

https://dspace.org/

The trends, prevalence and determinants of non-communicable diseases among youth (15-24 years old) in South Africa (2005-2015)

Ntombini, Ayanda Veronica

2020

https://hdl.handle.net/10539/31377

Downloaded from a DSpace repository. https://dspace.org/

THE TRENDS, PREVALENCE AND DETERMINANTS OF NON-COMMUNICABLE DISEASES AMONG YOUTH (15-24 YEARS OLD)

IN SOUTH AFRICA (2005-2015).



WITS
UNIVERSITY

BY: AYANDA VERONICA NTOMBINI

Student Number (900925)

Supervisor

Dr Nicole De Wet

A research report submitted to the Faculty of Humanities, Schools of Social sciences and Public Health, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Art in the field of demography and populations studies.

February 2019

DECLARATION

I, **Ayanda Veronica Ntombini** declare that this report is my own original work. It is being submitted for the degree of Master in Arts in the field of Demography and Populations studies at the University of the Witwatersrand, Johannesburg, South Africa. To my knowledge, this report has not been submitted for any degree or examination at this, or any other university.

_____

15 February 2019

ACKNOWLEDGEMENTS

- I lift my voice to the heavens, busting out in worship, if it was not for his grace and mercy, I would not have been able to finish my Master's research. To God be the Glory!
- To my mentor and supervisor, Dr Nicole De Wet- words can neither qualify nor quantify how helpful your guidance and advice has been. I will forever be grateful for the contribution and support you have given me throughout my masters and to the end of this research report. I pray God continues to install the seeds of blessings in your life.
- To the University of the Witwatersrand and the department of Demography and Population Studies (DPS) and again Dr De Wet, thank you for the financial contribution towards my studies. Without the scholarship and the Postgraduate Merit Award I would not have been able to complete my studies and this research
- To the staff and postgraduate students in the DPS programme, thank you for your continued support and contribution towards my research project. A special thanks to Sindiso Ndlovu, Tlangelani Makamu, Nqabanomqhele Mthimkhulu, Nomthandazo Gama and Teboho Letuka for your continued support and contribution and for keeping me sane at time.
- To my whole family, enkosi kuni BoBhayi. Above all my Mama- Monica Ntombini, I will forever be indebted to you for all the sacrifices you've had to make in this journey of life. I am grateful for all the times you've showed up every time I needed you, prayed for me and with me, supported and defended me when many did not understand the dream. Ngiyabonga Mambhele for your patience and love. UThixo akusikelele.
- To my friends and extended family, I appreciate all your support and understanding throughout my masters. I particularly thank my biggest cheerleader and critique-Hlologelo Malatji, your support, motivation, patience and unending contribution made this dream a possibility.
- Finally, I would like to acknowledge Statistics South Africa for granting me access to the data used for this study.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS **2**
TABLE OF CONTENTS **3**
LIST OF TABLES **5**
LIST OF FIGURES **6**
ABSTRACT **7**
CHAPTER 1: INTRODUCTION **8**
1.1 Background 8
1.2 Problem Statement 9
1.3 Justification 11
1.4 Research question 12
1.4.1 Sub questions 12
1.5 Research objectives 12
1.5.1 Main objective 12
1.5.2 Specific Objectives 12
1.6 Definition of terms 12
CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK **13**
2.1 Non-communicable diseases in Sub-Saharan Africa 14
2.2 Non-communicable diseases in South Africa 15
2.3 Factors contributing to non-communicable diseases prevalence 17
2.5 Prevalence of hypertension in South Africa 17
2.6 Theoretical framework 18
2.3 Conceptual framework 20
2.3 Statement of hypothesis 21
CHAPTER 3: METHODOLOGY **22**
3.1 Description of study Area 22
3.2 Data Source 22
3.3 Sampling Design 23
3.4 Selection of respondents 23
3.5 Survey Questionnaire 23

3.6 Study population and sample size 24
3.6 Variables and Variable measure 24
3.6.1 Dependent variable 25
3.6.2 Independent variables 25
3.7 Data management 27
3.8 Ethical issues 28
CHAPTER FOUR: RESULTS 29
4.1 Estimation of the Prevalence of Diabetes 29
4.3 Descriptive characteristics of youth with NCDs (Diabetes/hypertension) 39
4.4 Descriptive characteristics showing the Prevalence of NCDs by sex among youth in South Africa 40
4.5 Estimation of the prevalence rate for NCDs (Diabetes / hypertension) 41
4.6 Estimation of the prevalence rate for Diabetes 43
4.7 Estimation of the prevalence rate for hypertension 44
4.8 Prevalence rate of NCDs among youth across South African provinces 46
4.9 Unadjusted and adjusted binary logistic regression on Diabetes 47
4.10 Unadjusted and adjusted binary logistic regression on hypertension 52
4.11 Unadjusted and adjusted binary logistic regression on all NCDs 57
4.12 Testing of the hypothesis 63
CHAPTER FIVE: DISCUSSION 64
CHAPTER SIX: CONCLUSION, RECOMMENDATIONS AND LIMITATIONS 70
6.1 Conclusion 70
6.2.1 Policy recommendations 70
6.2.2 Future research 71
6.2.3 Limitations of the study 72

LIST OF TABLES

Table 3.1: Definition of the dependent variable **23**

Table 3.2: Categorization of the independent variables **24**

Table 4.1: Weighted frequency and percentage distribution of all youth (15-24 years old) with and without diabetes by socio-demographic and access characteristics in South Africa, 2005-2015. **27**

Table 4.2: Weighted frequency and percentage distribution of all youth (15-24 years old) with and without diabetes by household in South Africa, 2005-2015. **30**

Table 4.3: Weighted frequency and percentage distribution of all youth (15-24 years old) with and without hypertension by socio-demographic and access characteristics in South Africa, 2005-2015. **32**

Table 4.4: Weighted frequency and percentage distribution of all youth (15-24 years old) with and without diabetes by household characteristics in South Africa, 2005-2015. **35**

Table 4.5: Unadjusted and Adjusted binary logistic regression models producing odds ratios showing the association between diabetes and the selected characteristics in South Africa, 2005-2015. **45**

Table 4.6: Unadjusted and Adjusted binary logistic regression models producing odds ratios showing the association between hypertension and the selected characteristics in South Africa, 2005-2015. **51**

Table 4.7: Unadjusted and Adjusted binary logistic regression model producing odds ratios showing the association between all NCDs and all the selected characteristics among youth in South Africa, 2005-2015. **57**

LIST OF FIGURES

Figure 2.1: Commission of Social Determinants Framework, 2007 **17**

Figure 2.2: Conceptual Framework for the study of non-communicable diseases among youth in South Africa adapted from CSDH (2007). **18**

Figure 3.1: Map of South Africa showing the nine provinces. **20**

Figure 4.1: Percentage distribution showing the Prevalence of NCDs (diabetes/hypertension) by age group in South Africa, 2005-2015 **37**

Figure 4.2: The prevalence of NCDs among youth by sex in South Africa overtime, 2005-2015. **38**

Figure 4.3: Trend showing the prevalence rate (per 10,000 youth population) of all NCDs by sex among youth aged 15-24 years in South Africa, 2005-2015. **41**

Figure 4.4: Trend showing prevalence rate (per 10,000 youth population) of diabetes by sex among youth aged 15- 24 in South Africa, 2005-2015. **42**

Figure 4.5: Figure 4.4: Trend showing prevalence rate (per 10,000 youth population) of hypertension by sex among youth aged 15- 24 in South Africa, 2005-2015.

Figure 4.6: Map showing the prevalence rate of NCDs (per 10,000 youth population) in all nine provinces in South Africa, 2005-2015. **44**

ABSTRACT

Background: South Africa is increasingly being burdened with non-communicable diseases that hinders social and economic development. While there has been extensive research conducted on non-communicable diseases, there has been dearth of research conducted on the trends, prevalence and determinants of non-communicable diseases among youth in the country. Thus, the main objective of the study was to assess the trends, prevalence and determinants of non-communicable diseases among youth (15-24 years old) in South Africa (2005-2015). **Methods:** Data were drawn from the 2005-2015 General households Surveys, surveys conducted annually by Statistics South Africa. The surveys were chosen as they are a national representation of the entire population including youth. The study population was youth aged 15-24 years' old who had reported being diagnosed with either diabetes or hypertension from 2005-2015. The total sample was a weighted distribution of 590,414 youth who reported having been diagnosed with either Diabetes (229 162) or Hypertension (361 253). Descriptive statistics were used to summarize the socio-demographic, access and household characteristics of youth with and without Diabetes or Hypertension using percentage, frequency distributions as well as cross tabulations. The rate of disease prevalence was estimated using demographic methods. Three bivariate and multivariate logistics were conducted for diabetes, hypertension and all NCDs (diabetes and hypertension) to examine the association between the diseases and the socio-demographic, access and household characteristics. The interpretation of the results was made using odds ratios and a 95% confidence interval was used. **Results:** The results of the study found that NCDs were prevalent among youth, disproportionately affecting females. The study found that the NCD prevalence increased for females. Females were found more likely to be diagnosed with Diabetes or Hypertension when compared to males. The Diabetes and Hypertension prevalence increased with age, youth aged between 20-24 years (62%) had a high prevalence of both Diabetes and Hypertension when compared to youth aged 15-19 years old. Youth aged 20-24 were found more likely to be diagnosed with hypertension than diabetes. White and coloured youth were found more likely to be diagnosed with both diabetes and hypertension when compared to African/black youth. **Conclusions and policy implications:** There is a growing prevalence of Diabetes and Hypertension as the most common NCDs in South Africa, disproportionally affecting females and youth from various ethnic groups. This highlights the need for health policies and specific interventions to reduce non-communicable diseases among youth and urgently address the prevalence.

***Keywords**: Non-communicable diseases, youth, Diabetes, hypertension, South Africa*

CHAPTER 1: INTRODUCTION

This chapter provides an overview of the study by highlighting the background to the study, problem statement, justification and overview of the research objective as well as the explanation of key terms used in the study.

