly and then with some of the patients I could not find one in the file. For a patient I must have done it myself I look for results and the last was done in 2012 and they should actually be done every year. So, it feels that sometimes the patient maybe thinks "the doctor don't care about my diabetes, why must I care". So, they don't do the things they are supposed to do at the clinic .. it shows that..ag, it is just another thing don't worry about it and then the patient gets the same attitude.	*PMSG2No. 3* *Some participants laughs and nods heads in agreement*
		I think the ongoing management, it differs from condition to condition because like in Trompsburg for example we sat with the doctor we checked each patients blood pressure and the medication they are on. If the blood pressure is too high we adjust the medication every time, but you don't check the patients weight, once again, you don't check is the patient is losing some weight or the BMI is above 40 and it is dangerous, you just check the weight actually and you just move on.. you don't care about that at all, so it is completely condition dependent.	*PMSG1 No. 3*
	Staff shortage – different physicians - not continuous care *** Recurrent theme –staff shortage -patient load)	*I just remember we were at the clinic last year and we were only students, there was not a doctor and they just handed us these stakes of files, the prescriptions that needed to be rewritten for the next six months.. and then you don't even see the patient you just see their blood pressure is sky high and now you don't know what to do then, and they only going to see the doctor maybe in six months again. Now you must decide can you change a drug, which one do you change, should you refer them, should you not refer them and then afterwards sometimes the doctor just comes and signs even though you have told him you are a bit worried ..... so that was also bit scary and deciding should you maybe change the 12 to 25 or just do something at least*	*PMSG2 No.3*
		I think for the ongoing management, there is no insight. So we don't ..it is a lack of insight to say …this is wrong you must do this, they just repeat	*PMSG2No. 10*
(*****Recurrent theme - Psychological impact *Student emotional response to inappropriate responsibility – no supervision*		*Ok, from my side also I would like to add to what No 10 said with the fact that the patient see no 10 and then No 9 a month later and no It totally disrupt the professional relationship is disrupted. When the patient left home they say they are going to see doctor so and so and now they get to the hospital and now, why would I tell a doctor who does not know me my problems. So the complications I am experience with my hypertension or diabetes and the doctor that start today he is only interested in mommy is something wrong right now, no – ok copy what no 10 already said, you copy the script you don't verify if it is the correct script, you go for the most resent one and the most recent script is in January, right – you also you don't know who to call because that person is not there anymore…*	*PMSG2No. 9*
	Continuation of care problematic - different physicians	*Also with the chronic management of our patients, it is very difficult in our clinics, because also our patients see different doctors the whole time and sometimes you get a file and you don't know where this whole thing started. You don't know how correct the diagnosis is and it is really, really difficult. I remember we I once saw this patient , the patient dermtatomiosistis and I think the patient saw it in her file and she come to me and say to the other lady next door this thing does not go away, you have it for the rest of your life, she was very concerned. She was so confused, so ja it is very difficult because you are never sure how correct the other doctor was with the diagnosis.*	*PMSG2No. 2*
		Also with the control, nothing changes, that is disheartening to the patient, I am still on five hypertension drugs and my blood pressure is good but I must still take it. So there is no reward for the patients and lack of insight again to say, if blood pressure has control this long remove this one.	*PMSG2No. 10*

CBE AND IPE EXPERIENCE	Advantages of CBE experience	Advantages of CBE experience	Feeling of contributing important and importance of mutual benefit	*I think also just linking with what said no. 3 has said the fact that our CBE experience, it was definitely beneficial towards us and I feel also it would be nicer if it was beneficial to the patients themselves. I thought like the fact that we were there, we were just like signing those prescription forms and like …the patient did not benefit much of the time situation as well, because there were pressure on that one doctor that looked after us … ….(facilitator "them").. ja and on top of that us as well. It should actually be more beneficial to the patients themselves, not just us and saying we did our CBE, it would actually be nice if the patients also benefit.*	*PMSG2 No.8*
				Community health education actually helped us to see that we are going to see. I think the setting that we have here in Bloemfontein is a bit unrealistic for where you …unless you going to be a registrar. But for now it show us what our realities are already like.	*PMSG2No. 6*
			Help to contextualise CDL in communities Development of graduate competencies –being health activist and role models	*It is very important … CBE is very helpful, it helps us to see this is where the problem start and this is what we trying to do. What we see here at the tertiary institution is level 3 or 4 of the primary problem so it help for us to see where it starts and it is just important for us to improve primary health care, that we don't see so many complications. I think this is where it start, even in our primary….. from third year, the education has been actually lacking - we do/are being taught that but just an reinforcement of primary and preventative measures as well, that can be improved and be a lot better.*	*PMSG2No. 8*
				CBE was very helpful to us and I also learned that we must be examples to our patients and especially the sisters with regards to obesity. You see hypertension patients and diabetic patients – so we must also help our patients, we life in communities with our patients they look at us, our life style, I cannot tomorrow be there tomorrow with our patient and say don't eat that, while I was eating it..	*PMSG2No. 2*
				I completely agree with no 5 and that was something that concern me being in Trompsburg. With us being here, although our classes have been in English, it is not one of the languages spoken to most patients I have ever seen and there was a nice diabetic poster put up by the students in the clinic in Trompsburg. Like no 5 and everyone said it is completely useless because it is in a language that they do not understand and with information that they do not know how to use and it is not always applicable. It is just there because you have to make a poster, it is not applicable to their specific diet or their culture or anything.	*PMSG2 No. 4*
				And I feel that is something that surely lack in that rotation. We should have been taught some of those things…. What food is available to the patients, what are the cultural norms and teaching us conversational language that you can actually get ideas across to your patient .. without having to abandon the conversation thing…	
				I will say it is just the importance of actually us being a benefit to the patient. We don't want to just be there and say we had community based education but the patient is coming back and they still have the same problem ..and it is months ago and there still have not been an intervention.	*PMSG2 No.6*
			Need for earlier exposure to IPE in curriculum and different roles of Health Professionals	*Ja I think definitely our training with regards to other health professions is very lacking and okay I've heard that some of the others they get lectures from our lecturers for example about the effects of certain medications because occupational therapists and dieticians and physiotherapists they need to know when they are treating patients what medication. So they do get a few lectures from our lectures, not just about pharmacology, but I think we had may be one lecture in first year from the dietetic, no lectures from physiotherapy, none from occupational therapy and may be one or two from nursing and I think we could learn a lot more about when to refer what they can help us help the patient with and so on.*	*PMSG1No. 10*
				Yes when we were in Trompsburg I realise for the first time actually how important the referral system is because we had our patients we needed to visit and they have multiple problems .. musculoskeletal…endocrine.. metabolic all of those and sometimes I didn't even know where to refer someone with a problem which I could not help them with and the occupational therapists …Umm..we work with, taught us to … where we should refer the patients to and it was really fascinating how many referrals we wrote a day, it was really extraordinary actually ….	*PMSG1No. 6*

		Just continue on what no. 10 said about the inter-professional roles and things ...umm.. the IPE has really broadened my personal vision as no. 6 also mentioned, nr 6 and nodded in agreement but I think it is not enough because it focusses on so few aspects and I think it would be helpful if we could may be have lecturers from say OT and physio within each rotation that we have. Maybe just one lecturer from the Allied Health Sciences - pertains specifically to that group of patients that we are dealing with say now at Obs and Gyne for what every reason if a patient needs a referral, dietician referral or a physio referral, it would be nice in that rotation just to have one lecture from Allied Health Sciences and not from a doctor telling us this is what they do from that specific Allied Health Sciences and just ..... and it's not a lot it could be an half hour lecture where they just give a broad overview of that specific conditions and that specific patient. I think in one afternoon we could see all of the Allied Health Sciences for so that we have just a broader vision of how they are involved....	*PMSG1No. 11*
		I feel a lot of the consultations, when you follow up the chronic patients, there is a sort of monotony behind it. If the patients come in, say retroviral disease, you check the viral load and say yes it is good come back next month. There is no incentive for the patient, like you tell the patient, well done your CD4 is up, your viral load down, you are doing a good job.. . you are managing your disease ..the same with hypertension and diabetes. There is no … I want to say ..education to the patient that they are either controlling or not controlling their disease, they just come back every how many months time just for the check up. I feel that is something that is definitely lacking.	*PMSG1 No. 8*
Lack of patient education of disease control *Patient education not relevant to socioeconomic context*	*At MUCPP I definitely saw patients who were near the end of their TB regiment or who were getting their hypertension medication and were better controlled than what they were previously. I think a big problem that a lot of us had found it just the problems and the defaulting of treatment and lack of understanding is overwhelming, and so it seems to almost drown out the stuff that goes right because you almost expect it to go wrong, so you have to have plan A-Z, when something starts going wrong now what am I going to do, because it is more common to have it gone wrong than to let it go right almost.*	*PMSG2No. 4*
	I actually agree with what no 4 saying about the diet of the patient, because a lot of these posters have nice diagrams … half of your plate must be veggies and a quarter must be meat and a quarter of something else, but you are not sure if the patients have that available. So I feel eduation on what they should eat must focus on what you have and then the portion size of what you have. I think the posters cater a lot on the professionals, you think "yo it is cool", you take a photo and you read it .. even the jargon they use on the posters, it is not a laymen's jargon	*PMSG2 No. 9*
Suggestions: incorporate medical students in health dialogue to improve patient education	*Yes, I will just suggest, while the patients are waiting, there should be a medical student with someone .. and tell them "let me tell you about...." Like in Trompsburg. They just sit there and nothing is happening and someone can change their life's, the doctor said .. the doctor came to speak to me: "Ye, Ye put away that bun". Even my own mother …"No, the doctor said this, it is more effective than I have read this".*	*PMSG2 No. 10*
	I think like no 10 mentioned as well, the issue of it is very common, patients don't seems to take it very seriously, they think well, my family all have this and you just take the medication but when I try to ask some of them, "what do you think will happen if you don't take your medication or what is going to go wrong, if your sugar is too high for too long" and they don't understand why it is necessary to take the medication and I feel that is a big part of the problem like everyone has mentioned, having not time spend enough time with these patients, they don't understand. So if I did not understand, why would I take my medication and ja it is concerning because you can see where there is an issue, but again as it has been mentioned you feel powerless because you know there is a problem but there is nothing you can do about it particularly.	*PMSG2No. 4*
	We actually did that when we rotated in Trompsburg. We had a topic we talked to the patients about and we had like slides or a poster and we actually verbalized what the poster said and it was a good interaction.	*PMSG2No. 7*
Lack of physical resources (consumables to diagnose complications) *Lack of health care providers (physicians) and staff*	*I saw a patient in the clinic at Springfontein that has longstanding diabetes and hypertension and heart problems and she came in with signs and symptoms of heart failure but there was no ECG stickers in the clinic, so there is no way of checking, looking at her heart and you can't just send… Call an ambulance to come fetch the patient and she gets to the hospital but no ECG was done you have no idea what the exact condition the patient is in and now you are putting them on an ambulance … you don't know when the ambulance is coming. I think that is a big problem if something as simple and cheap as ECG stickers are not available in the clinic.*	