1.1 Background

Non-communicable diseases (NCDs) also known as chronic diseases of lifestyle are diseases that cannot be transferred from one person to another. They tend to be of long duration and slow in progression (World Health Organization, 2011a). The main types of NCDs are cardiovascular diseases such as heart attacks, cancers, chronic respiratory diseases such as asthma and diabetes. These are considered the leading causes of morbidity and death in many countries (Alwan et al., 2010; Nojilana et al., 2016). Found in literature is the assertion that NCDs are attributed to a number of risk factors; such as physical inactivity, the adoption of unhealthy and western diets , use of alcohol and drugs including rapid unplanned urbanization, globalization and population ageing (Mayosi et al., 2009; Sliwa et al., 2008).Literature from other countries has also identified individual-level determinants, including behaviour and diet as the risk factors of NCDs. However a lot of these studies were not focused on youth but included them within the adult population (Schmidt et al,2011;(Gore et al., 2011; Miranda, Kinra, Casas, Davey Smith, & Ebrahim, 2008; Singh, Maheshwari, Sharma, & Anand, 2006)

In 2010 the global burden of disease study estimated that NCDs deaths increased from 8 million in 1990 to 52.8 million in 2010 (Nojilana, Bradshaw, Pillay-van Wyk, Msemburi, Laubscher, et al., 2016). For a while, NCDs were debated as a burden of the developed world, receiving increasing academic and policy attention (Terzic & Waldman, 2011). Research has shown that the burden of NCDs in developing countries is fast increasing and already has major adverse on health and social development (Alwan et al., 2010; Oni et al., 2015; Wu et al., 2015)

The number of deaths from NCDs has been increasing globally, and NCDs are currently among the leading causes of death in many countries (Levitt, 2008; Nojilana,et al., 2016; Wagner & Brath, 2012). In Sub-Saharan Africa while the health agenda has been on communicable diseases, maternal and nutritional conditions, Sub-Saharan Africa is increasingly being burdened with non-communicable diseases (NCDs) that hinders social and economic development (Dalal et al., 2011; Gore et al., 2011).Contributing to premature mortality rates, the World Bank estimated that one

third of the population in developing countries die prematurely from NCDs, as a result this affects their families and acts as a chronic poverty trap (Adeyi, Smith, & Robles, 2007). Where, NCDs and their risk factors may lead to increased burden on individuals, families and communities contributing to poverty and hunger through loss of productivity, long-term treatment and care costs which threatens household income (World Health Organization, 2011a, 2014). In South Africa, the burden of Diseases Research Unit found that NCDs are among the leading cause of death. The study which analysed the mortality levels and trends for NCDs over a 14 year period (1997-2010) found that by 2010, NCDs accounted for about 39% of the total deaths in the country(Nojilana et al., 2016). The study also showed that, more than 36% of these NCDs related deaths occurred before the age of 60 years and that in 2010 the number of NCD related deaths was the same to the number of HIV/AIDS and tuberculosis combined related deaths(Nojilana et al., 2016).

1.2 Problem Statement

South Africa is in the middle of a health transition with a high burden of both communicable and NCDs diseases. NCDs are developing in both the rural and urban areas (Mayosi et al., 2009). This contrary to the belief that NCDs are more prevalent in developed countries as recent statistics have shown a decrease in the prevalence rate of NCDs in developed worlds (Wagner & Brath, 2012). This decrease has been attributed to the decline in behavioural risk factors such as unhealthy diet, use of substances, physical inactivity as well as improved access to healthcare (Nojilana, et al., 2016).

In the globalised world with the dissemination of knowledge, trends, technology, economic transition, lifestyle differences between developing and developed countries are lessening, this to an extent where the prevalence of non-communicable diseases is becoming comparable. It is argued that major factors which involve demographic change and resulting in an increasing ageing population in South Africa are contributing to increasing rates in NCDs (Mayosi et al., 2009).

Within the broader category of NCDs, cardiovascular diseases (CVD) linked with hypertension, cancers, chronic respiratory diseases and diabetes, represent the threat to human health and development (Labadarios, Shisana, & Simbayi, 2014). The WHO estimated that annually these diseases contribute to an estimated 35 million deaths each year, 60% of all deaths globally with 80% in developing countries(World Health Organization, 2014). South Africa is no exception to this, as diabetes and hypertension are among the top ten underlying causes of death (Stats SA,

2016). In 2016, 46% of women and 44% of men in South Africa aged 15 years and older were estimated to have had hypertension. Of the 46% and 44% of women and men who had been diagnosed with hypertension respectively, only 9% of the women and 6% of the men were reported to have been taking medication and were in control of their hypertension (Statistics South Africa, 2017).

In 2015, The International Diabetes Federation (IDF) reported that about 2.8 million (7%) of the South African population between the ages of 21 and 79 years had diabetes (International Diabetes Federation, 2015). They argued that based on the on the latest population estimates for South Africa in 2015, an estimated 3.85 million South Africans may have had diabetes, however were not accounted for(International Diabetes Federation, 2015). This indicates the importance of quality data, where the health information systems for monitoring NCDs has been argued to be relatively less advanced when compared to infectious diseases(Wandai, Aargaard- Hansen, Day, Sartorius, & Hofman, 2017)

Furthermore, research with focus in South Africa has found that, although NCDs are widespread across different ages, the prevalence of NCD exists predominantly among older people (Peer, Bradshaw, Laubscher, Steyn, & Steyn, 2013; Phaswana-Mafuya, Peltzer, Chirinda, Musekiwa, & Kose, 2013). This might be attributed to the NCD risk factors where, the abuse of alcohol and drugs, physical inactivity, unhealthy diets and the dissemination of trends and technology which are patterns that are normally initiated during adolescence or young adulthood set the stage for unhealthy behaviours and diseases later in adult life. In 2015, The WHO reported that more than two-thirds of preventable diseases such as cancer, diabetes, chronic lung diseases and cardiovascular diseases (main NCDs) are associated with behaviour that started in adolescents(World Health Organization, 2015).

Although there has been extensive research conducted on the prevalence of NCDs, there has been dearth of research that has focused on youth (15-24 years old). Notable here, is the idea that although the youth are crucial to the health system, they are often ignored as a population group, especially when it comes to NCDs (Hauerslev & Allen, 2018).

1.3 Justification

In South Africa, the population is largely made up of what the South African government considers 'youth' (18-35 years old). With over 54 million people in the country, those below the age of 35 make up about 66% of the total population (Statistics SA, 2011). Of the 66%, about 24% of the total population are between the ages of 15-24 (Stats, 2011). Majority of the youth make up the economically active population, contributing to the country's social and economic development (Statistics South Africa, 2011). Therefore, the health and wellbeing of the youth is a crucial priority to the South African government. The National Youth Policy 2015-2020 aims to enhance the capabilities of young people to transform the economy and society(Presidency of South Africa, 2015). This study fits the aims of the policy as it seeks to address NCD diseases which has the potential to hinder the health and wellbeing of the young people through sickness and disabling them from playing a pivotal role within their families and society. Moreover, disabling them from being independent and taking care of themselves and their families. The burden of NCD diseases could affect their ability to work thus failing to contribute to the country's social and economic development

Youth are becoming increasingly susceptible to NCDs with their exposure to unhealthy diets and sedentary lifestyles putting them at a greater risk of lifestyle diseases such as diabetes and hypertension(Peer, Bradshaw, et al., 2013). One study found that young people engaged in unhealthy dietary choices, lack of physical activity and the use of substances (alcohol and drugs) were found to have a higher prevalence of obesity and hypertension (Singh et al., 2006). Thus, it is important to understand the trends and prevalence of these diseases among the youth, this in order to work on specific interventions and inform policies to aid in reducing the already modifiable risk factors and eliminate susceptibility. Moreover, the urgent need to address the NCD prevalence has been included in the Sustainable Development Goals (SDGs). SDG target 3.4 which aims is to ensure a reduction by one third in premature mortality, in the probability of dying between the ages 30 and 70 years old due to NCDs by 2030 (Bennett et al., 2018).

Furthermore, in South Africa there is a dearth of literature that focuses specifically on the youth (15-24years old). Seemingly, with the increasing burden of NCDs in South Africa, there is a need to understand the disease distribution among youth. As NCDs may lead to losses of educational investments and labour productivity among this age group as the economically active in the

country, thus hindering young people from emerging positively from poverty. Furthermore, the chronic nature of these diseases can lead to high levels of long term disability and premature mortality that often places a burden on families and the government as far as the health budget is concerned (Mutyambizi et al., 2018).

1.4 Research question

What are the trends, prevalence and determinants of non-communicable diseases among youth (15-24 years old) in South Africa (2005-2015)?

1.4.1 Sub questions

1. What are the trends and prevalence of non-communicable diseases among youth in South Africa (2005-2015)?
2. What are the socio-demographic, household and healthcare access characteristics of youth with NCDs in South Africa (2005-2015)?

1.5 Research objectives

1.5.1 Main objective

To assess the trends, prevalence and determinants of non-communicable diseases among youth (15-24 years old) in South Africa (2005-2015).

1.5.2 Specific Objectives

1. To identify the trends and prevalence of non-communicable diseases among youth in South Africa (2005-2015).
2. To examine the socio-demographic, access and household determinants of youth with non-communicable diseases in South Africa (2005-2015).

1.6 Definition of terms

1.6.1 Non-communicable disease (NCDs): also known as chronic diseases of lifestyle, are diseases that cannot transmitted from one person to another (WHO, 2011). For the purpose of this study, the reference of all NCDs includes diabetes and hypertension.

1.6.2 Youth: these are persons between the ages of 15-24 years old.

1.6.3 Globalization: process characterized by the growing interconnectedness and interdependence of the world population, concerning the assimilation of economies, culture, technologies, and governance (Chapman, 2009).

1.6.4 Households : refers to individuals or groups who reside in the same home or unit for at least four nights a week or on average they must have resided there in past four weeks prior to the survey as a sample selection would have been done four weeks before the survey(Statistics South Africa, 2016).

CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This chapter presents an overview of literature on NCDs. The review looks at NCDs in Sub-Saharan Africa and South Africa, Factors influencing the NCDs prevalence, the trends and prevalence of diabetes and hypertension as the most common NCDs among youth in South Africa. Moreover, the review also looks at the theoretical framework: Social determinants of health commissioned by the WHO (2007) and the adapted conceptual framework through which the study was contextualized.

2.1 Non-communicable diseases in Sub-Saharan Africa

Much development policy is designed on the untrue assumption that NCDs are the "lifestyle diseases" of the rich or the elderly (Barouki, Gluckman, Grandjean, Hanson, & Heindel, 2012). In developing countries, another pattern is seen. In Sub-Saharan Africa (SSA), while the focus has been on communicable diseases, research has shown that SSA is overwhelmingly being burdened by both communicable and non-communicable diseases (Dalal et al., 2011; Kane, Landes, Carroll, Nolen, & Sodhi, 2017; Parkin et al., 2008). It is projected that NCD mortality will be greater than that of communicable diseases(maternal, perinatal and nutritional diseases) combined by 2030 (Kane et al., 2017). This developing double burden of disease poses a challenge to the already struggling health care system(Kane et al., 2017)

The World Health Organization (WHO) has projected that by 2020, NCDs will contribute to the highest mortality rates in Africa (WHO, 2011). NCDs deaths are projected will increase by 15% in 2020. The highest increases are expected in Africa, the Eastern Mediterranean, and South-East Asia, by over 20% (WHO, 2011). This highlights the notion that, the prevalence of NCDs is becoming similar and even more to that of developed countries. The increase is attributed to trends such as globalization and the dissemination of knowledge and technology (social media and use of gadgets), rapid urbanization and increasingly sedentary lifestyles (Wagner & Brath, 2012).

Literature shows that NCDs are often associated with older age groups, but emerging research shows that there seems to be a trend of NCDs developing in young people (Kaba, Khamisa, & Tshuma, 2017a; Kimani-Murage et al., 2010; Phaswana-Mafuya et al., 2013; Ssewanyana, Abubakar, Van Baar, Mwangala, & Newton, 2018). Both the young and old are all susceptible and vulnerable to the risk factors contributing to NCDs, whether from the unhealthy diets, physical

activity, the use and abuse of alcohol and drugs as well as the rapid and unplanned urbanization (Kaba, Khamisa, & Tshuma, 2017b; Mohamed et al., 2018; Wagner & Brath, 2012)

Furthermore, evidence from literature shows that in SSANCDs occur at the younger ages when compared to other countries. For example, the average years of mortality is at 10 years younger than in developed countries (Unwin et al., 2001). Globally, the highest risk of NCD mortality was observed in low- and middle-income countries such as SSA and the lowest risks of NCD mortality was observed in high income countries such as Europe and Canada. In 2016, there were 56.9 million deaths reported, of the 56.9 million deaths 40.5 million deaths were NCDs related deaths. furthermore, of these 1.7 million deaths occurred in people younger than 30 years(WHO, 2018).

Evidence from literature shows that the burden of NCDs is likely to increase over the coming years, with the projections of the WHO estimating that by 2030, without the alleviation of NCDs, 52 million people will die from NCD related death(WHO, 2018). This is a cause for concern, considering the demographic transition and the fact that young people play a pivotal role in a country's social and economic development.

2.2 Non-communicable diseases in South Africa

Similarly, South Africa is overwhelmed with the burden of NCDs (Abegunde, Mathers, Adam, Ortegon, & Strong, 2007; Dalal et al., 2011; Mayosi et al., 2009; Reddy et al., 2009). Against NCDs, the burden of HIV/AIDS and tuberculosis (TB) remains high (Oni et al., 2015). A study conducted in South Africa over a 14-year period found that NCDs have continued to be a major contributor to the causes of deaths (Nojilana,et al.,2016).In 2010, South Africa reported approximately 594 071 deaths, of these 39% (43% female and 35% males) were as a result of NCDs. About 14.7% of those who died were younger than 45 years and 21.5 were older than 45. This indicates a considerable number of premature deaths due to NCDs, were about 36% of the individuals had not reached the average life expectancy of 60 years of age (Nojilana, et al., 2016).

. South Africa is among the most urbanised country in sub-Saharan Africa with over 60% of the country's population living in the urban areas (Oni et al., 2015). In South Africa with over half of the population found in urban areas, modifiable risk factors associated with urbanization such as diet, obesity, and a decrease in physical activity all have significant influence on the health of Individuals (Maimela et al., 2016a) Evidence in literature has identified all these risk factors as the

attributes to the prevalence of cardiovascular diseases linked to hypertension, type 2 diabetes, which are continuously increasing and are among the leading causes of death in the country(Aboyade, Beauclair, Mbamalu, Puoane, & Hughes, 2016; Maimela et al., 2016; Nojilana, et al., 2016).

2.3 The prevalence of diabetes in South Africa

Diabetes mellitus (DM) is a disease characterised by raised blood glucose levels, it is major source of morbidity and mortality worldwide and in South Africa(International Diabetes Federation, 2017;; Shaw, Sicree, & Zimmet, 2010) .Attributed to the increase in urbanisation and poor dietary, in 2017 the IDF reported that approximately 451 million adults worldwide had been diagnosed with diabetes, with projections of 693 million cases by 2045. Globally, approximately 50% of diabetes cases are not accounted for as many individuals remain undiagnosed largely in low income and middle-income countries. In Africa, the proportion of undiagnosed diabetes is 69.2% (International Diabetes Federation, 2017). Moreover, 77% of deaths due to diabetes occurred among individuals younger than 60 years old(International Diabetes Federation, 2017).

The prevalence of diabetes is rapidly increasing in South Africa. In 2009, approximately 2 million people aged 30 years old and older had been diagnosed with diabetes, increasing almost double since the year 2000(Bertram, Jaswal, Pillay-van Wyk, Levitt, & Hofman, 2013). In 2011, diabetes accounted for about 30% of premature mortality and 25.8% of Disability Adjusted Life Years (Kengnea, Mchizad, Amoahe and Mbanya, 2013). In 2013, the International Diabetes and Federation's Diabetes Atlas reported that in South Africa there were more than 2.5 million who had been diagnosed with diabetes, with an estimated 2 million people living with diabetes and not taking treatment for it. This makes people risk of developing complications which have potential to harm their health and contribute to disability or premature mortality (Mbanya, Motala, Sobngwi, Assah, & Enoru, 2010a; Mutyambizi, Pavlova, Chola, Hongoro, & Groot, 2018). Evidence in literature has found that the presence of diabetes was linked with common risk factors such as gender, obesity, age and heredity (Seck et al., 2015). Several studies have found that diabetes was high among females when compared to males(Mohamed et al., 2018; Peer et al., 2012;).Sex differences in lifestyle may contribute to the development of diabetes. for example, in many SSA countries where diabetes seems to be prevalent among females when compared to male, females are more likely to be obese or overweight when compared to their male counterparts. thus it is

expected they would be diabetic(hilawe, Yatsuya, Kawachi, & Aoyama, 2013; Mohamed et al., 2018; Peer et al., 2012). Another study conducted in Uganda found that the prevalence of diabetes was ultimately high in the urban areas (Namusisi et al., 2011). These findings could be attributed to urbanization. One study found that diabetes has increased rapidly in all age groups in urban settings(Pheiffer et al., 2017)

2.4 The prevalence of hypertension in South Africa

Hypertension is the most common risk factor for cardiovascular disease which is one of the leading NCDs and causes of morbidity and mortality in the world. Emerging evidence found in literature show that globally and locally, the prevalence of hypertension has been increasing in children, adolescents as well as young adults under the age of 40 (Mangena, Saban, Hlabyago, & Rayner, 2016). In South Africa, it is estimated that about a third of the adult population is hypertensive. Among those aged between 15-24 years, the incidence rate is set at approximately 10%. Also, although the incident rate might be considered high, it must be noted that most young patients within this age group are asymptomatic as such diagnosis only occurs during screening or when a patient presents with an unrelated condition(Mangena et al., 2016).

One Study found that hypertension was linked with several modifiable and non-modifiable risk factors. The modifiable risk factors were; smoking, poor dietary patterns and alcohol consumption. These behaviours often lead to overweight and obesity, high blood pressure and high cholesterol; these are all directly associated to the increased in diseases such as hypertension. This study also found that women were found to be more obese when compared to their male counterparts and in addition they were found to be more hypertensive. One study found that South Africans who spent most of their life in the urban areas were found more likely to be hypertension when compared to those in the rural areas(Ibrahim & Damasceno, 2012) The non-modifiable risk factors included the individual's age and type of residence education and wealth quantile (Yaya, Ekholuenetale, & Bishwajit, 2018).. In the same study, Cameroon, rural to urban migration was found to be linked to areas is associated with high body-mass index, fasting blood sugar, and blood pressure (Ibrahim & Damasceno, 2012)

2.5 Factors contributing to non-communicable diseases prevalence

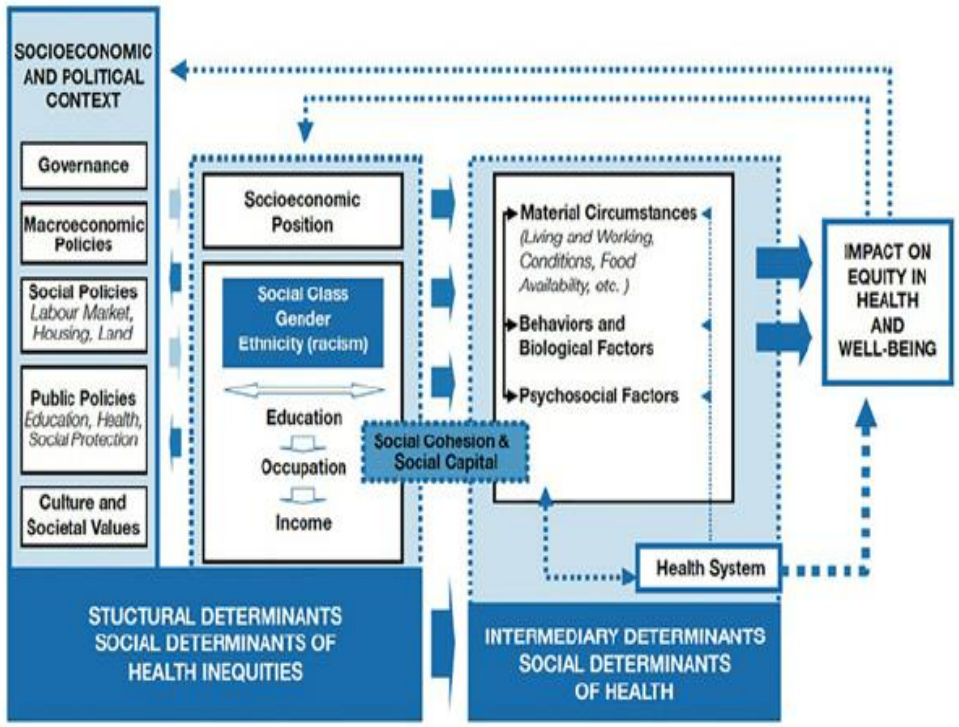
Literature has found that NCDS are attributed to several behavioural risk factors that are linked with lifestyle choices. These include the choice of diet, physical inactivity etc. (Kaba, Khamisa, &

Tshuma, 2017; Maimela et al., 2016). While most of these behavioural risk factors are modifiable, the WHO has reported that two third of premature deaths in adults are often as a result of behavioural risk factors where health problems experienced in adulthood or late adulthood develop in one's youthful years (World Health Organization, 2011). A study conducted in Kenya identified factors at different levels that contributed to NCDs among young people. although the study focused on adolescents (10-19 years old), they found that behavioural risk factors such as unhealthy and unbalanced diet (fast food, sweets, cold beverages), the use of substances (alcohol and smoking), physical inactivity were some of the factors that contributed to NCDs.

Seemingly, literature has found that NCDs seem to vary by sex, age and race (Naicker, Venter, MacIntyre, & Ellis, 2017; Beatrice Nojilana, Bradshaw, Pillay-van Wyk, Msemburi, Laubscher, et al., 2016; Peer, Bradshaw, et al., 2013; Reddy et al., 2009; Tollman et al., 2008a). Two studies found that the prevalence of behavioural risk factors such as smoking and drinking as well as NCDs was much higher in males than females (Reddy et al., 2009; Tollman et al., 2008b). Seemingly, one study found that, NCDs were prevalent among older people; this was due to the fact that older people had more risk factors that placed them at getting NCDs such as physical inactivity, diet etc. (Phaswana-Mafuya et al., 2013). Furthermore, other studies found that because of socio-demographic characteristics, NCDs were more prevalent among white people when compared to blacks, Asians/Indians and black (Beatrice Nojilana, Bradshaw, Pillay-van Wyk, Msemburi, Laubscher, et al., 2016; Reddy et al., 2009)

2.6 Theoretical framework

While there are many models that focus and advocate for the relationship between health determinants and the outcome these determinants have on health. This research will be rooted within the Commission of social determinants of health framework (CSDH) presented below.