		Patient load (difference between urban and rural) *Incomplete patient records* *follow up adverse effect of treatment* *Updated management (new drugs)*	*Another problem which I experienced, especially in the hospitals is when a patient gets admitted and you go through their problem list then they would say, or you would see they have hypertension, which is not controlled under their current medication and then you ask them do they use their medication, do they follow up at the clinic and then they will tell you, yes they go to the clinic but there is never a doctor when they are there, there is only sisters and I mean even a qualified sister is not always qualified to prescribe certain medications or adjust the dosage of their medication to improve their disease and I know it is difficult, we have a shortage of doctors and the health staff is not always qualify to do what the doctor can do, but I think that contributes to the problem which certain patients are experiencing when following up a chronic condition.*	*PMSG1 No. 6*
			I think it easier in Trompsburg to have these system what they have, because in Trompsburg people don't really have much to do in Trompsburg…compare to Bloemfontein, people are always asking for a letter for work, or things like that, they are people on the go and also the patient load is much more than in Tompsburg. The doctor to patient ratio is a bigger ratio. Yes, I think it is easier in Trompsburg especially with all the students there at Trompsburg. This is a different vibe and you know there we spend a lot of time with a patient, here it is about finishing the clinic, get the signature and go home, but in Trompsburg we know that we are living here .. you meet the people, they are more appreciate of us, they want to know more about our personal life, it is nicer in Trompsburg it is more relaxed because of the rural environment, here it is ongoing….difficult	*PMSG2 No. 4*
			Just to support what nr 4 just said regarding the fact in Trompsburg we were able to follow up our patients, the intervention program, but at MUCPP you just walk in and there is a whole room full of patients and you cannot sit down with every patient as you would like to do…	*PMSG2 No. 8*
			I think regarding, specifically at Trompsburg and Botshabelo. One thing that was quite disheartening to me, the fact is the patients have problems they wanted to discuss with the doctor but the doctor was not there and then he would come after we have copied the script down and then he will just come to put a stamp in and I remember I telling the doctor – O doctor this patient has this and this and he said: You know what they will come with all kind of problems what they have or tell us that whole story and we understand the staff situation, the problem is that we are very understaffed, our system is very understaffed. Even though we could try to help this way but you won't get through all the patients with a thorough evaluation for every single patient. So I don't know how we are going to help unless we actually increase the number of doctors.	*PMSG2No. 8*
	Emotional distress experiencced		*With just what no 8 was saying about the doctor come and put a stamp there, it cause a problem because you know that there is a problem that needs to be fix but you can not physically fix it because you are not qualified to do anything, all you can do is to report to the doctor and when you do they just say they are coming up with stories they just want attention. So it is a bit if a problem you know.*	*PMSG2No. 6*
			Just like no 10 said now the fact that there is very little time, and then the resources as well in terms of staff is a big issue, and probably along with that is they are not entirely aware of what to check in each and every patient. So if you have a diabetes patient now, you should be checking their hypertension and there weight and give them a whole lot of advice. I think although we have the knowledge, if you are in that situation and you have 10 minutes or you are trying to get through when the whole clinic is full, you are going to start to forgetting things and became tired. I think maybe having a checklist, that we can even start to do, that you know that there is some vital things you make sure you always do and that it always get locked in the file. As if being mentioned before almost half of the information is missing and at least if you have that vitals you can see trends in patients treatment and also what you need to have a better look at and that you can focus you history or examination further on something but at least you have a starting point and you are not forgetting those important things even if you are tired.	*??? PMSG*

				I just want to say regarding like the patients and their medication. I don't think we are really taught … or we are taught the adverse effects of drugs, but you don't ask every single patient do you get muscle pains, do you get … and we don't do kidney functions for certain medications, they actually should get .. I am actually referring now to things like diabetes, hypertension, cholesterol and lifestyle diseases. I think we should emphasize on that and really ask about adverse effect of the medicine we put our patients on...And another thing with regards to patients or with follow up patients or treating patients and ongoing management, there is a lot of newer drugs actually available we don't really learn about because it is not available in the state, but are actually available in the private or in other countries, and I think we should also just try to stay updated.	*PMSG1 No. 4*
Successes	*Successful health dialogue rural*			*In terms of ongoing management, I feel like those lifestyle group therapy are aimed in terms of that. They identify the hypertensive patients or diabetic patients and they make sure that every week they come together… and lets say one of the patient this week suffered from some sort of problem, they discuss it there so that everyone gets educated together… in the sense, if I feel this, I must go to the hospital because he felt this way and he went to the clinic. So those lifestyle group in place are aimed at, I feel, on the ongoing management quite well there.*	*PMSG1 No. 2*
				Still when we were in Trompsburg, they had a diabetes lifestyle club that they actually started. So, what would happen is like they meet up, I think once every week on a Thursday and they bring along their books where they monitor their blood glucose and every time they were controlling well … there get points, there were a point system that was happening there and at the end of the whole year, we were the last group that went there, we threw them a party, type of a closing party for the year and all the people came with the points and then they converted those points into money – almost like tokens- so that they could buy something from the store…token shop and that actually motivated them to control well……	*PMSG2 No.5*
		intervention program in rural area - diabetes lifestyle group *-point and reward system*		*I think it was very good because people was controlling nicely…* *At some point things just went smooth sailing, I don't even know how, but there were actually people that did not have problems with blood glucose for a very long time .. three or four, five months and they were very happy.*	*PMSG2 No.5*
		Personal individual interaction - rural		*I think the good that I saw, was just what someone else had already mentioned at a previous question the weekly gatherings and discussions that the patients had, like we had experienced in Trompsburg, that was good because it seems that the patients was really up to control their blood sugars and control their diet properly.. that was one good thing that I saw , ye..*	*PMSG2No. 8*
				Regarding the rural, the diabetic clinic, the group that we also saw in Trompsburg because we were also part of that and then they chose, what they want to hear. . I think it makes the patient more compliant, because they feel that they are somehow more in control of their treatment… you are not just bombarding them with information over a long period of time. Instead of sitting with the patient, because we were told as a doctor when they see a patient they must counsel them about their disease but in all honesty, if I am told that I have a certain disease today and you give me all the information about the disease, the only thing I am going to remember is the diagnosis and I am going to forget everything else. So they can always looking forward to the information and they can keep growing on it and if they forget somewhere along the line we will revert back to starting with complications of diabetes. With us when we were there they wanted to know more about diet, something they have been told but you still need to reinforce it as time goes by. Even the aspect of a budget for a diabetic in their social circumstances.. so ..ja	*PMSG2 No.1*
				The more personal the interaction .. there are some clinic's , not the clinic's we are talking about now, where the nurse will come in the waiting area and assist the patient and even in Trompsburg were given the assignment of ….they can ask you direct questions and people can directly ask you.. a video will be very general and it will be very difficult with language barriers for example where you have different languages. If I can speak three different languages, I can actually communicate with those groups of patients at the same time.	*PMSG2No. 1*
		Rural vs urban intervention programs		*Our experience at MUCPP …… so my exposure was at the diabetic and HIV clinic or we had obstetrics rotations there as well … but I don't remember intervention programs.*	*PMSG2 No.8*

		- Lack in certain urban primary clinics Incomplete patient clinical observation data Lack of preventative care	I think when comparing the two, I say the system at MUCPP do the patients injustice, because a lot of them are presenting already complicated …. and then again they must refer the patients. I know the question was not asked directly to me, you asked how she feels, but I feel rather powerless because these thinks are theoretically put inplace, they are put on paper and there are protocols but they are not followed, you know. So for example you look at a patients file and then out of the 100% information that is required from the medical or personal division, 40% or 30% is charted down or if it is charted down some of it is charted wrong. It is just a great mismanagement of our patients and there is a lack of empathy in my opinion ….	PMSG2No. 5
	Pockets of excellence	Policlinic diabetes clinic	When we were rotated at policlinic B at the diabetic clinic there, each patient will come in and the sisters will know that the patient will first start that their blood pressure is taken and then The finger prick glucose is done and then they take you for the urine and do the dipstix and then they do the Snellen chart and then only the patient is seen so in some clinics there is actually some intervention that is working …… So each and every patient, you know what he finger prick glucose was, urine ok today.. they even weight the patient everytime that the patient comes.	PMSG2No. 5 A lot of participants agree
Health education		Antenatal vs other specialist clinics	I do remember at Obs and Gyne they did have dietitians and the patient that where seen on that day was taken to the back to be seen by the dietitian and they had a consultation and some of these consultations were longer than an hour. So I think in some places they are trying	PMSG2No. 3
		Patient education – patient empowerment	Just the same about those clinics, the people just decide what they want to hear next about their diseases. One week they wanted to hear about exercise and the next week we had to present to them the effect of diabetes on their eyes. …so they get to decide what they want to know. I think it helps that they are sort of friends because they are together once a week and .. uhmm I think it is just like a big support system and they are like in control of the information around them and they just want to motivate each other….and I think that is very nice.	
		Home visits: screening	What I want to say has kind of more to do with the protocol and for us as students …I know this is back tracking ….but it is just important to mention it. Within the red bag that we get to go to the clinics or where ever, there is dipstix in the bag. But we go to the rural area with this mindset .. resources are very limit, don't do things unnecessarily … I think …and we all know that in the hospital a patient comes in you do a dipstix on the patient, but especially with a home visits, you know that you are supposed to do it but then you think but resources .. so I think it should just be clarified to everyone that if you see a patient do a dipstix, no matter if there is no indication, no matter if the patient does not have symptoms or anything. I think that it should just be emphasised and I think at the lifestyle group maybe as well, patients could get a urine dipstix there. Prof I just feel that, with regards, to the chronic management of them, I feel people fall through the cracks because usually it is the older people that have diabetes and hypertension and combined and they just don't ever come back to the clinic, no one ever follows them up. They are not going to bring you, it is not like our settings here. That way I feel they are actually doing an injustice to our community. The community health workers really do help but someone got to say this person needs their medication.	PMSG1 No. 11 PMSGc1 No. 1

	Suggestion *Pt tracking system* *-involve family*	*Maybe they can keep a log book at the clinic of the patients on chronic treatments, and as much as the patients file get ticked that the patients take medication in the clinic, I think that there should be a logbook in the clinic where specific, just for that patients, to see if they come for their treatment, if they come for their follow ups. In that way you can see if a patient has not come in two months … maybe what is wrong with that patient then you can do a specific home visit for that patient and go see why didn't they come.* *I think also maybe involving the family in taking care of the patient because like no 1 said, most patients fall through the cracks but if there is a grandchild or daughter or someone who is there to ensure that grandma goes to get her high blood or anti-hypertensives then it should help, because in Trompsburg I had a lady she was 65 and she has not come to get her anti-hypertensives and the only reason she was there that day is because now she has headaches and she feels very light headed and she thinks it is because she has been stress lately so she just want to have that check out but what about her hypertension she did not have her antihypertensives for two months. So if someone else .. because most of them like number 1 mentioned are the older population and they usually take care of other people and that is what they care about, that is what they focus on. So, if the rest of the family could then be given the task to take care of them, I think that could be like a way to ensure that there is control.*	*PMSG1 No. 11* *PMSG1 No. 9*

APPENDIX P-1: Abstracts accepted for podium presentation presented at the Faculty Research Forum (29-30 August 2019 and 26-27 August 2021), hosted by the Faculty of Health Sciences, University of the Free State

A. Abstract accepted for podium presentation presented at the Faculty Research Forum: 29-30 August 2019

Title: **MULTIPLE RISK FACTORS AND INFLAMMATORY MARKERS FOR CHRONIC DISEASES OF LIFESTYLE IN URBAN AND RURAL COMMUNITIES IN THE FREE STATE**

Authors: Dr Sanet van Zyl[1], Prof Corinna M Walsh[2], Mr Francois C[3] van Rooyen and Prof G Joubert[3].

Departments: [1]*Basic Medical Sciences,* [2]*Nutrition and Dietetics,* [3]*Biostatistics*

Presenter: Sanet van Zyl

Introduction and aim: The escalating lifestyle-related prevalence of Non-Communicable Diseases (NCDs) worldwide places a significant burden on healthcare systems. Behavioural risk factors give rise to biological risks, leading to key physiological changes resulting in various chronic diseases of lifestyle (CDL). The main aim of this study was to determine the prevalence of CDL risk factors and inflammatory markers in different communities in central South Africa.

Methodology: This cross-sectional study included adults aged 25-64 years in rural Southern Free State and urban Mangaung. Socio-demographic factors, four behavioural and six metabolic risk factors as well as inflammatory biomarkers for CDL were determined.

Results: A total of 575 rural (median age: 49 years; 71% female) and 429 urban (median age: 47 years; 76% female) participants participated in the study. In total, 59.9% of rural and 52.1% of urban participants had five or more behavioural and metabolic risk factors present. Hypertension and diabetes were more prevalent amongst rural participants, with two-third of family members in both communities previously diagnosed with hypertension. In both communities, insufficient fruit and vegetable intake, alcohol use, and high blood pressure

ranked among the top five risk factors. Physical inactivity was amongst the top two reported risk factors in the urban community. Alcohol and tobacco use were significantly higher in the rural community. hsCRP, only available for rural participants, was alarmingly high, with increased levels observed in more than 80% of participants. Fibrinogen was the most prevalent inflammatory marker in both communities.
Conclusion: This study illustrated the high prevalence of multiple risk factors and differences in the CDL risk profiles in the rural and urban communities in central South Africa. This multifactorial aetiology of CDL must be considered in developing focused, tailor-made community-orientated primary care prevention and health promotion programmes.

Keywords: Non-Communicable Diseases, chronic diseases of lifestyle, lifestyle-related factors, inflammatory markers

297 words

B. Abstract accepted for podium presentation presented at the Faculty Research Forum: 26-27 August 2021

Title: **Medical students' perceptions of the chronic diseases of lifestyle curriculum and related experiences in primary health care settings in central South Africa**

Authors: Sanet van Zyl[1] Willem H Kruger[2], Corinna M Walsh[3]

Departments: [1]Basic Medical Sciences, [2]Community Health, [3]Nutrition and Dietetics

Presenter: Sanet van Zyl

Introduction and aim: Non-communicable diseases are the leading cause of death globally, with the World Health Organization projecting a significant increase, especially in developing countries. Community-based primary healthcare (PHC) forms the foundation of health care in South Africa; therefore, medical curricula need to equip future health practitioners to face the challenges of the rising burden of lifestyle-related chronic diseases in different communities. Community-based education (CBE) rotations contribute to the development of knowledge, skills, and attitudes appropriate to the challenges experienced in the primary healthcare context. The aim was to explore medical students' perceptions of the current medical curriculum and their experiences of implementing the chronic diseases of lifestyle (CDL) programmes during community-based education rotations in urban and rural PHC settings in the Free State, South Africa.

Methodology: Focus group discussions were conducted with medical students in the clinical phase of training. Using a thematic analysis approach, perceptions of the current CDL curriculum content, the relevance thereof for the PHC setting and barriers and challenges to the implementation of PHC in primary health care settings were reported.

Results: This study identified foundational chronic diseases of lifestyle content that needs to be incorporated or revisited at strategic points throughout the curriculum. Barriers and challenges that students identified included high patient load, resource constraints, lack of continuous care and a general focus on communicable diseases. Participants identified the need to contextualise educational programmes and focus on affordable, culturally acceptable, and holistic health care prevention strategies for chronic diseases of lifestyle. Participants described community-based education rotations as a positive and meaningful

experience that presents students with the opportunity to develop a range of professional attributes, competencies, and skills.

Conclusion: Specific emphasis on socio-cultural-behavioural-economic determinants throughout the CDL curriculum can enhance students' socio-cultural sensitivity and understanding of challenges experienced in urban and rural communities.

303 words

APPENDIX P-2: Abstract accepted for podium presentation presented at the Free State Research day on 8 November 2019, hosted by the Free State Department of Health and the Faculty of Health Sciences, University of the Free State

Title: **CHRONIC DISEASES OF LIFESTYLE: SIMILARITIES AND DIFFERENCES IN THE SOCIO-BEHAVIOURAL-METABOLIC RISK PROFILES OF URBAN AND RURAL COMMUNITIES IN THE FREE STATE**

Authors: S van Zyl[1], C M Walsh[2], FC van Rooyen[3], G Joubert[3]

Authors affiliation: Departments: [1]Basic Medical Science, [2]Nutrition and Dietetics, [3]Biostatistics

Presenter: Sanet van Zyl

Introduction/background*:* The escalating prevalence of lifestyle-related Non-Communicable Diseases (NCDs) worldwide places a significant burden on healthcare systems. Chronic diseases of lifestyle (CDL) are a group of chronic diseases that share similar modifiable risk factors resulting in long-term disease processes. Considering the socio-behavioural-metabolic risk profiles of communities can assist in the development of focused and effective intervention and management programmes for CDL.

***Aim*:** To determine the socio-behavioural-metabolic risk profiles of communities in central South Africa.

Methodology: This cross-sectional study included adults aged 25-64 years in rural Southern Free State and urban Mangaung. Social determinants, behavioural and metabolic risk factors as well as inflammatory biomarkers for CDL were determined.

Results: A total number of 575 rural (median age: 49 years; 71% female) and 429 urban (median age: 47 years; 76% female) participants were included in the study. A high prevalence of reported cardiometabolic diseases was observed in both communities, with reported hypertension and diabetes more prevalent among rural participants. Insufficient fruit and vegetable intake, alcohol use, and high blood pressure were among the top five risk factors in both communities. Physical inactivity ranked among the urban community's

top two risk factors, while alcohol and tobacco use were significantly higher in the rural community. Fibrinogen was the most prevalent inflammatory marker in both communities. hsCRP, only available for rural participants, was alarmingly high, with increased levels observed in more than 80% of participants.

Conclusion: This study illustrated the high prevalence of socio-behavioural-metabolic risk factors for CDL and identified distinct differences in risk profiles in rural and urban Free State communities. The CDL risk profiles of communities can assist in prioritising health needs and contribute to developing focused, tailor-made community-orientated primary health care prevention, intervention and health promotion programmes.

Word count: 297

APPENDIX P-3: Abstract accepted for a poster presentation presented at the South African Association of Health Educationalists (SAAHEE) virtual conference (21-24 June 2021).

(SAAHEE 2021 AWARDS: One of three commended poster presentations)

Medical students' perceptions of the chronic diseases of lifestyle curriculum and related experiences in primary health care settings in central South Africa

Van Zyl S [1], Kruger W [2], Walsh C [3]

Authors affiliation: Departments: [1]Basic Medical Sciences, [2]Community Health, Nutrition and [3]Dietetics

Presenter: Sanet van Zyl

Introduction: Non-communicable diseases (NCDs), also called chronic diseases (CDs), are the leading cause of death globally. The World Health Organization projects a significant increase in CDs, especially in developing countries. Community-based primary health care (PHC) forms the foundation of health care in South Africa; therefore, medical curricula should equip future health practitioners to face the challenges of the rising burden of CDs. Community-based education (CBE) rotations develop knowledge, skills, and attitudes appropriate to the challenges experienced in the PHC context. This study aimed to explore medical students' perceptions of the current chronic diseases of lifestyle (CDL) curriculum at the University of the Free State and the related experiences during CBE rotations in PHC settings.

Methodology: Focus group discussions were conducted with medical students of the Faculty of Health Sciences. Using a thematic analysis approach, participants' perceptions of the current CDL curriculum content, the relevance thereof for the PHC setting, and observations of existing barriers and challenges to implementing PHC programmes in urban and rural PHC settings were reported.

Results: This study identified foundational CDL content that must be incorporated or revisited at strategic points throughout the curriculum. The essential connection between

foundational knowledge and its application should be enhanced in the real-world setting. Participants identified barriers and challenges experienced in rural and urban PHC settings, including inadequate resources, high patient load, staff shortages, and a general focus on communicable diseases.

Discussion: Participants described CBE rotations as a positive and meaningful experience that presents the opportunity to develop various professional attributes, competencies, and skills. Participants identified the need to contextualise educational programmes and focus on affordable, culturally acceptable, and holistic health care strategies.

Take home message: Specific emphasis on socio-cultural-behavioural-economic determinants throughout the CDL curriculum can enhance socio-cultural sensitivity and understanding of different challenges experienced in urban and rural communities.