Source: CSDH, 2007

Figure 2.1 Commission of the Social Determinants Framework

The CSDH was commissioned in 2007 by the WHO with the main aim of promoting equity in access to healthcare by reducing the health differences such as gender, race and socio-economic status as a root of difference between different people and countries. The CSDH is made up of structural and intermediary determinants which have an influence in the impact on the equality in health and welfare of an individual (World Health Organization, 2010). According to the CSDH framework the structural determinants are factors that create or strengthen stratification in society and that describe individual's socio-economic position in society. The framework shows that the structural determinants such as gender, race and socio-economic position directly affects intermediary factors such as living condition, behavioural and biological factors. The unequal distribution of these intermediary determinants creates a way through which an individual's socio-economic position will generate health inequalities. This framework also includes the health system as an intermediary factor that influences health outcome(World Health Organization, 2010).

Although this model was designed purposefully to determine health equity within and between countries. It will be adapted for this study to examine the determinants of non-communicable disease as a health outcome.

2.3 Conceptual framework

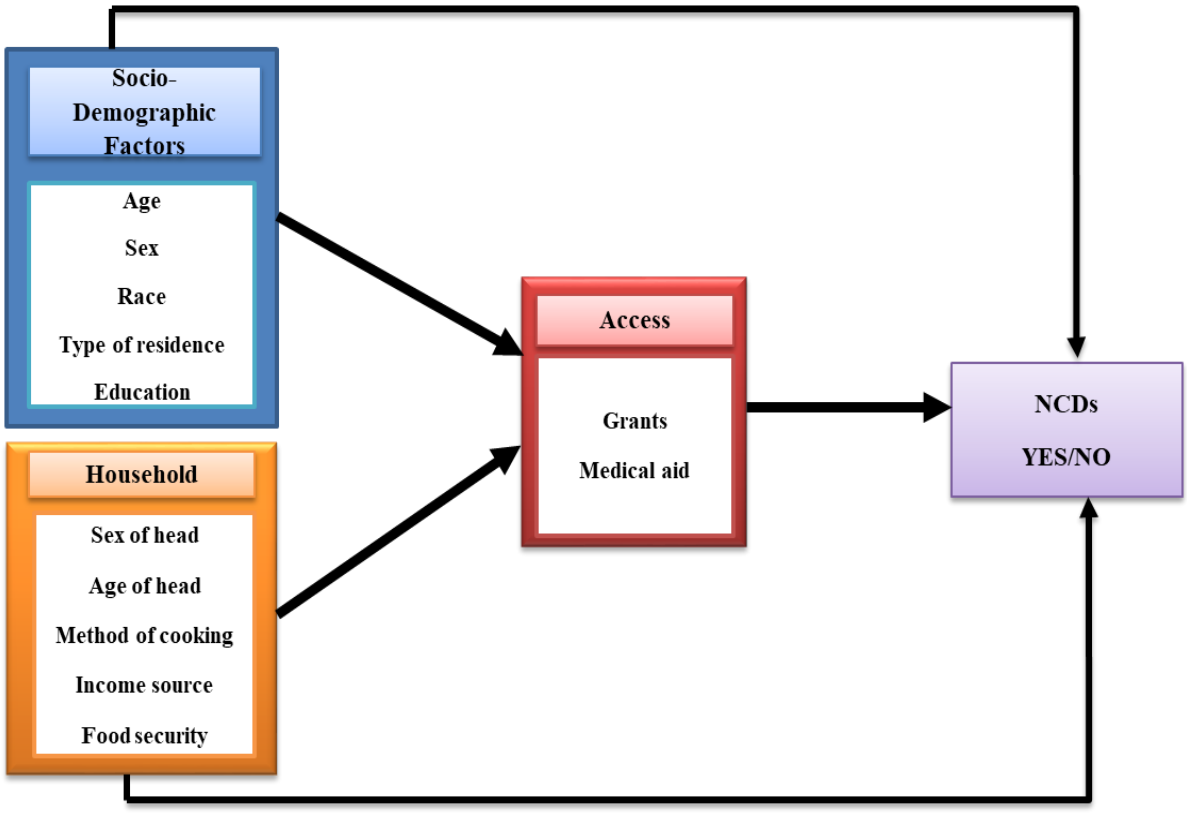


Figure 2.2: Conceptual Framework for the study of non-communicable disease among youth in South Africa adapted from the CSDH.

The conceptual framework was adapted from the Commission of Social Determinants framework and it shows how the socio-demographic, household and access factors can influence an individual's health outcome. For this study on NCDs, only certain structural determinants and intermediary factors were adapted to show a potential pathway leading to NCDs. The structural determinants of the CSDH that were used in this study included sex, race and education and the added household factors such as. The intermediary determinants included in the study are characterized as material circumstances and psychosocial factors in the CSDH framework were household factors such as cooking method which highlights the extent of the individual's living

condition. The added factors include head of sex, age of the head of household, main income source and food security, these are believed have an influence in an individual's health outcome.

In addition, the health system will be adapted to represent access to grants, medical aid and visit to health facility. These factors made up the independent variables in the study and were chosen based on literature and the conceptual determinants of health frameworks which highlights demographic, socio-economic, and health systems as important components that impact on the outcome of health (World Health Organization, 2010). These variables will help us understand the issue of access and availability of these services to the youth.

The conceptual framework depicts the independent variables grouped as socio-demographic, house hold and access factors. In the framework, the arrow, which extends from the independent variables to the intermediary determinants, represents the path of influence. It indicates that the socio-demographic factors and household structure affects the type of access one has to services. This model like the CSDH assumes that the socioeconomic in this case including the demographic and household factors affects the outcome of the disease. Also, the conceptual framework shows that the socio-demographic factors and household structure can directly affect the outcome of non-communicable diseases. Furthermore, concerns about the availability and access to health services such as medical aid being at the forefront for the early detection and treatment of diseases such as hypertension and diabetes (Keegan et al., 2018; Mbanya, Motala, Sobngwi, Assah, & Enoru, 2010b)

2.3 Statement of hypothesis

Based on the theoretical and conceptual frameworks above, the following hypotheses were tested:

- H_0: The trends and prevalence of non-communicable diseases among youth (15-24 years old) in South Africa have decreased overtime.
- H_1: The trends and prevalence of non-communicable diseases among youth (15-24 years old) in South Africa increased overtime
- H_0: There is no significant association between the demographic, access and household characteristics and non-communicable diseases.
- H_1: There is a significant association between the demographic, access and household characteristics and non-communicable diseases

CHAPTER 3: METHODOLOGY

3.1 Description of study Area

The selected study area is South Africa. The country is situated in the Southern part of Africa, with nine provinces. The mid-year population estimated reported that in 2017 there were approximately 56, 521, 900 million people living in South Africa (Stats SA, 2017).



Figure 3.1: Map of South Africa showing the nine provinces

3.2 Data Source

This study is a cross-sectional secondary data analysis of all the South African General Household Surveys (GHS) conducted annually from 2005-2015. The GHS is an annual household survey conducted by Statistics SA since 2002, it was designed explicitly to measure the living conditions of South African households and determining the progress of development in the country (Statistics South Africa, 2016). The GHS covers six broad areas, namely education, health and social development, housing, household access to services and facilities, food security and agriculture. The GHS data was suitable to meet the study objectives because of the collection of the demographic, socio-economic as well as health status information on the population of South

Africa, including the youth. had the information needed to achieve the study's objective highlighted in chapter one.

3.3 Sampling Design

The GHS has always used multi-stage stratified sampling with primary sampling units (PSUs) selected from the strata with probability to proportional size (PPS), and systematic sampling of dwelling units (DUs) from the PSUs. The strata used for recent surveys differed for the survey conducted in 2005. In the 2005 survey, the first stage was stratification by province, then by type of area within each province (urban/non-urban) (Statistics South Africa, 2006). In the 2006 and 2007 surveys, the strata were represented first by province then by the 53 district councils. The primary sampling units (PSUs) were allocated to these strata by power allocation method, and PSUs was done using the probability proportional to size (PPS) principle. The design included two stages of, sampling; firstly, the PSUs were randomly selected using PPS sampling technique. In the second stage, sampling Dwelling units (DUs) were randomly selected as Secondary Units (SSUs) (Statistics South Africa, 2008, 2009).

For the surveys 2008 to 2015, the first stage stratification was by metropolitan and non-metropolitan geographic area type. The second stage stratification was by household size, education, occupancy status, gender, and industry and income (Statistics South Africa, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016). For each survey, at least 3 000 PSUs were selected.

3.4 Selection of respondents

The target population for the all the surveys was households, worker's hostels and convents/monasteries. For all the surveys, institutions such as old age homes, hospitals, prisons and military barracks were excluded. The data was collected on several aspects of the living conditions from members over 30 000. The data was collected by trained field workers from Stats SA through a face-to-face interview for each household sampled and visited (Statistics South Africa, 2006, 2007b, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016).

3.5 Survey Questionnaire

The GHS questionnaire has four key sections; biographical information, information related to work and unemployment, trips undertaken 12 months prior to the survey and household information. Each section focuses on a particular area of interest (Statistics South Africa, 2007a,

2010, 2016). According to Statistics South Africa(Statistics South Africa, 2006, 2010, 2016), depending on the need for additional information, the questionnaire is adapted on an annual basis. Additional questions are often added to existing sections or removed, depending on the need. Overtime, the GHS has undergone some minor and major revisions. The 2005 survey included additional questions in the education category. Between 2006 and 2008, most of the survey questions were retained(Statistics South Africa, 2009).

From 2009, major revisions were made. This following an extensive consultation with various stakeholders from different government departments. Sections that were revised considerably during the review included education, social development, housing, agriculture, food security and health. For example, from 2005 to 2008, the GHS health related questions asked the respondents found in households "what sort of illness or injuries did an individual suffer from?". From 2009, the new survey question was added for chronic illnesses and was phrased as: "Has the individual been informed by a medical practitioner or nurse that he/she suffers from any of the following illnesses or conditions?" the option was yes, no or unspecified. This new question may have prompted considerably the under reporting of chronic diseases than before. This considering the nature and lack of diagnosis of chronic diseases

3.6 Study population and sample size

The population of interest for this study was all youth aged 15-24 years old in South Africa who were respondents in the surveys from 2005-2015. Youth from all racial groups and provinces were represented in the study. The study sample size was derived from the total number of youth (15-24 years old) that had either diabetes or hypertension and those without. These diseases were chosen based on literature as among the top leading causes of death globally and in South Africa, moreover these NCDs were chosen as the most common among youth from 2005 -2015. The sample size for the study was a weighted distribution of 590 415 (1 011 unweighted) youth with NCDs. 229 162 (367 unweighted) had diabetes and 361 253 (644 unweighted) had hypertension. The data was weighted to make it a national representative of the youth population in South Africa.