Word count: 300

APPENDIX P-4: Article 1 published in Frontiers in Public Health, 20 October 2020

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A Comparison of the Socio-Behavioral-Metabolic Risk Profiles and Associated Factors for Chronic Diseases of Lifestyle in Urban and Rural Communities in Central South Africa

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Background: The global escalating prevalence of lifestyle-related non-communicable diseases places a significant burden on health systems. Chronic diseases of lifestyle (CDL) are a group of diseases that share similar modifiable risk factors that can result in long-term disease processes. Considering the socio-behavioral-metabolic risk profiles of communities and risk factors predictive of the presence of CDL can assist in the development of focused and effective community-based prevention, intervention, and treatment programs for CDL.

Aim: To determine the socio-behavioral-metabolic risk profiles and identify associated factors for the following CDL: obesity, cardiovascular disease, hypertension, and type 2 diabetes mellitus in rural and urban communities in central South Africa.

Methodology: This cross-sectional study included adults aged 25–65 years in the rural Southern Free State and urban Mangaung. Social determinants, behavioral and metabolic risk factors, and inflammatory biomarkers for CDL were determined.

Results: In total, 575 rural (mean age: 42 years; 71% female) and 429 urban (mean age: 44 years; 76% female) participants were included in the study. More than 20% of participants in both communities reported being previously diagnosed with cardiovascular diseases; with reported hypertension and diabetes mellitus more prevalent among rural participants. Insufficient intake of fruit and vegetables, alcohol use, and high blood pressure were among the top five risk factors in both communities. Physical inactivity ranked among the top two risk factors in the urban community; while alcohol and tobacco use was significantly higher in the rural community. Fibrinogen was the most prevalent inflammatory marker in both communities (32.9 rural vs. 48.3% urban). High sensitivity C-reactive protein (Hs-CRP), only available for rural participants, was high with increased levels in more than 80% of participants. In both communities,

being female, having high blood pressure and increased fibrinogen levels were associated with obesity.

Conclusion: This study illustrated the high prevalence of socio-behavioral-metabolic risk factors for CDL, and identified similarities and distinct differences in the risk profiles of rural and urban communities. Considering the CDL risk profiles of communities can assist in prioritizing health needs and contribute to the development of tailor-made community-based primary health care prevention, intervention, and health promotion programs.

Keywords: non-communicable diseases (NCDs), chronic diseases of lifestyle (CDL), socio-behavioral-metabolic risk profiles, obesity, cardiovascular disease, hypertension, type 2 diabetes mellitus, community-based primary health care prevention

INTRODUCTION

Non-communicable diseases (NCDs), also called chronic diseases, are a group of conditions that account for millions of deaths globally each year (1). Current projections indicate a significant rise in NCDs among the ranks of the top 10 leading global causes of death by 2040, with NCDs mortality projected to be the leading cause of death in the African region by 2030 (2, 3). The World Health Organization's (WHO) country-specific profiles for NCDs (3) illustrate the escalating prevalence of modifiable lifestyle/behavioral risk factors in South Africa, that can lead to physiological and metabolic changes (obesity, high blood pressure, hyperglycemia, and hyperlipidemia) and result in chronic diseases of lifestyle (CDL), including hypertension, chronic lung diseases, cancer, and diabetes.

An increasing number of studies show strong evidence of the integral role that socio-demographic or background risk factors play in the multifactorial etiology of CDL, especially in developing countries. Moving from the conventional biomedical approach, to a holistic biopsychosocial approach that considers socio-demographic determinants, such as population aging and growth, low levels of education, poverty, inequitable access to health care, rapid urbanization, and adoption of a more westernized lifestyle, is required to address the escalating burden of CDL (1, 4–6).

In recent years, attention has also shifted from focusing only on adult lifestyle-related risk factors as a cause for maintaining the risk cycle for CDL to adopting a life-course approach that acknowledges the influence of early life experiences on adult health and mortality. It has become clear that chronic low-grade systemic inflammation is the root cause of many chronic diseases with evidence proposing links between early adversity (e.g., an unfavorable early environment), impairment of immune status, and susceptibility to CDL later in life (7, 8). The chronic low-grade inflammatory state is characterized by increased levels of inflammatory biomarkers that reflect inflammatory load, for example; high sensitivity C-reactive protein (Hs-CRP), fibrinogen, high density lipoprotein (HDL), white blood cells (WBC), and cortisol (9–12). Lifestyle interventions, including exercise, healthy diet, and sleep patterns, managing stress and a focus on overall well-being, may have multiple anti-inflammatory effects, including favorable long-term changes in biomarkers of inflammation that may lower the risk of CDL (4, 13). Health care professionals are encouraged to advocate for an anti-inflammatory lifestyle and purposefully address it at patient, community, and national levels to improve the health and well-being of populations (4).

The National Development Plan (NDP) 2015–2020 of the South African Department of Health, focuses on nine long-term health goals to improve the health and well-being of the South African population and to strengthen health systems (14). One of the envisioned goals is a significant reduction in the prevalence of chronic diseases in South Africa by 2030. Primary health care facilities are the first point of contact with health services. In South Africa, these facilities are dominated by lifestyle-related chronic diseases that create a significant burden on health systems, with hypertension and type 2 diabetes mellitus ranked first and fourth, respectively, on the list of the top 25 diagnoses made at primary health care facilities (15). Mayosi et al. (5) highlighted the escalating burden and emerging differences in CDL profiles in rural and urban communities in South Africa, and the need for improved community-based health promotion and care.

Assessing and understanding the health needs of different communities can contribute to focused, targeted primary health care prevention, intervention, and treatment programs for CDL in resource-constrained settings, and support the vision of the NDP to reduce the prevalence of chronic diseases in South Africa. Detailed information relating to the multifactorial risk profile and factors maintaining the risk cycle for CDL in rural and urban communities in the Free State, South Africa are still limited and therefore this study was envisioned. The study aimed to determine the socio-behavioral-metabolic risk profiles and inflammatory markers, and to identify clusters of associated risk factors for the following CDLs: obesity, cardiovascular disease (CVD), hypertension, and type 2 diabetes mellitus with CDL in rural and urban communities in the Free State.

Abbreviations: CDL, chronic diseases of lifestyle; CVD, cardiovascular disease; Hs-CRP, high sensitivity C-reactive protein; NCD, non-communicable disease; NDP, national development plan; PAL, physical activity level.

METHODS

Study Design, Population, and Sampling

This cross-sectional epidemiological study formed part of the "Assuring Health for All" in the Free State (AHA FS) research study that investigated how living in rural and urban areas affects a person's lifestyle, health, and well-being. The study was conducted in two community service delivery sites of the University of the Free State. The rural part of the study was conducted in the southern Free State district of Xhariep in the rural towns of Springfontein, Trompsburg, and Phillippolis that form part of the service area of the Free State Rural Development Partnership Programme (FSRDPP). Adult members, aged 25 to 64 years, from households (formal plots and squatter households) in surrounding township areas of the three rural towns were eligible to participate in the study. Trained field workers visited all eligible households in these areas to explain the purpose of the study and recruit participants for the study. The urban part of the study was conducted in the service area of the Mangaung University Community Partnership Programme (MUCPP) clinic and a stratified proportional cluster sample of the communities in this service area was selected for the study. After determining the number of plots in the MUCPP service area using a municipal map a stratified proportional cluster sample, stratified by area and formal plots and squatter households in open areas, were done. After selecting X and Y coordinates randomly, 100 starting points were selected and from each starting point five adjacent households were approached by field workers and informed about the study. In each household all adult household members (25–64 years) were eligible to participate in the study. Trained field workers visited all eligible households to explain the purpose of the study and recruit participants for the study.

Data Collection Procedures and Laboratory Analysis

Data collection took place in community halls in the three rural towns of the Free State for the rural part of the study and in the MUCPP clinic for the urban part of the study. All participants were interviewed to complete questionnaires related to household socio-demographic, individual health, physical activity, and diet information. Language interpreters for Sesotho, Setswana, and isiXhosa-speaking participants assisted the researcher, where necessary. Senior dietetic students, under the supervision of lecturers from the Department of Nutrition and Dietetics at the University of the Free State (UFS), interviewed the participants and completed the questionnaires that focused on household socio-demographic information (e.g., age, gender, level of education, employment status, experienced stress) and health information that included lifestyle-related risk factors, family, and medication history.

Assessment of physical activity included a 24-h recall of all physical activities performed during the previous day, which included information on the time spent doing vigorous physical activity, moderate physical activity, walking activity, and sedentary periods. Frequency of activities that was not undertaken every day (e.g., gardening) was also determined. Using this information, the researchers calculated the physical activity level (PAL) for each participant, which were classified as: sedentary 1–1.39 PAL, low activity 1.4–1.59 PAL, active 1.6–1.89 PAL, and very active 1.9–2.5 PAL (16).

Anthropometric measurements were taken according to standard WHO procedures and included weight in kilograms (kg), height in centimeters (cm), and waist circumference (cm). Weight was determined using a Seca® (Germany) digital electronic foot scale, with participants in examination gowns, without shoes. Anthropometric indices included body mass index (BMI) (weight in [kg] divided by the square of the standing height [m^2]), with overweight classified as a BMI $\geq$ 25 kg/m^2 and obesity a BMI of $\geq$ 30 kg/m^2 (17). The cut-off point for central obesity was a waist circumference of $\geq$88 cm in women and $\geq$ 102 cm in men (18).

In addition to anthropometric assessment, medical examinations were conducted by qualified medical professionals from the Department of Basic Medical Sciences of the Faculty of Health Sciences, UFS. Participants with urgent medical conditions were referred on the day of the medical examination, and participants could obtain results of biochemical tests and referral letters (where necessary) during follow-up visits. Blood pressure was measured during the clinical examination in the supine position with a DS-175, auto-inflate electronic blood pressure monitor (Nissei, Japan). Hypertension was defined as a systolic blood pressure of 140 mmHg or higher and/or a diastolic pressure of 90 mmHg or higher (19).

Fasting blood samples were obtained to determine biomedical risk factors as well as inflammatory markers. All analyses were performed by an accredited laboratory. Serum and plasma samples were prepared in the laboratory according to standard methods and stored at −80°C until analyses were performed. Complete full blood counts were performed using the Roche Sysmex XT 2000i analyzer® (Sysmex Sverige, Kungsbacka, Telefon). Blood specimens for the measurement of fasting venous plasma glucose were drawn into fluoride tubes. Samples were centrifuged within 4 h and fasting venous plasma glucose was measured using the glucose oxidase method on a Beckman LX20® auto-analyzer (Beckman Coulter, Fullerton, CA. Diabetes mellitus was defined as fasting plasma glucose value $\geq$ 7.0 mmol/L [126 mg/dl] and HbA1c levels were defined as prediabetes: 5.7–6.4% (39–47 mmol/mol) and diabetes: 6.5% or higher (48 mmol/mol or higher) (20, 21).

Fasting serum lipid levels were measured using enzymatic assay kits on a Beckman LX20® auto-analyzer (Beckman Coulter, Fullerton, CA). Raised blood lipids were defined as total cholesterol $\geq$ 200 mg/dl (5.2 mmol/l); low-density lipoprotein (LDL) cholesterol $\geq$ 100 mg/dl (2.59 mmol/L); triglycerides $\geq$ 150 mg/dl (1.7 mmol/L). Hs-CRP results were categorized as low risk: <1.0 mg/L, average risk (1.0–3.0 mg/L) or high risk (>3.0 mg/L) levels, as indicated by the American Heart Association and US Centers for Disease Control and Prevention recommendations (22). Raised total leucocytes was defined as $\geq$9.88 $\times$ 10^9/L; fibrinogen $\geq$ 290 mg/dl. The ratio of NLR was determined with normal value ranging between 0.78 and 3.53 (23, 24).

Statistical Analysis

Data were statistically analyzed by the Department of Biostatistics, UFS, using frequencies and percentages for categorical variables and means for numerical variables. Comparisons between rural and urban participants were done using contingency tables with chi-squared or Fisher's exact tests as appropriate. A level of significance was accepted as a two-tailed P-value < 0.05.

To identify factors for CDL, logistic regression models with each potential risk factor, age, and gender were fitted. Risk factors with P-value < 0.15 were included in the stepwise logistic regression models to identify significant associated risk factors. Stepwise logistic regression starting with all variables included in the model (i.e., backward elimination) was performed, using $P = 0.05$ as threshold for entry and exit. If a variable with multiple missings was not significant in the model, the model was run again excluding that variable. Odds ratios (OR) and 95% confidence intervals (95% CI) were used to present risk factors identified through this process for the following: CDL; obesity, hypertension, diabetes, and CVDs. Obesity was defined as a BMI of ≥ 30 kg/m^2; hypertension as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg) or on medication to lower blood pressure; and diabetes mellitus as fasting plasma glucose value ≥ 7.0 mmol/L or with a history of diagnosis of diabetes. Reported history of CVDs included stroke, heart disease, angina, heart attack, and heart failure.

The socio-behavioral-metabolic risk factors and inflammatory biomarkers categorized and defined below were considered for inclusion in the univariate logistic regression models. Variables which were significant in the different models were selected and considered for the final multivariate logistic regression models.

Behavioral risk factors were defined as:

Physically inactivity (level 1: sedentary—<60 min of moderate to vigorous-intensity activity daily, and level 2: low activity—<150 min of moderate-intensity activity per week); unhealthy diet (insufficient intake of fruit and vegetables/low consumption of fruits and vegetables defined as a consumption of <5 total servings [400 g] of fruit and vegetables per day); tobacco use (currently smoke and formerly smoked); alcohol use (currently and formerly used).

Metabolic risk factors with categorical cut points were defined as follows:

Raised blood glucose (fasting plasma glucose value ≥ 7.0 mmol/L [126 mg/dl]); HbA1c (diabetic: 6.5% or higher [48 mmol/mol or higher]); high blood pressure (elevated systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg); overweight (BMI ≥ 25 kg/m^2) and obesity (≥ 30 kg/m^2); increased waist circumference (men ≥ 102 cm [high risk]; women $\geq$ 88 cm [high risk]); raised blood lipids (total cholesterol ≥ 200 mg/dl [5.2 mmol/L]); LDL cholesterol $\geq$ 100 mg/dl (2.59 mmol/L); triglycerides ≥ 150 mg/dl (1.7 mmol/L).

Inflammatory biomarkers with categorical cut points were defined as follows:

Hs-CRP: average risk (1.0–3.0 mg/L) or high risk (>3.0 mg/L); total leucocytes (>9.88 $\times$ 10^9/L); NLR $\geq$ 3.35; fibrinogen $\geq$ 290 mg/dl.

Ethical Considerations

Ethics approval to conduct the AHA-FS study was obtained from the Ethics Committee of the Faculty of Health Sciences (UFS-ETOVS number 21/07), the Health Sciences Research Ethics Committee (HSREC) of UFS (UFS-HSD2017/1435), the Free State Department of Health and local municipalities before commencement of the study. In all communities, trained field workers recruited participants during home visits and the research team explained the project to participants before written informed consent was obtained from each participant.

RESULTS

Study Population

A total number of 1,004 (575 rural and 429 urban) participants, between 25 and 65 years adhered to the study criteria and were included in the study. The mean age of the rural and urban participants was 47.2 years (71% females) and 44.4 years (76% females), respectively.

Socio-Demographic Characteristics and Background Risk Factors of Study Participants

Results obtained through socio-demographic questionnaires, summarized in **Table 1**, revealed that a higher percentage of urban (19.9) vs. rural (15.4%) participants completed grade 11–12 at school level. Reported unemployment status was higher in the urban community (54.8%) than the rural community (24.2%). While 31.0% of urban participants reported that they experienced permanent stress, only 9.0% of rural participants reported similar levels of stress. Results obtained through individual health questionnaires are summarized in **Table 1**, indicated the high prevalence of hypertension, diabetes mellitus, and CDVs among rural and urban participants and their family members.

A large percentage of rural and urban participants (63.1 and 48.2%, respectively) reported having hypertension themselves, with just over 60% of participants in both study groups reporting a family history of hypertension. Self-reported diabetes mellitus was higher in the rural than urban (11.0 vs. 7.4%) participants, with more than a quarter of participants (26.0 rural and 33.1% urban) reporting a family history of diabetes mellitus. Twenty-four percent and 26.7% of rural and urban participants, respectively, reported being previously diagnosed with CVDs (stroke, heart disease, angina, heart attack and heart failure) and a high reported family history was also observed among both study populations (rural 41.3 and urban 52.1%).

The high prevalence of behavioral and metabolic risk factors among the rural and urban study populations are illustrated in **Table 2**. Significant differences between rural and urban participants were observed in tobacco use ($P < 0.01$), alcohol use ($P < 0.01$), PAL ($P < 0.01$), total cholesterol levels ($P < 0.01$), and high blood pressure ($P < 0.01$). The different behavioral and metabolic risk factors were ranked, and **Table 3** illustrates distinct differences between the risk profiles of rural and urban communities. Insufficient intake of fruit and vegetables was the

TABLE 1 | Reported socio-demographic/background risk factors of rural and urban participants.

Risk factor	Rural			Urban			*P*-value for % difference
	N	*n*	%	*N*	*n*	%	
Age	**575**			**429**			<0.01
25–29 years		34	5.9		51	11.9	
30–34 years		52	9.0		37	8.6	
35–39 years		67	11.7		64	14.9	
40–44 years		80	13.9		58	13.5	
45–54 years		158	27.5		125	29.2	
55–65 years		184	32.0		94	21.9	
Gender	**575**			**429**			0.08
Men		167	29.0		103	24.0	
Women		408	71.0		326	76.0	
Marital status	**546**			**403**			<0.01
Never married		110	20.1		137	34.0	
Married/Traditional marriage		182	33.3		120	29.8	
Living with a partner		73	13.4		40	9.9	
Widowed		104	19.1		58	14.4	
Separated		55	10.1		18	4.5	
Divorced		21	3.8		29	7.2	
Other		1	0.2		1	0.3	
Medical history							
Previously diagnosed with diabetes mellitus	**547**	60	11.0	**405**	30	7.4	0.06
Previously diagnosed with hypertension	**548**	346	63.1	**405**	195	48.2	<0.01
Previously diagnosed with the following CDVs:							
Stroke	**549**	36	6.6	**405**	21	5.2	0.33
Heart disease, angina, heart attack	**545**	88	16.2	**405**	68	16.8	0.79
Heart failure	**549**	6	1.1	**405**	19	4.7	<0.01
Family history							
Member previously diagnosed with diabetes mellitus	**548**	145	26.6	**405**	134	33.1	0.03
Member previously diagnosed with hypertension	**544**	333	61.2	**405**	251	62.0	0.81
Member previously diagnosed with the following CDVs:							
Stroke	**543**	84	15.5	**405**	78	19.3	0.12
Heart disease, angina, heart attack	**542**	107	19.8	**405**	107	26.4	0.01
Heart failure	**546**	33	6.0	**405**	26	6.4	0.81
Level of education	**550**			**416**			<0.01
None		144	26.2		76	18.3	
Primary school education		173	31.5		153	36.8	
Secondary school education:							
Grade 8–10		145	26.4		100	24.0	
Grade 11–12		85	15.5		84	20.2	
Tertiary education		3	0.6		3	0.7	
Employment status	**575**			**429**			<0.01
Housewife by choice		14	2.4		3	0.7	
Unemployed		139	24.2		235	54.8	
Self-employed		9	1.6		4	0.9	
Full-time wage earner (receive a salary)		42	7.3		21	4.9	
Other (part-time job, piece job)		371	64.5		166	38.7	
Experienced stress	**539**			**405**			<0.01
Never		173	32.1		54	13.3	
Few periods of stress		173	32.1		129	31.9	
Several periods of stress		145	26.9		96	23.7	
Permanent stress		48	8.9		126	31.1	

CDV, cardiovascular disease; N, number of participants.

TABLE 2 | Summary of behavioral, metabolic and inflammatory risk factors of rural and urban participants.

Risk factor	Parameter	Rural			Urban			*P*-value for % difference
		N	*n*	%	*N*	*n*	%	
		575			429			
BEHAVIORAL RISK FACTORS								
Tobacco use	Currently smoke & formerly smoked	548	322	58.8	405	130	32.1	<0.01
Insufficient intake of fruit and vegetables	Consumption <5 servings (400 g) of fruit and vegetables per day	550	530	96.4	418	410	98.1	0.11
Alcohol use	Currently intake and formerly used	548	437	80.0	404	219	54.2	<0.01
Physical inactivity	Level 1 (i.e., sedentary: <60 min of moderate to vigorous-intensity activity daily) and Level 2 (i.e., low activity: <150 min of moderate-intensity activity per week)	550	150	27.3	415	276	66.5	<0.01
METABOLIC RISK FACTORS								
Elevated blood lipids (total cholesterol)	High risk: ≥240 mg/dl (≥6.22 mmol/L)	552	75	14.2	415	17	4.1	< 0.01
High blood glucose	≥7.0 mmol/L (126 mg/dl)	544	43	7.9	411	18	4.4	0.03
HbA1c	Diabetes: 6.5% or higher (48 mmol/mol or higher)	548	53	9.7	415	25	6.0	0.04
High blood pressure	Systolic blood pressure of 140 mmHg or higher and/or a diastolic pressure of 90 mmHg or higher	563	382	67.9	413	235	56.9	<0.01
Body mass index	Overweight and obese BMI ≥25.00	555	295	53.2	419	227	54.2	0.75
Waist circumference	Men ≥ 102 cm (high risk)/Women ≥ 88 cm (high risk)	547	323	59.1	418	223	53.4	0.08
INFLAMMATORY RISK FACTORS								
Total leucocytes	(>9.88 × 10^9/L)	543	71	13.1	417	18	4.3	<0.01
Neutrophils	(>7.5 × 10^9/L)	544	25	4.6	417	6	1.4	0.01
Lymphocytes	(>4.0 × 10^9/L)	544	4	7.7	417	7	1.7	<0.01
Monocytes	(>1.8 × 10^9/L)	543	35	6.5	417	25	6.0	0.78
Neutrophil:lymphocyte ratio	≥3.53	543	29	5.3	417	17	4.1	0.36
Fibrinogen	≥290 mg/dl	520	171	32.9	389	188	48.3	<0.01

leading risk factor in both communities. Tobacco and alcohol use ranked higher in the rural community. Physical inactivity ranked among the top two risk factors in the urban community followed by high blood pressure. More than half of participants in both communities were either overweight or obese.