3.6 Variables and Variable measure

The dependent and independent variables for this study were found in the 2005-2015 GHS datasets. The variables not needed for this study were dropped from the data sets.

3.6.1 Dependent variable

The study sought to assess the trends prevalence and determinants of youth (15-24 years old) with NCDs in South Africa. For the purpose of this study NCDs will refer to diabetes and hypertension. The dependent variables for the study were NCDs (Diabetes and hypertension). For the NCDs diagnosis, this study combined two questions where respondents were asked whether they had ever self-diagnosed or have been diagnosed by a doctor/nurse/other health care worker or had diabetes or hypertension with any two of the NCDs diabetes or hypertension. The responses in all the 11 surveys were binary, yes or no and they were coded as follows:

Table 3.1 Definition of the dependent variable

Variable name	Response category	Coded as
NCDs (Diabetes or Hypertension)	Refers to whether one has been diagnosed with either diabetes or hypertension in 2005-2015.	0- No diabetes/hypertension 1- Yes Diabetes/hypertension

3.6.2 Independent variables

The independent variables in this study included the socio-demographic characteristics (age, sex, and race, province, type of residence and education), access characteristics (medical aid and grants) and household characteristics (sex of the household head, age of the household head, and method of cooking, main household income source and food security). These variables were selected based on literature and the theoretical framework that underpinned this study. As shown in the conceptual framework, the variables were categorized and defined as follows:

Table 3.2: Definition of the independent variables

Variable Name	Definition	Coding
Socio-demographic factors		
Age	Age in years of the youth.	Recoded as 1. 15-19 years' old 2. 20-24 years old
Sex	Sex of the respondent	1. Male 2. Female
Race	Population group of the respondent	1. African/black 2. Coloured 3. Indian/Asian 4. White 5. Other.
Province of residence	Province of residence for the respondent.	1. Western Cape 2. Eastern Cape 3. Northern Cape 4. Free State 5. KwaZulu-Natal 6. North West 7. Gauteng 8. Mpumalanga 9. Limpopo
Type of residence	Type of residence for the respondent	Recoded as 1. Rural 2. Urban
Education	Highest level of education for the respondent.	Recoded as 1. No education 2. Primary education 3. Secondary education 4. Higher education
Access factors		
Medical aid	Respondents access to medical aid	1. Yes 2. No
Grants	Respondents access to grants (disability, child, care, social or foster grant).	Generated and recoded as 1. Yes 2. No
Household factors		
Sex of the household head	Sex of the respondent's head of household.	1. Male 2. Female
Age of the household head	Age of the respondent's head household.	Recoded as 1. Youth (15-24 years old) 2. Adults (25-64 years old) 3. Elderly (65+)

Household main income source	The main income source for the household	1. Salary 2. Remittances 3. Grants 4. Other sources 5. No income

3.7 Data management

The data was downloaded from the Stats SA website and presented in STATA 15. STATA is statistical software used for analysing quantitative data by researchers. The test of association was done at the 95% confidence interval and at 5% level of significance. The data was analysed according to the sub- objectives of the study. The household and person data were merged separately for each year, thereafter appended as one data set for the analysis.

3.8 Analysis plan

To identify the trends and Prevalence of non-communicable diseases among youth in South Africa (2005-2015), descriptive statistics were used to summarize the socio-demographic characteristics of the study population; frequency and percentage distributions were presented using cross tabulations done and presented in a table. Chi-square test was used to identify significance differences in the type of NCD diagnosis and the selected characteristics. The rates of disease prevalence were estimated using the formula:

$$\frac{number\ of\ youth\ with\ NCDs}{Total\ youth\ population} \times 10{,}000$$

The prevalence rates of being diagnosed with either diabetes or hypertension were done for sex and for each province in South Africa. The provincial prevalence rates were presented graphically on a map generated using excel. This to show the prevalence rates per province. Moreover, a series of graphs such as a line and bar graphs were used to present the trend and the prevalence rates of NCDs from 2005-2015.

To examine the socio-demographic, access and household characteristics of youth with non-communicable diseases in South Africa (2005-2015); binary logistic regression models showing the relationship between diabetes, hypertension and all NCDs with the selected characteristics were done. Both the unadjusted and adjusted were done for each regression model. The formula for logistic regression is as follows:

$$In(y) = In\left(\frac{p(y)}{1-p(y)}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$$

Where: βs are the regression coefficients

$y =$ idependent variable

X = independent variables.

β_0 = intercept of the regression

3.8 Ethical issues

The study used secondary data from the GHS surveys collated by Stats SA, as such the study did not require ethics approval from the University of the Witwatersrand Human Research Ethics Committee. Moreover, no personal information of the respondents was used thus guaranteeing anonymity and confidentiality. Stats SA will be acknowledged as the data source.

CHAPTER FOUR: RESULTS

4.1 Characteristics of the Respondents

Table 4.1: Weighted frequency and percentage distribution of all youth with and without NCDs (15-24 years old) by socio-demographic and access characteristics in South Africa, 2005-2015.

	Frequency	Percentage
Socio-demographic factors		
Total	72595 841	100
Age*		
15-19	36 713 583	52.35
20-24	35 882 258	47.65
Sex*		
Male	36 237 340	49.34
Female	36 358 501	50.66
Race*		
African/Black	60 324 899	84.51
Coloured	6 074 515	9.89
Indian/Asian	1 546 690	1.73
White	4 649 737	3.87
Province*		
Western Cape	7 075 407	9.75
Eastern Cape	9 865 314	12.16
Northern Cape	1 496 629	5.41
Free State	3 983 375	8.03
Kwa-Zulu Natal	14 796 440	18.68
North West	4 718 239	7.85
Gauteng	15 618 500	14.39
Mpumalanga	6 132 067	10.64
Limpopo	8 909 871	13.09
Type of residence*		
Urban	42 563 880	55.30
Rural	30 031 961	44.70
Education level*		
No education	1 688 185	2.29
Primary education	8 876 827	12.71
Secondary education	58 855 331	81.27
Tertiary education	3 175 499	3.73
Access factors		
Medical aid*		
Yes	9 297 568	10.73
No	63 298 274	89.27
Health access *		
Yes	2 214 241	3.62
No	70 381 600	96.38

Grants*		
Yes	9 382 238	13.47
No	63 213 603	86.53
Household factors		
Head of sex		
Male	37 414 007	47.90
Female	35 134 120	52.10
Age of head		
Youth (15-24 years old)	7 431 292	10.26
Adults (25-64 years old)	55 022 229	73.24
Elderly (65+ old)	10 094 607	16.50
Method of cooking		
Electricity	51 641 731	70.07
Other	20 422 751	29.41
None	370 430	0.52
Main income source		
Salary	36 115 883	45.60
Remittances	11 732 150	16.31
Grants	20 549 689	32.42
Other	843 217	4.55
Food security (insufficient)		
Yes	8 534 605	12.42
No	64 013 523	87.58

Table 4.1 shows the profile of the respondents by selected characteristics. from 2005-2015, there was a total of 72 595 841 youth who responded to the GHS surveys. In terms of the socio-demographic factors, about 52% of the respondents were between the ages 15 and 19, while the smallest number of participants were aged between 20 and 24 years old (48%). There were slightly more female respondents (51%) when compared to male respondents (49%). The majority (84%) of the respondents were African/Black youth, 10% were coloureds, 4% White and the least number of respondents were Indian/Asian (2%). Furthermore, the majority (19%) of the respondents were from the KwaZulu-Natal province, while the lowest (5%) number of respondents were from the Northern Cape province. with regards to the type of residence, about 55% of the respondents resided in the urban areas, while 45% resided in the rural areas. Moreover, majority (81%) of the respondents had a secondary level education while the lowest (2%) number of respondents had no education.

Seemingly, in terms of the access factors; majority (89%) of the respondents reported that they were not covered by a medical aid, while the lowest (2%) number of the respondents reported being covered by a medical aid. About 96% of the respondents reported that they had no access to

health facility, while 3% reported having access to a health facility. Majority (87%) of the respondents reported they had not been receiving any type of grant, while the least (13%) number of respondents reported receiving a grant.

In terms of the household factors, more than half (52%) of the respondents reported that they had been living with a female household head, while 48% reported living with a male household head. Majority (73%) of the respondents reported living with a head categorised as an adult (25-64 years old), while the least (10%) number of respondents reported living with a head categorised as a youth (15-24years old). Furthermore, about 70% of the respondents reported that they used electricity as a method of cooking, while no respondents reported they had no method of cooking. About 46% of the respondents reported of the respondents reported that that their household relied on a Salary/wages, while the least (1%) number of respondents reported that they relied on other income sources. lastly, majority (88%) of the respondents reported that they had insufficient access to food, while 12% had enough to food.

4.2 Bivariate Analysis

Table 4.2 weighted frequency and percentage distribution of respondents with / without diabetes per selected socio-demographic, access and household characteristics.

Dependent variable	Diabetes		No Diabetes	
Socio-demographic factors	Frequency	%	Frequency	%
Total	229 162		72 366 680	
Age*				
15-19	96 319	46.32	36 617 265	52.36
20-24	132 384	53.68	35 749 415	47.64
Sex*				
Male	106 108	43.60	36 131 232	49.36
Female	123 054	56.40	36 235 448	50.64
Race*				
African/Black	159 559	70.57	60 165 341	84.56
Coloured	24 347	15.26	6 050 168	9.87
Indian/Asian	3 401	1.91	1 543 289	1.73
White	41 855	12.26	4 607 882	3.84
Province*				
Western Cape	28 230	14.17	7 047 177	9.74
Eastern Cape	23 011	10.63	9 842 303	12.17
Northern Cape	3 724	5.72	1 492 905	5.41
Free State	14 303	8.99	3 969 072	8.02

Kwa-Zulu Natal	39 148	16.89	14 757 292	18.68
North West	11 021	7.36	4 707 218	7.85
Gauteng	82 393	20.98	15 536 107	14.37
Mpumalanga	12 401	7.08	6 119 666	10.65
Limpopo	14 931	8.17	8 894 939	13.10
Type of residence*				
Urban	161 377	63.76	42 402 504	55.28
Rural	67 785	36.24	29 964 176	44.72
Education level*				
No education	8 443	4.63	1 679 741	2.29
Primary education	24 338	11.72	8 852 490	12.71
Secondary education	180 381	76.57	58 674 950	81.28
Tertiary education	16 000	7.08	3 159 499	3.72
Medical aid*				
Yes	49 284	8.45	9 248 284	10.71
No	179 878	91.55	63 118 396	89.29
Health access *				
Yes	176 337	74.93	2 037 904	3.42
No	52 825	25.07	70 328 776	96.58
Grants*				
Yes	17 802	8.72	9 364 437	13.48
No	211 360	91.28	63 002 243	86.52
Household factors				
Total	229162	100	72319317	100
Head of sex*				
Male	145 278	56.95	37 268 729	47.88
Female	83 884	43.05	35 050 588	52.12
Age of Head				
Youth (15-24 years old)	24 816	10.90	7 406 475	10.26
Adults (25-64 years old)	171 149	69.75	54 851 432	73.25
Elderly (65+old)	33 197	19.35	10 061 410	16.49
Method of cooking				
Electricity	180 578	75.75	51 461 505	70.06
Other	48 548	24.25	20 374 167	29.42
None	0	0.00	370 430	0.52
Main income source				
Salary	132 229	47.68	35 984 005	45.60
Remittances	39 959	17.71	11 692 191	16.30
Grants	47 192	29.16	20 502 497	32.43
No income	6 893	3.27	3 300 295	4.56
Food security (insufficient)				
Yes	16 863	8.45	8 518 093	12.43
No	212 299	91.55	63 801 224	87.57

*p<0.05 total for the household factors is different from the socio-demographic and access factors because household factors only include responses from one household irrespective of the number of individuals aged 15-24-year-old.