The number of risk factors in the two populations were calculated and illustrated in **Figure 1**. Due to the presence of missing information it was decided to include all participants with information for seven or more of the 10 behavioral and metabolic risk factors in the calculations. Of the 575 rural participants, the data of 561 were included and of the 429 urban participants, the data of 420 were included (**Table 3**). For participants with information for 7, 8 or 9 of the risk factors, the number of risk factors present were calculated proportional to the number of risk factors with known information and rounded down to a value between 0 and 10. For example 1 risk factor present out of 7 with known information was calculated as 1/7*10 = 1.4 and reported as 1.

Markers of inflammation are summarized in **Table 2**. Hs-CRP results (average risk: 1.0–3.0 mg/L and high risk: >3.0 mg/L) were only available for rural participants, with average and high levels observed in 88.5% of rural participants. Fibrinogen was the most prevalent inflammatory marker in both communities with 32.9% of rural participants and 48.3% of urban participants having elevated levels. Significant differences for total leucocytes ($P < 0.01$), lymphocytes ($P < 0.01$), and fibrinogen ($P < 0.01$) were observed between rural and urban participants, with more rural participants presenting with elevated leucocytes (13.1 rural vs. 4.3% urban) and lymphocytes (7.7 rural vs. 1.7% urban) and more urban participants with elevated fibrinogen. The least prevalent inflammatory marker in both communities was elevated neutrophils (4.6 rural vs. 1.4% urban).

In addition to the comparison of the socio-behavioral-metabolic risk factors and inflammatory biomarkers for CDL in rural and urban participants, univariate analysis was performed to identify risk factors associated with obesity, hypertension, diabetes, and CVDs, results are illustrated in **Table 4**. The number of participants excluded due to missing values include 20 rural and 17 urban participants for obesity, 9 rural and 7 urban participants for hypertension, 29 rural and 17

TABLE 3 | Ranked behavioral and metabolic risk factors of rural and urban participants.

Rural	Percentage (%)	Ranking	Percentage (%)	Urban
Insufficient intake of fruit and vegetables	96.4	**1**	98.1	Insufficient intake of fruit and vegetables
Alcohol use	80.0	**2**	66.5	Physical inactivity
High blood pressure	67.9	**3**	56.9	High blood pressure
Increased waist circumference	59.1	**4**	54.2	Alcohol use
Tobacco use	58.8	**5**	54.2	Body mass index
Body mass index	53.2	**6**	53.4	Increased waist circumference
Physical inactivity	27.3	**7**	32.1	Tobacco use
Elevated blood lipid levels	14.2	**8**	6.0	Elevated HbA1c levels
Elevated HbA1c levels	9.7	**9**	4.4	Elevated blood glucose levels
Elevated blood glucose levels	7.9	**10**	4.1	Elevated blood lipid levels

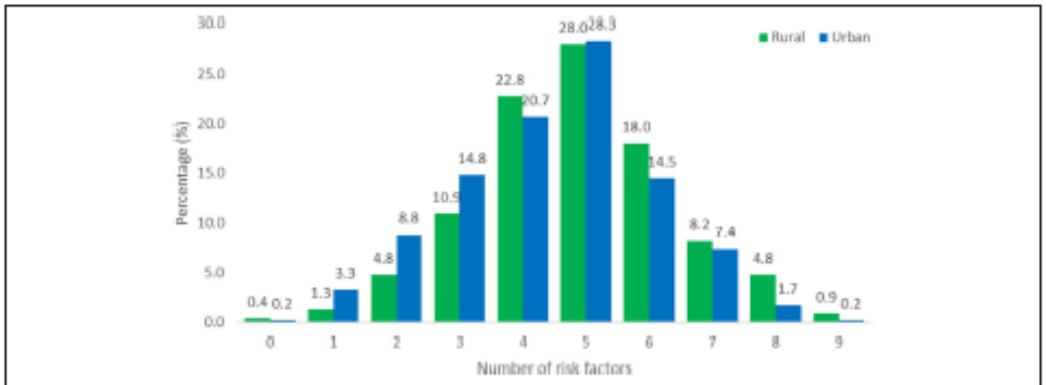

FIGURE 1 | Total number of behavioral and metabolic risk factors for rural ($N = 561$) and urban ($N = 420$) participants. The data of 14 rural participants and 9 urban participants were incomplete.

urban for diabetes, 26 rural and 24 urban participants for cardiovascular disease.

Results of the multivariate logistic regression models are indicated in **Table 5**.

Multivariate logistic regression analysis showed that in the rural sample, being female, having high blood pressure, increased triglycerides, and increased levels of the inflammatory biomarkers Hs-CRP and fibrinogen were positively associated with **obesity**. In the urban sample, being female, having high blood pressure, high blood glucose, and fibrinogen levels were positively associated with being obese. As expected, smoking was negatively associated with obesity in rural (OR 0.25; $P < 0.01$) and urban (OR 0.42; $P < 0.01$). Age advancement was associated with the presence of **hypertension** in both rural and urban areas. The probability of having hypertension in the rural area was higher with increased reported stress levels, while high HbA1c levels increased the odds of having hypertension 10.40 (95% CI 1.37;78.98) times. In this sample, residing in an urban area, being overweight and obese were positively associated with the presence of hypertension.

In this study, adults living in an urban area had increased odds of **diabetes mellitus** with increased age; while increased waist circumference was positively associated with diabetes mellitus in rural (OR 4.10; $P < 0.01$) areas. Based on the OR, adults living in a rural area, with a sedentary/low activity lifestyle, increased triglycerides, and leucocytes had increased odds of having diabetes. Adults residing in a rural area, with no education were almost three times (OR 2.9, 95% CI 1.34; 6.30) more likely to have **CVDs**; in terms of the association between CVD and levels of stress, results were unexpected. Possible reasons for this will be included in the discussion. Urban participants with hypertension (OR 2.84, 95% CI 1.39; 5.78), elevated glucose (OR 2.24, 95% CI 1.03; 4.88), and leucocytes (OR 3.17, 95% CI 1.09; 9.21) were more likely to have CVDs.

DISCUSSION

Statistics South Africa (Stats SA) has reported an increase in deaths due to cardiovascular diseases since 2009 in South Africa, with the highest percentage of these deaths (57.4%) observed in 2016 (25). At that time, hypertension (ranked third),

TABLE 4 | Significance of individual risk factors for chronic diseases of lifestyle (CDL).

	Obesity		Hypertension		Diabetes		Cardiovascular diseases	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
SOCIO-DEMOGRAPHIC/BACKGROUND RISK FACTORS								
Age	0.56	**0.04**	**<0.01**	**<0.01**	**0.03**	**0.01**	**0.06**	**0.03**
Gender	**0.01**	**<0.01**	0.15	**0.02**	0.66	0.64	0.40	0.64
Level of education	**<0.01**	**0.06**	0.38	0.99	0.55	0.32	**0.09**	0.76
Experienced stress	0.23	0.26	**0.02**	0.42	0.53	0.32	**<0.01**	**<0.01**
BEHAVIORAL RISK FACTORS								
Physically inactivity	0.66	0.80	0.54	**0.07**	**0.03**	0.95	0.19	0.43
Unhealthy diet	0.56	0.86	0.30	0.92	**0.01**	**0.06**	0.24	0.55
Tobacco use	**<0.01**	**<0.01**	0.97	0.84	**0.01**	**<0.01**	**0.07**	0.62
Alcohol use	**0.01**	0.25	0.90	0.66	**0.06**	**0.06**	0.58	**0.12**
METABOLIC RISK FACTORS								
Raised fasting blood glucose	**<0.01**	**<0.01**	**0.13**	**0.03**	-	-	0.78	**0.04**
HbA1c	**<0.01**	0.98	**0.03**	0.17	**<0.01**	**<0.01**	**0.14**	**0.27**
High blood pressure	**0.01**	**<0.01**	-	-	0.15	**0.03**	0.26	**<0.01**
Overweight and obesity	-	-	**0.01**	**<0.01**	**<0.01**	**<0.01**	0.41	0.34
Increased waist circumference	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**0.01**	0.26	0.21
Raised total cholesterol	0.92	0.45	**0.04**	0.16	0.23	0.97	0.19	0.64
LDL cholesterol	**0.09**	**0.07**	0.29	0.25	0.48	0.73	0.21	0.81
Triglycerides	**<0.01**	0.57	**0.14**	**0.04**	**0.01**	0.62	0.91	0.17
INFLAMMATORY BIOMARKERS								
Hs-CRP	**<0.01**	ND	0.47	ND	0.23	ND	0.65	ND
Leucocytes	0.52	0.17	0.45	0.61	**0.06**	0.77	0.41	**0.04**
Neutrophil	0.58	0.19	0.83	0.39	0.42	0.48	0.25	**0.09**
Neutrophil-lymphocyte ratio	**<0.01**	0.71	0.89	0.57	0.17	0.80	0.43	0.97
Fibrinogen	**<0.01**	**<0.01**	0.94	0.78	0.26	0.16	0.21	0.27

Risk factors with p-value <0.15 were included in the stepwise logistic regression models to identify significant (p-value <0.05) associated risk factors as displayed in **Table 5**.
Note missing values: Obesity (rural 20, urban 17); Hypertension (rural 9, urban 7), Diabetes (rural 29, urban 17), Cardiovascular disease (rural 26, urban 24).
ND, not done.

cerebrovascular disease (fourth), and diabetes mellitus (fifth) were among the 10 leading underlying natural causes of death in the Free State province. The social determinants of health and diseases cannot be ignored when looking at the mentioned deaths as studies concluded that the risk factors included several societal factors (26, 27). Identifying and addressing the major social determinants of health, forms an integral part of the South African National Department of Health's Primary Health Care Re-engineering Strategy (28). This study observed distinct differences between social determinants of CDL in rural and urban communities in the Free State. Although a higher percentage of urban participants had completed secondary school education, reported unemployment status was higher in the urban study population (54.8%) than in the rural group (24.2%). Almost a third of urban participants vs. 9% of rural participants reported that they experienced permanent stress which may be related to unemployment status.