To identify the prevalence and determinants of diabetes, chi square tests were conducted. The results in table 4.2 shows that the socio-demographic, access factors and Household variables,

however with the exception for the Age of the head of household and main income source were significantly associated with diabetes. From 2005-2015, 229 162 youth aged between 15-24 years reported being diagnosed with diabetes as opposed to the 72 366 680 who reported that they had never been diagnosed with diabetes. A high proportion of the youth aged between 20-24 years old (54%) reported being diagnosed with diabetes when compared to those aged 15-19 years old (46%). More than half (52%) of those who had never been diagnosed with diabetes were aged between 15-19 years old. More than half (52%) of the youth who reported being diagnosed with diabetes were females, while 48% were male.

With regards to race; majority (71%) of the youth who reported being diagnosed with diabetes were African/Black, followed by coloureds (15%) and Indian/Asians reported the least (2%) number of youths who reported being diagnosed with diabetes. Similarly, majority (85%) of the youth who reported they had never been diagnosed with diabetes were African/black and the least number of youth who reported they had never been diagnosed with diabetes were Indian/Asian. This was expected, considering there are more African/black youth when compared to other ethnic groups.

With regards to province, about 21% of the youth who reported being diagnosed with diabetes resided in the Gauteng province, followed by KwaZulu-Natal (17%) and the Western Cape (14%). five percent (5%) of the youth who reported they had never been diagnosed with diabetes were from the Northern Cape, followed by North West (8%). Sixty-four percent (64%) of the youth who reported being diagnosed with diabetes resided in urban area. Forty-five percent (45%) who reported they had never been diagnosed leaved in the rural area. Majority (81%) of the youth who reported being diagnosed with diabetes had secondary education, while 12% had primary education, 7% had tertiary education and 5% had no education. seemingly, a majority (81%) of those with a secondary education, 13% with primary education, 4% with tertiary education and 2% with no education reported they had never been diagnosed with diabetes. This was expected as the high proportion of respondents was within the level of secondary education.

In terms of access factors; a high proportion of youth without access to a medical aid were diagnosed with diabetes (92%) and the least (8%) number of youths with a medical aid had also been diagnosed with diabetes. Similarly, a high proportion of youth without access to a medical aid reported they had never been diagnosed with diabetes (89%) and 11% with medical aid access

had also never been diagnosed with diabetes. seventy-five percent (75) % of youth who had been diagnosed with diabetes reported having access to a healthcare facility while 25% who had no access to a medical health facility also reported being diagnosed with diabetes. Ninety-six percent (96%) who had no access to a medical health facility reported they had never been diagnosed with diabetes, while 3% of those with access to a medical health facility reported they had also never been diagnosed with diabetes. More than ninety percent (91%) of the youth with no access to grants reported being diagnosed with diabetes, while 9% of those who reported they had access were also diagnosed with diabetes. eighty-six percent (86%) of those with no access to grants reported they had never been diagnosed with diabetes.

In terms of the household factors; majority (57%) of the youth who reported being diagnosed with diabetes lived in a male headed household, while 43% of those who reported living in a female headed household were also diagnosed with diabetes. Fifty-two percent (52%) of the youth who reported living in a female headed household reported they had never been diagnosed with diabetes. Seventy percent (70%) of youth who reported being diagnosed with diabetes lived with a household head categorised as an Adult, while 19% lived an elderly head and 11% lived with a head categorised as youth. Similarly, majority (73%) of the youth who reported they had never been diagnosed with diabetes live with a head categorised as an Adult, while 10% reported living with a head categorised as youth.

with regards to the method of cooking; Majority (76%) of the youth who had reported being diagnosed with diabetes relied on electricity, 24% relied on other methods such as gas, wood, coal and animal dung and none relied on no methods of cooking. Seventy percent (70%) of those who reported they had never been diagnosed with diabetes relied on electricity and about 0.5% relied on no methods of cooking. Forty-eight percent (48%) of the youth who reported being diagnosed with diabetes indicated that their households relied on salary/ 29% relied on grants,2% relied of other sources. Forty-six percent (46%) of the youth who reported they had never been diagnosed with diabetes indicated their households relied on a Salary/wage and 1% reported their households relied on other sources of income. Lastly, Majority (92%) of the youth who were diagnosed with diabetes reported their households had insufficient food and 8% had enough foods. similarly, 88% who reported they had never been diagnosed with diabetes had insufficient food and 12% had enough food.

4.2 Estimation of the Prevalence of hypertension

Table 4.3: Weighted frequency and percentage distribution of all youth (15-24 years old) with and without hypertension by socio-demographic, access and household characteristics in South Africa, 2005-2015.

Dependent variable	Hypertension		No Hypertension	
Socio-demographic	Frequency	%	Frequency	%
Total	361 253		72 234 237	
Age*				
15-19	9 682	29.97	36 616 549	52.46
20-24	264 571	70.03	35 617 688	47.54
Sex*				
Male	104 882	28.88	36 132 106	49.44
Female	256 370	71.12	36 102 131	50.56
Race*				
African/Black	284 289	78.88	60 040 258	84.55
Coloured	34 614	13.35	6 039 900	9.87
Indian/Asian	6 067	1.55	1 540 623	1.73
White	36 282	6.21	4 613 456	3.85
Province*				
Western Cape	33 955	9.94	7 041 452	9.75
Eastern Cape	33 422	9.16	9 831 891	12.18
Northern Cape	12 910	8.70	1 483 719	5.40
Free State	32 582	19.98	3 950 793	8.00
Kwa-Zulu Natal	54 819	13.66	14 741 269	18.70
North West	30 261	9.94	4 687 978	7.84
Gauteng	100 172	14.91	15 518 328	14.39
Mpumalanga	35 245	11.96	6 096 822	10.63
Limpopo	27 886	7.76	8 881 985	13.12
Type of residence*				
Urban	233 673	60.09	42 329 857	55.28
Rural	127 580	39.91	29 904 381	44.72
Education level*				
No education	7 644	2.95	1 680 541	2.29
Primary education	40 629	12.11	8 836 198	12.71
Secondary education	291 274	80.12	58 563 705	81.27
Tertiary education	21 706	4.81	3 153 793	3.73
Medical aid*				
Yes	44 206	10.40	9 253 362	10.73
No	317 047	89.60	62 980 876	89.27
Grants*				
Yes	20 693	5.75	9 361 546	13.51
No	340 560	94.25	62 872 691	86.49
Household factors				
Total	361 253	100	72 186 875	
Head of sex *				
Male	201 922	50.16	37 212 085	47.89
Female	159 330	49.84	34 974 790	52.11
Age of head				

Youth (15-24 years old)	67 791	19.25	7 363 501	10.22
Adults (25-64 years old)	257 365	67.70	54 764 763	73.27
Elderly (65+ old)	35 997	13.04	10 058 610	16.52
Method of cooking*				
Electricity	269 140	70.81	51 372 591	70.07
Other	90 475	28.73	20 332 276	29.41
None	16 378	0.47	368 792	0.52
Main income source				
Salary	208 045	48.29	35 907 838	45.59
Remittances	56 759	17.08	11 675 391	16.31
Grants	82 855	29.66	20 466 834	32.43
Other	2 632	1.24	840 585	1.12
No income	10 962	3.73	3 296 227	4.56
Food security (insufficient)				
Yes	43 184	12.58	8 491 420	12.42
No	318 068	87.42	63 695 454	87.58

*p<0.05 total for the household factors is different from the socio-demographic and access factors because household factors only include responses from one household irrespective of the number of individuals aged 15-24 years' old

To identify the prevalence and determinants of hypertension, chi square tests were conducted. The result in table 4.3 shows that the socio-demographic, access and Household variables, this with the exception for the Age of the head of household, main income source and food security was significantly associated with hypertension. From 2005-2015, 361 253 youth aged between 15-24 years reported being diagnosed with hypertension as opposed to the 72 234 237 680 who reported that they had never been diagnosed with hypertension. This indicated that there was a high proportion of the number of youths who were diagnosed with hypertension when compared to diabetes. A high proportion of the youth aged between 20-24 years old (70%) reported being diagnosed with hypertension when compared to those aged 15-19 years old (30%). More than half (52%) of those who had never been diagnosed with hypertension were aged between 15-19 years old. The majority (71%) of the youth who reported being diagnosed with hypertension were females, while 48% were male. seemingly, 51% who reported they had never been diagnosed with hypertension were females and 49% were males.

With regards to race; majority (79%) of the youth who reported being diagnosed with hypertension were African/Black, 13% were coloureds, 6% were white and 2% were Indian/Asians. Similarly, majority (85%) of the youth who reported they had never been diagnosed with hypertension were African/black and the least (2%) number of youth who reported they had never been diagnosed

with hypertension were Indian/Asian. This was expected, considering there are more African/black youth when compared to other ethnic groups.

With regards to province, about 20% of the youth who reported being diagnosed with diabetes resided in the Free State province, followed by Gauteng (15%) and the KwaZulu-Natal province (14). This was contrary to the number of youths who were diagnosed with diabetes. The Northern Cape (5%) and the North West province (8%), also reported the lowest number of youths who had never been diagnosed with hypertension, while KwaZulu Natal (19%) and the Gauteng province (14%) reported the highest proportion of youth who had never been diagnosed with hypertension.

With regards to the type of residence; Sixty percent (60%) of the youth who reported being diagnosed with hypertension resided in the urban areas. forty-five percent (45%) who reported they had never been diagnosed with hypertension resided in the rural area. Majority (80%) of the youth who reported being diagnosed with hypertension had secondary education, while 12% had primary education, 5% had tertiary education and 3% had no education. Seemingly, the majority (81%) of those with a secondary education, 13% with primary education, 4% with tertiary education and 2% with no education reported they had never been diagnosed with hypertension. This was expected as the high proportion of respondents were within the level of secondary education.

In terms of access factors; a high proportion of youth without access to a medical aid reported being diagnosed with hypertension (90%) and 10% were also diagnosed. Similarly, a high proportion of youth without access to a medical aid reported they had never been diagnosed with hypertension (89%) and 11% with medical aid access had also never been diagnosed. More than ninety percent (94%) of the youth with no access to grants reported being diagnosed with hypertension, while 6% of those who reported they had access were also diagnosed. Eighty-seven percent (87%) of those with no access to grants reported they had never been diagnosed with hypertension.

In terms of the household factors; A fifty-fifty (50/50) split of the youth who reported being diagnosed with hypertension lived in both a female and a male headed household. Fifty-two percent (52%) of the youth who reported living in a female headed household reported they had never been diagnosed with hypertension, while 48% who lived in a male headed household also reported they had never been diagnosed with hypertension. Sixty-seven (67%) of the youth who

reported being diagnosed with hypertension lived with a household head categorised as an Adult, while 19% lived with a head categorised as a youth and 13% lived with a head categorised as elderly. Seemingly, the majority (70%) of the youth who reported they had never been diagnosed with hypertension live with a head categorised as an Adult, while 17% reported living with a head categorised as elderly and 10% lived with a head categorized as youth

With regards to the method of cooking; Majority (71%) of the youth who had reported being diagnosed with hypertension relied on electricity and 29% relied on other methods such as gas, wood, coal and animal dung. Seventy percent (70%) of those who reported they had never been diagnosed with hypertension relied on electricity and about 0.5% relied on no methods of cooking. Forty-eight percent (48%) of the youth who reported being diagnosed with hypertension indicated that their households relied on salary, 30% relied on grants, 11% relied on remittances and 1% relied of other sources. Forty-six percent (46%) of the youth who reported they had never been diagnosed with hypertension indicated their households relied on a Salary/wage and 1% reported their households relied on other sources of income. Lastly, Majority (87%) of the youth who were diagnosed with hypertension reported their households had insufficient food and 13% had enough foods. About 88% who reported they had never been diagnosed with hypertension had insufficient food and 12% had enough food.

4.3 Descriptive characteristics of youth with NCDs (Diabetes/hypertension)

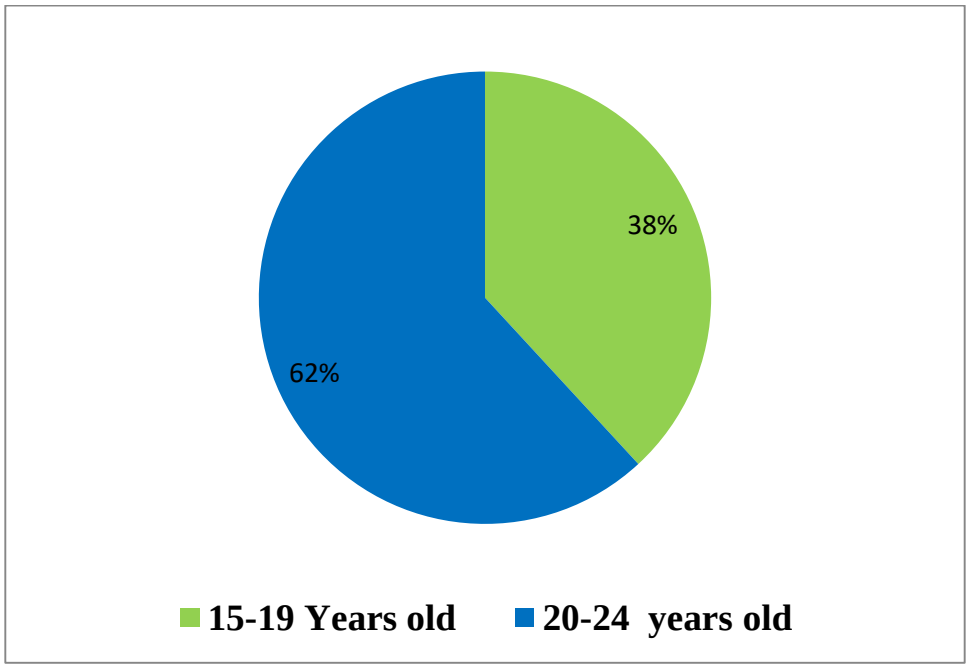


Figure 4.1: proportion of the Age group distribution showing the prevalence of NCDs (diabetes/hypertension) among youth in in South Africa, 2005-2015

Figure 4.1 shows that a high proportion (62%) of youth aged between 20-24 years reported being diagnosed with NCDs when compared to those aged between 15-19 years at 38%.

4.4 Descriptive characteristics showing the Prevalence of NCDs (diabetes and hypertension) by sex among youth in South Africa.

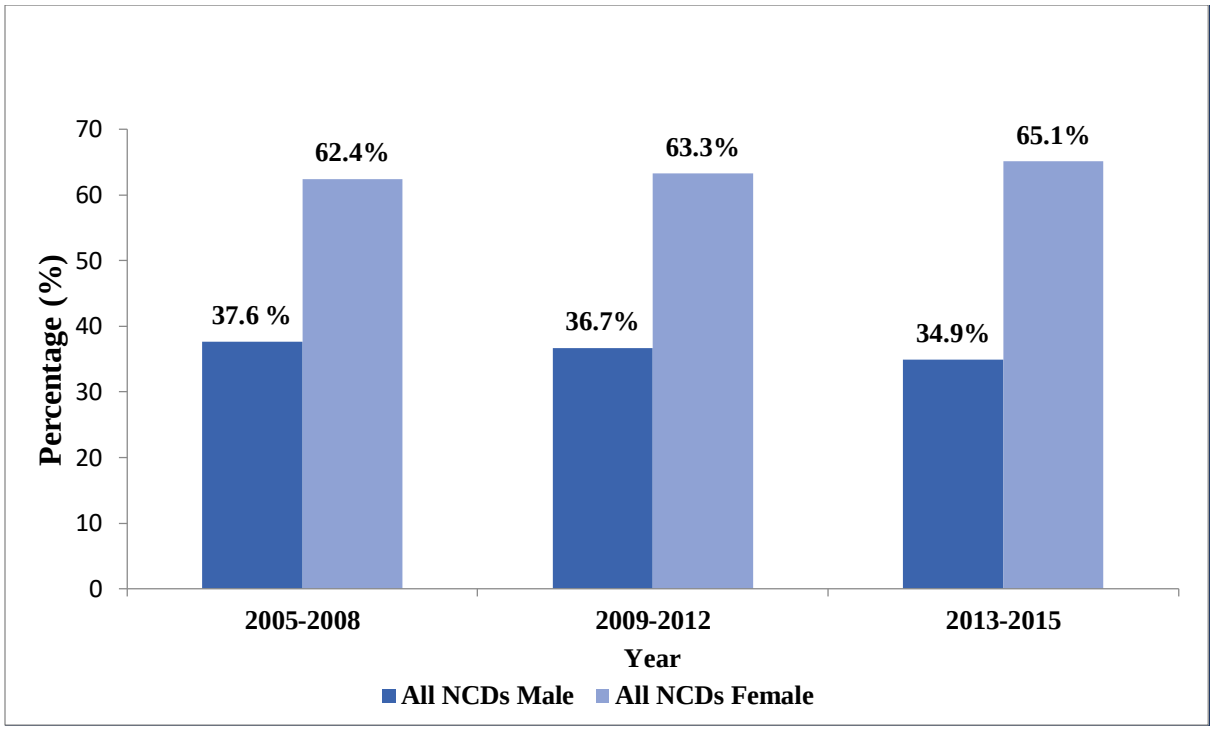


Figure 4.2 the prevalence of NCDs (diabetes and hypertension) among youth by sex in South Africa over time, 2005-2015

Figure 4.2 shows the proportion of all NCDs among youth (15-24 years old) by sex in South over time. The figure shows that in all three time periods, females had the highest proportion of NCDs when compared to their male counter parts. Seemingly, for males the prevalence decreased over time from 37.6% in 2005-2008 to 34.9% in 2013-2015. Whereas, for females the percentage levels increased from 62.4 in 2005-2008 to 65.1 in 2013-2015.

4.5 Estimation of the prevalence rate for NCDs (Diabetes / hypertension)

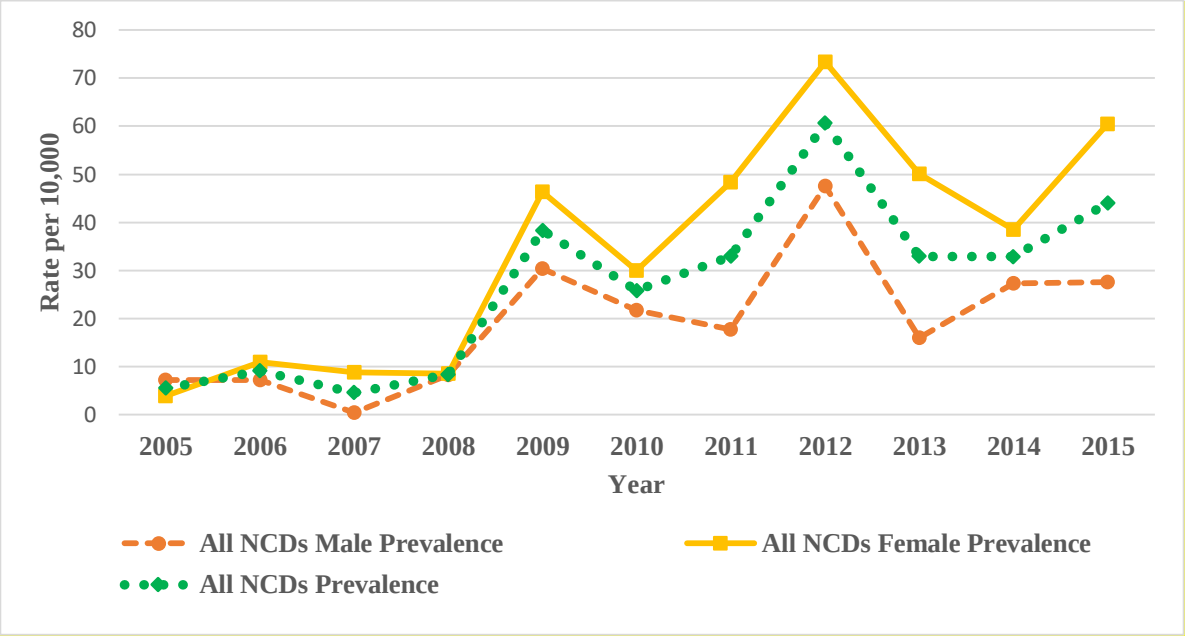


Figure 4.3: Trend showing prevalence rate (per 10 000) of all NCDs by sex among youth aged 15-24 years in South Africa, 2005-2015.

Figure 4.3 above indicates the trend highlighting the prevalence rate of NCDs by sex among youth in South Africa from 2005-2015. The prevalence rate of NCDs among males, females and the total prevalence rate had been inconsistent. During the current reporting period, the results show that the prevalence rate was higher among females when compared to males and the total prevalence. In 2005, the prevalence rate for males began at 7 NCDs diagnosis per 10, 000 male youth. The trend indicated that the prevalence rate for males increased peaking for the first time in 2009 at about 30 NCDs diagnosis per 10,000 male youth. This was followed by a decline which saw the prevalence below 25 NCDs diagnosis, this was until the year 2011 where the prevalence peaked for the second time and stood at 47 NCDs diagnosis per 10,000 male youth. However, following this, there was again a considerable decline in 2013 to about 16 NCDs diagnosis per 10,000 male youth. This was followed by an increase for both 2014 and 2015 at 27.3 and 27.5 NCDs diagnosis per 10,000 male youth respectively. Although the prevalence rate had been inconsistent, the figure does highlight an increase in the prevalence rate of NCDs among males.