The high prevalence of reported cardio-metabolic diseases among rural and urban participants and their family members in this study illustrated the intra- and intergenerational burden of CDL in these communities. Although prevalence of chronic diseases was high in both groups, a higher percentage of rural participants reported being diagnosed with hypertension and diabetes. The findings of the present study are supported by those reported in the South African National Health and Nutrition Examination Survey (SANHANES) by Shisana et al. (29), who showed that at that time the Free State province had the highest prevalence of self-reported high blood pressure (45.8%), high blood sugar (26.7%), heart disease (28.7%), and stroke (14.5%), with an increase in self-reported high blood pressure and stroke observed between 2003 and 2012. The findings of the current study further highlight important urban and rural differences.

A study undertaken among older adults from 2007 to 2010 in six low- and middle-income countries (China, Ghana, India, Mexico, Russian Federation and South Africa) by Wu et al. (30) ranked seven risk factors for CDL (inadequate vegetable and fruit intake, low PALs, smoking, frequent alcohol use, high blood pressure, obesity, central obesity) and revealed that South Africa had the highest prevalence for low PALs (59.7%) and obesity (45.2%) across the six countries. Similarly, the present study revealed that insufficient intake of fruit and vegetables was the leading risk factor for CDL in both the urban and rural study populations. The high prevalence of food insecurity in the study population may have been responsible for this, with 73.2

TABLE 5 | Significant socio-behavioral-metabolic risk factors, inflammatory biomarkers associated with the presence of obesity, cardiovascular disease, hypertension, and diabetes mellitus in a rural and urban sample.

Variables		Rural		Urban	
		Odds ratio (95% confidence interval)	*P-value	Odds ratio (95% confidence interval)	*P-value
OBESITY					
Sex	Female vs. male	3.90 [2.35;6.48]	< 0.01	8.64 [4.14;18.04]	<0.01
Smoke	Yes vs. No	0.25 [0.16;0.40]	< 0.01	0.41 [0.23;0.72]	<0.01
High blood pressure	Yes vs. No	1.72 [1.01;2.94]	0.05	4.54 [2.60;7.93]	<0.01
High blood glucose levels	Yes vs. No			3.41 [1.27;9.13]	0.02
Elevated triglycerides	Yes vs. No	2.95 [1.86;4.66]	<0.01		
Average/high-risk Hs-CRP	Yes vs. No	2.59 [1.20;5.60]	0.02		
Elevated fibrinogen	Yes vs. No	2.04 [1.28;3.24]	< 0.01	2.11[1.27;3.49]	<0.01
HYPERTENSION					
Age(years)	55–65 vs. 25–34	11.82 [5.40;25.84]	< 0.01	19.16 [7.86;46.74]	<0.01
Age (years)	45–54 vs. 25–34	6.20 [3.05;12.60]	< 0.01	7.74 [3.96;15.14]	0.04
Age (years)	35–44 vs. 25–34	1.93 [1.04;3.56]	0.01	3.03 [1.61;5.68]	0.02
Stress	Never vs. permanent stress	0.27 [0.08;0.95]	< 0.01		
Stress	Few periods of stress vs. permanent stress	0.40 [0.11;1.44]	0.21		
Stress	Several periods of stress vs. permanent stress	0.77 [0.21;2.88]	0.18		
BMI				2.19 [1.08;4.41]	0.03
Waist circumference				2.44 [1.22;4.90]	0.01
HbA1c	Diabetes (Yes vs. No)	10.40 [1.37;78.98]	0.02		
DIABETES					
Age(years)	55–65 vs. 25–34			8.84 [1.92;40.66]	<0.01
Age (years)	45–54 vs. 25–34			7.32 [1.61;33.30]	0.02
Age (years)	35–44 vs. 25–34			2.23 [0.44;11.41]	0.25
Smoke	Yes vs. No			0.23 [0.08;0.60]	< 0.01
Physical inactivity	1 vs. 2	1.84 [1.01;3.38]	0.05		
Increased waist circumference	Yes vs. No	4.10 [1.91;8.77]	< 0.01		
Elevated triglycerides	Yes vs. No	2.14 [1.19;3.82]	0.01		
Elevated leucocytes	Yes vs. No	2.33 [1.15;4.67]	0.02		
CARDIOVASCULAR DISEASES					
Stress	Never vs. permanent stress	1.90 [0.88;4.11]	0.05	0.75 [0.31;1.82]	0.86
Stress	Few periods of stress vs. permanent stress	2.14 [0.98;4.67]	0.01	0.30 [0.13;0.66]	<0.01
Stress	Several periods of stress vs. permanent stress	0.74 [0.35;1.56]	< 0.01	1.75 [0.93;3.30]	<0.01
Education	None vs. tertiary education	2.91 [1.34;6.30]	0.04		
Education	Primary school vs. tertiary education	2.03 [1.12;3.67]	0.31		
Education	Grade 8–12 vs. tertiary education	1.24 [0.73;2.11]	0.12		
High blood pressure				2.84 [1.39;5.78]	<0.01
Glucose levels	Diabetes (Yes vs. No)			2.24 [1.03;4.88]	0.04
Elevated leucocytes	Yes vs. No			3.17 [1.09;9.21]	0.03

*$P < 0.05$.

Note missing values:

Obesity: 65 rural and 57 urban observations were excluded due to missing values for the response or explanatory variables Hypertension: 50 rural and 8 urban observations were excluded due to missing values for the response or explanatory variables.

Diabetes: 66 rural and 19 urban observations were excluded due to missing values for the response or explanatory variables.

Cardiovascular diseases: 31 rural and 17 urban observations were excluded due to missing values for the response or explanatory variables.

and 87.4% of the current rural and urban families, respectively, classified as having a high risk of food insecurity (31). Low intake of fruits and vegetables has been reported in other South African studies, such as in a rural Limpopo community, where Maimela et al. (32) reported that 88.6% of participants had a low daily intake of fruit and vegetables. A contributing factor for this observation in our rural study population could be the distances that these participants need to travel on foot to purchase fruit and vegetables (83 rural vs. 54% urban) (31). In addition, the transition to an unhealthier "Westernized" diet in South Africa is often characterized by low intake of fresh fruit and vegetables (33, 34).

As confirmed in the current study, urban dwellers are more likely to experience a sedentary lifestyle with decreased PALs (35). Physical inactivity was ranked among the top two risk factors for CDL in our urban community (66.5%) and ranked seventh (27.3%) in the rural community. Several studies have illustrated an inverse relationship between physical activity and the prevalence of CDL such as hypertension and diabetes mellitus (29), while regular physical activity has been shown to strengthen resilience to stress.

The SANHANES (29) found that 50.4% of Free State participants smoked tobacco in 2012; this is much higher than the national average of 32.8%. In the current study, significant differences were observed between tobacco use of urban and rural participants (58.8 vs. 32.1%; $P < 0.01$). Tobacco use ranked among the top five risk factors in the rural community but ranked much lower (seventh) in the urban community. In addition to the high prevalence of smoking reported in the rural study population, reported alcohol use ranked second in the rural study population (80.0 rural vs. 54.2% urban, $P < 0.01$). The recent South African Demographic and Health Survey (36) revealed a slight increase in the national prevalence of men consuming alcohol from 58 (1998) to 61% (2016), while the prevalence among women remained unchanged (26%).

In the present study, high blood pressure ranked among the top three risk factors in both communities, with prevalence levels of 67.9 and 56.9% among rural and urban participants, respectively. High prevalence of hypertension was also observed in the South African leg of the Prospective Urban Rural Epidemiological (PURE) Study (37), where a slightly higher prevalence of hypertension was seen in their urban (74.0) vs. rural (71.8%) study population. Concerning results of the South Africa Demographic and Health Survey (SADHS) (36, 38) indicated that of the 46% South African women and 44% men who had hypertension, more than 80% of women and 87% of men presented with uncontrolled hypertension. Although 11.0 and 7.4% (rural and urban participants, respectively) in the current study reported being diagnosed with diabetes, elevated HbA1c, levels that provide a longer-term view of glycemic status, was observed in 9.7 rural vs. 6.0% urban participants. These results reflect poorly controlled or undiagnosed diabetes.

A high prevalence of overweight/obesity and waist circumference is linked to the high prevalence of metabolic disorders such as hypertension and type 2 diabetes mellitus (29). In both the study populations of the current study, overweight/obesity ranked fourth and sixth among the 10 behavioral and biological/metabolic risk factors observed in this study. More than half of rural and urban participants (53.2 and 54.2%) were either overweight or obese and 59.1% of rural participants (20.3 men vs. 75.5% women) and 53.4% of urban participants (6.0 men vs. 68.0% women) had waist circumference levels above the cut-off values. The prevalence of overweight or obesity among females living in urban and rural settings (66.1 and 65.6%, respectively) in this study corresponds with findings of the SADHS (36) that reported that 68.4 and 66.1% females, living in urban and rural settings respectively, were either overweight or obese. In the current study, as in other South African surveys (29, 36), the prevalence of overweight and obesity was much lower among men than women.

Obesity is associated with chronic low-grade inflammation, and markers of inflammation such as CRP, TNF-α, and IL-6 have been reported to correlate positively with adipocyte size (39). Lifestyle-related risk factors such as physical inactivity, poor diet and emotional stress are considered to be triggers that can cause activation of the immune system and consequently the hypothalamic pituitary adrenal stress response system, increasing the risk for obesity and chronic diseases such as CVD and diabetes mellitus (8, 11, 40, 41). This study confirmed a high prevalence of inflammation in both urban and rural participants that could be attributed to the higher cumulative risk effects of multiple risk factors. More than half of both urban and rural participants had five or more risk factors present for CDL. Almost 90% of rural participants had high Hs-CRP levels that have been associated with lifestyle risk factors such as smoking and physical inactivity (42) and correlate positively with BMI (43). Significant differences ($P < 0.01$) were observed between the study populations for the following inflammatory markers; total leucocytes levels (13.1% rural vs. 4.3% urban), lymphocytes (7.7% rural vs. 1.7% urban) and fibrinogen (32.9% rural vs. 48.3% urban). An elevated leucocyte count is a strong independent risk factor for coronary heart disease morbidity and mortality, while NLR can also be used as a predicative tool for adverse cardiac events in diabetic patients with CVDs (44). Elevated fibrinogen levels were the highest-ranked inflammatory marker in both communities. The Emerging Risk Factors Collaboration group (45), investigated the value of CRP or fibrinogen in CVD prediction and found that one additional CDV event over a period of 10 years could be prevented with additional assessment of CRP or fibrinogen in patients at intermediate risk for a CDV event after initial screening of conventional risk factors. Chen and Lacey (7) used CRP and fibrinogen to indicate adult inflammation in a 1958 British birth cohort and illustrated that adverse childhood experiences, related to socio-economic and health behavioral factors, were associated with inflammation in mid-life.

In a community-based study in Shanghai, Zhang et al. (46) reported that hypertension, diabetes, and dyslipidemia were positively associated with obesity. In our study, multivariate logistic regression analysis revealed that in both the rural and urban sample, obesity was also associated with having hypertension. In addition, obesity was positively associated with

being female and elevated fibrinogen levels. In the rural sample, obesity also increased the odds of having increased triglyceride and Hs-CRP levels, while in the urban sample, high blood glucose was positively associated with obesity. A community-based cross-sectional Ethiopian study (47), reported that obesity was positively associated with daily intake of alcohol; while our study found that former and current smoking was negatively associated with obesity in both the urban (OR 0.42; $P < 0.01$) and rural (OR 0.25; $P < 0.01$) study populations.

In terms of hypertension, multivariate logistic regression analysis showed that age advancement was more likely to be associated with the presence of hypertension in both rural and urban areas; a finding also observed in the earlier South African Adult Demographic and Health Survey (48) and a recent African based study (49). In addition, we found that the probability of having hypertension in the rural area was higher with increased reported stress levels, while high HbA1c levels increased the odds of having hypertension 10.40 (95% CI 1.37; 78.98) times. The current study also found that increased waist circumference and BMI $\geq$ 25.0 kg/m^2 were positively associated with the presence of hypertension. Similar observations were made by Zekewos et al. (49) who reported that age advancement, BMI ($\geq$25.0 kg/m^2), and central obesity (waist-to-height ratio $\geq$0.50) were positively associated with hypertension. Mbouemboue and Ngoufack (50) also reported that in a low-resource African setting, age, overweight and high serum triglyceride level were identified as independent factors predicting hypertension. The observation of Mahmood et al. (51) that in addition to age, education was an independent risk factor of hypertension for urban participants living in India, was not confirmed in the current study; however, adults residing in a rural area, with higher education levels were three times more likely to have CVDs; this can possibly be attributed to higher employment and income levels that can lead to unhealthy eating habits due to a higher intake of fast foods (6). Urban participants with hypertension (OR 2.84, 95% CI 1.39; 5.78), high glucose levels (OR 2.24, 95% CI 1.03; 4.88), and elevated leucocytes (OR 3.17, 95% CI 1.09; 9.21) were more likely to have CVDs. The logistic regression related to CVD and stress delivered unexpected results. The authors acknowledge that categorizing stress as "never," "few periods," and "several periods" may have been confusing to participants. Answers to questions related to concrete variables such as age and level of education are more easily answered by participants than variables that are more fluid, such as one's experience of stress.

In terms of diabetes, for participants living in a rural area, being physically inactive, having increased waist circumference, elevated triglycerides and leucocytes levels emerged as important associated risk factors of diabetes, while in an urban area advanced age was associated with diabetes. Vijayakumar et al. (52) reported that advanced age and the presence of central obesity were important risk factors for type 2 diabetes mellitus in an Indian study. As part of lifestyle management, the American Diabetes Association (ADA) (53) recommends focused goal-based behavioral lifestyle intervention programs for prediabetes patients, that includes 7% weight loss and physical activity (150 min of physical activity, similar in intensity to brisk walking, per week).

Many governments are not keeping pace with the growing burden of lifestyle-related chronic diseases and associated demands on health services. Baird et al. (54) and Mikkelsen et al. (55) have emphasized the importance of adopting a life course approach that recognizes the opportunity to promote health, prevent and control NCDs at key stages throughout the life course, from preconception through to adulthood. Focusing on key life stages throughout the life course of the individual and implementing targeted lifestyle modifications and awareness programs can reduce the prevalence of prioritized risk factors for communities identified in this study, and break the risk cycle and the current intergenerational transmission of CDL in communities.

The authors acknowledge the following limitations of the study. Firstly, more females than males participated in the study, mostly because more males are employed laborers and therefore not available to participate on weekdays that the study was conducted and therefore, we acknowledge that the study population was not completely representative of the target population. We further acknowledge that not all relevant psychosocial factors (e.g., household composition, social support, depressive symptoms) were assessed or reported on in this publication. The exclusion of participants due to missing values occurred and is acknowledge by the authors as a limitation of the study, furthermore, we acknowledge that multiple testing took place due to the numerous variables involved and spurious results may occur.

CONCLUSION AND RECOMMENDATIONS

This study aimed to provide a better understanding of the health needs of urban and rural communities in the Free State with the aim of contributing to focused, targeted primary health care prevention and intervention programs for CDL, supporting the vision of the NDP to reduce the prevalence of chronic diseases in South African communities. The WHO has emphasized the importance of developing a holistic, integrated approach that targets the major common risk factors for CDL in the most cost-effective way to prevent and control CDL in communities.

Various studies have confirmed that a healthy lifestyle is associated with lower concentrations of inflammatory markers. Gaesser et al. (13) indicated that exercise and dietary factors, including dietary fiber, fruits (especially berries), omega-3 unsaturated fatty acids, antioxidant vitamins E and C and zinc could reduce inflammatory markers. Johannsen et al. (39) found that aerobic exercise not only reduced total WBC and neutrophil count in a group of overweight/obese women, but was particularly beneficial for those with low-grade systemic inflammation.

Based on the findings of this study, the researchers recommend:

- Focused and tailor-made community-based primary health care prevention [that include early screening toolkits and important point of care devices that can contribute to immediate identification of critical biochemical markers (HbA1c, Hs-CRP, fibrinogen)] and intervention programs that

prioritize the identified multi-factorial etiology of CDL and related health needs in the different communities.

- Using the proposed approach to strengthen health and wellness educational programs in the different communities, with emphasis on the benefits of a healthy early environment and anti-inflammatory lifestyle throughout the individual's life course.
- Incorporating the following essential components in community-based chronic disease learning modules for undergraduate Health Professions programs:
  - Contextual understanding of the multi-factorial etiology of CDL in different communities with emphasis on the different determinants (social, cultural, behavioral, biological, psychological, economic, and environmental) that drive CDL disease processes, at individual and collective levels in the communities.
  - Promote a holistic integrated primary health care approach that focuses on the complementary roles of different health professionals involved in the care of patients with CDL in order to reduce the prevalence and associated prioritized risk factors of these diseases in the communities.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of the Faculty of Health Sciences (UFS-ETOVS number 21/07) Health Sciences Research Ethics Committee (HSREC) of UFS (UFS-HSD2017/1435). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SZ were also responsible for the protocol and manuscript preparation, data collection, and data interpretation. GJ and FR were responsible for the data analysis. CW was the principle investigator. All authors were involved in the protocol and publication planning, writing, editing, and finalization.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

APPENDIX Q: Approval letters HSREC and FS DoH

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA

UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

Health Sciences Research Ethics Committee

22-Mar-2018

Dear Dr Sanet Van Zyl

Ethics Clearance: **CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE**

Principal Investigator: **Dr Sanet Van Zyl**

Department: **Community Health (Bloemfontein Campus)**

APPLICATION APPROVED

Please ensure that you read the whole document

With reference to your application for ethical clearance with the Faculty of Health Sciences, I am pleased to inform you on behalf of the Health Sciences Research Ethics Committee that you have been granted ethical clearance for your project.

Your ethical clearance number, to be used in all correspondence is:**UFS-HSD2017/1435**

The ethical clearance number is valid for research conducted for one year from issuance. Should you require more time to complete this research, please apply for an extension.

We request that any changes that may take place during the course of your research project be submitted to the HSREC for approval to ensure we are kept up to date with your progress and any ethical implications that may arise. This includes any serious adverse events and/or termination of the study.

A progress report should be submitted within one year of approval, and annually for long term studies. A final report should be submitted at the completion of the study.

The HSREC functions in compliance with, but not limited to, the following documents and guidelines: The SA National Health Act. No. 61 of 2003; Ethics in Health Research: Principles, Structures and Processes (2015); SA GCP(2006); Declaration of Helsinki; The Belmont Report; The US Office of Human Research Protections 45 CFR 461 (for non-exempt research with human participants conducted or supported by the US Department of Health and Human Services- (HHS), 21 CFR 50, 21 CFR 56; CIOMS; ICH-GCP-E6 Sections 1-4; The International Conference on Harmonization and Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH Tripartite), Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines, Constitution of the HSREC of the Faculty of Health Sciences.

For any questions or concerns, please feel free to contact HSREC Administration: 051-4017794/5 or email EthicsFHS@ufs.ac.za.

Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours Sincerely

Dr. SM Le Grange
Chair : Health Sciences Research Ethics Committee

Health Sciences Research Ethics Committee
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YUNIVESITHI YA FREISTATA

UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

Health Sciences Research Ethics Committee

22-Mar-2018

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Yours Sincerely

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APPENDIX R: Verification of language editing

LANGUAGE PRACTITIONER: Anneke Denobili

BA Communication Science (Corporate and Marketing Communications)*
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October 2021

DECLARATION

I, Anneke Denobili, hereby declare that I did the language editing of the thesis of Sanet van Zyl (student number: 1984606044) titled CHRONIC DISEASES OF LIFESTYLE: A RISK ASSESSMENT AND HEALTH PROMOTION FRAMEWORK FOR A RURAL AND URBAN PRIMARY HEALTH CARE SETTING IN THE FREE STATE PROVINCE. The thesis to be submitted in fulfilment of the requirements for the degree, Philosophiae Doctor in Community Health (Faculty of Health Sciences, University of the Free State). All the suggested changes, including the implementation thereof, were left to the discretion of the student.

Please note:

The language editing excludes reference editing/checking and technical formatting. The editor will not be held accountable for any later additions or changes to the document that the editor did not edit, nor if the student rejects/ignores any of the changes, suggestions or queries, which he/she is free to do. It remains the student's responsibility to ensure that the similarity index is according to the University's regulations. The editor can also not be held responsible for errors in the content of the document or whether or not the student passes or fails. It is the student's responsibility to review the edited document before submitting it for evaluation.

Sincerely

SATI Registration #: 1003466