For females, at the starting point, figure 4.3 shows that the prevalence rate was at about 4 NCDs diagnosis per 10, 000 female youth. This was the lowest prevalence rate when compared to both the males and the total prevalence rate. Following this, the female prevalence rate remained somewhat unstable, then it peaked for the first time in 2009 at about 46 NCDs diagnosis per 10,000 female youth, this was high compared to the male prevalence. Following this, it declined in 2010 to about 29 NCDs diagnosis per 10,000 female youth, and then there was a considerable increasing from 2011 to 2012. This resulted in its second and highest peak ever recorded in 2012 at about 73 NCDs diagnosis per 10,000 female youth. Subsequently, there was again a considerable decline from 2013 to 2014 at about 50 and 38 NCDs diagnosis per 10,000 female youth respectively. Then it increased in 2015 to about 60 NCDs diagnosis per 10,000 female youth. Like the male prevalence rate, although the prevalence rate had been inconsistent over time, the figure shows that the prevalence rate for female was the highest and it had increased over time.

Furthermore, a similar trend is observed for the total prevalence rate. Between 2005-2015 the prevalence rate had been inconsistent. At the starting point, the total prevalence rate was recorded at about 5 NCDs diagnosis per 10,000 youth population. Subsequently it was unstable, then like both the female and male prevalence it peaked for the time in 2009 at about 38 NCDs diagnosis per 10,000 youth population, this was slightly lower than the female prevalence but higher than the male prevalence rate.

Following this, it declined in 2010 to about 26 NCDs diagnosis per 10,000 youth population, and then there was a considerable increase from 2011 to 2012. This resulted in its second and highest peak in 2012, although lower than the female prevalence rate it was higher than the male prevalence rate at about 60 NCDs diagnosis per 10,000 youth population. Subsequently, there was again a considerable decline from 2013 to 2014 at about 34 and 32 NCDs diagnosis per 10,000 youth population respectively. Then it increased in 2015 to about 44 NCDs diagnosis per 10,000 youth population, this again was lower than the female prevalence but higher than the male prevalence. Like both the female and the male prevalence rate, although the prevalence rate had been inconsistent over time, the figure shows that the prevalence rate for the total prevalence had increased over time.

4.6 Estimation of the prevalence rate for Diabetes

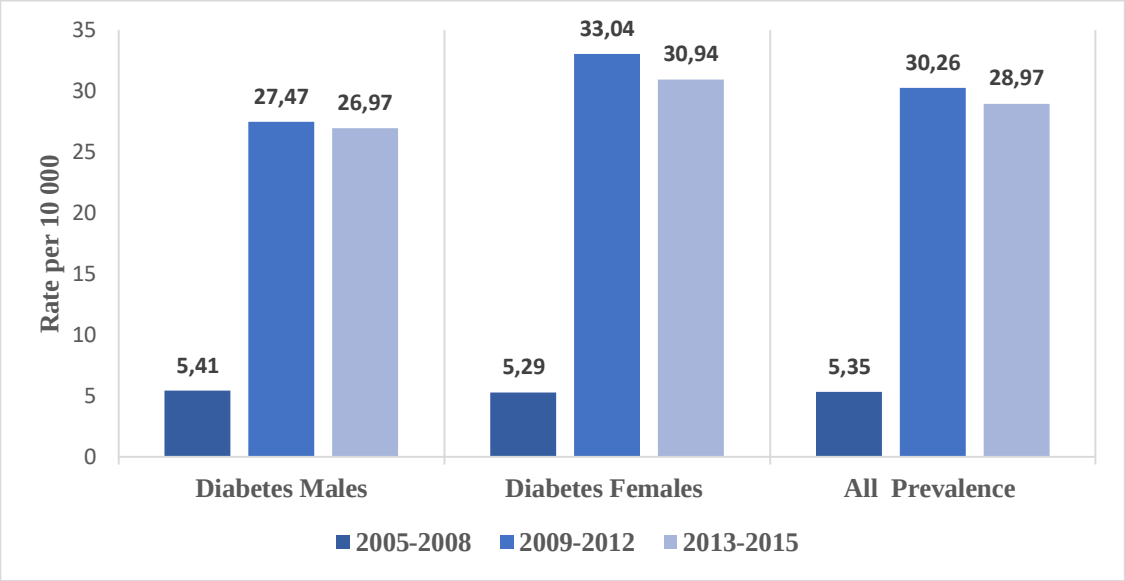


Figure 4.4: Trend showing prevalence rate (per 10,000) of diabetes by sex among youth aged 15- 24 in South Africa, 2005-2015.

Figure 4.4 shows the prevalence rate of diabetes by sex per 10,000 youth aged 15-24 in South Africa, from 2005-2015.During the current reporting period, the prevalence rate for youth diagnosed seemed to be fluctuating for both females and males. The, however it found to be higher for females with an exception for the 2005-2008 period. For males with diabetes, the figure shows that the diabetes prevalence rate was lowest between the 2005-2008 periods at about 5.4 diabetes diagnoses per 10,000 male youth, however it was high when compared to the female and the total diabetes prevalence rate. Seemingly, the diabetes prevalence rate increased between the 2009-2012 periods to about 27.5 diabetes diagnosis per 10,000 male youth. This was the highest diabetes prevalence rate for males. Subsequently, the diabetes prevalence rate for males then slightly decreased to about 26.9 diabetes diagnosis per 10,000 male youth between 2012-2015.

Similarly, for females with diabetes, the figure shows that the diabetes prevalence rate was lowest between the 2005-2008 periods at about 5.3 diabetes diagnosis per 10,000 female youth, it was slightly lower when compared to males and the total prevalence rate. Following this, the prevalence rate increased considerably between the 2009-2012 periods to about 33.0 diabetes

diagnosis per 10,000 male youth. Subsequently, the prevalence rate for females then slightly decreased to about 30.9 diabetes diagnosis per 10,000 male youth between 2012-2015.

Furthermore, for the total diabetes prevalence rate, figure 4.4 shows the total diabetes prevalence rate was similarly lowest between the 2005-2008 periods at about 5.3 diabetes diagnosis per 10, 000 youth population. This was lower than the male prevalence rate but high when compared to the female prevalence rate. This was similarly by a considerable increase at about 30.3 diabetes diagnosis per 10,000 youth population between the 2009-2012 periods. Subsequently, there was a slight decrease to about 29 diabetes diagnoses per 10,000 youth population.

4.7 Estimation of the prevalence rate for hypertension

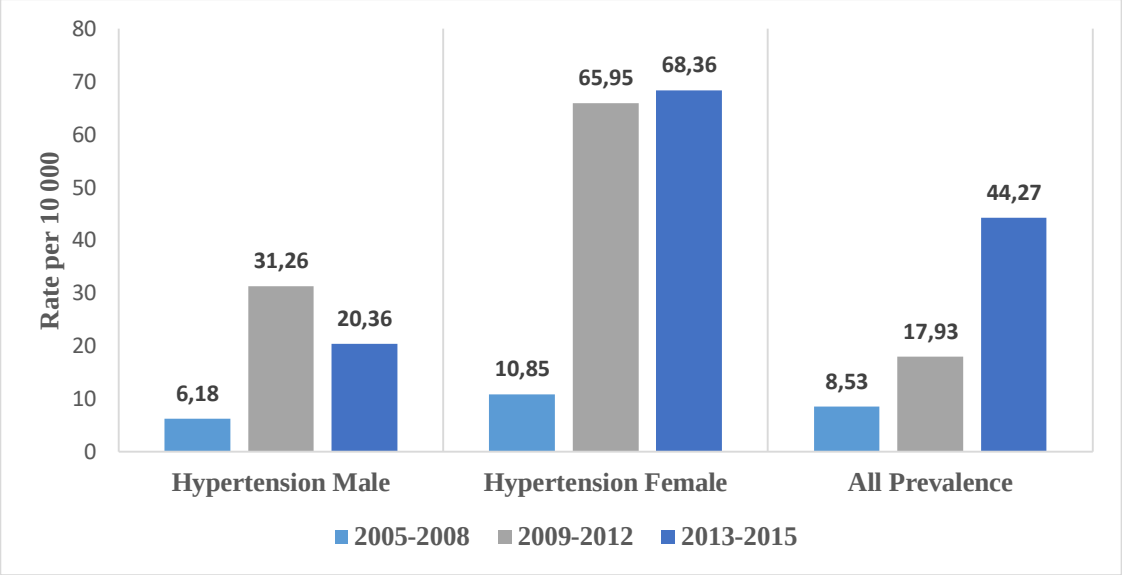


Figure 4.5: Trend showing prevalence rate (per 10,000) of hypertension by sex among youth aged 15- 24 in South Africa, 2005-2015.

Figure 4.5 above shows the prevalence rate of hypertension by sex per 10,000 youth aged 15-24 in South Africa, from 2005-2015. Figure 4.5 shows that throughout the three time periods, the prevalence rate for hypertension had been fluctuating for males and increasing for females. Moreover, the prevalence rate was highest for females and lowest for males when compared to the total hypertension prevalence rate. For males with hypertension, the figure shows that the prevalence rate was lowest between the 2005-2008 periods at about 6.2 hypertension diagnosis per 10,000 male youth, this was the lowest prevalence rate when compared to the female and the total hypertension prevalence rate. Subsequently, the prevalence rate for males increased between the

2009-2012 periods to about 31.3 hypertension diagnoses per 10,000 male youth. This was higher than the prevalence rate for diabetes in figure 4.4, thus highlighting that in 2009-2012; hypertension had a high prevalence rate when compared to diabetes among male youth. Seemingly, the prevalence rate then decreased to about 20.4 hypertension diagnosis per 10,000 male youth between 2012-2015. This was lower than the prevalence rate for diabetes in figure 4.4, thus highlighting that in 2013-2015; hypertension had a low prevalence rate when compared to diabetes among male youth.

Contrary to this trend, for females with hypertension the figure shows that the hypertension prevalence rate was lowest between the 2005-2008 periods at about 10.9 hypertension diagnosis per 10,000 female youth. This was higher when compared to the diabetes prevalence rate in figure 4.4. Subsequently, the prevalence rate for females increased between the 2009-2012 periods to about 66 hypertension diagnoses per 10,000 female youth. This was higher than the prevalence rate for diabetes in figure 4.4, thus highlighting that in 2009-2012; hypertension had a high prevalence rate when compared to diabetes among female youth. Seemingly, the prevalence rate further increased to about 68.4 hypertension diagnosis per 10,000 female youth between 2013-2015. This was higher when compared to the diabetes prevalence rate in figure 4.4, thus highlighting that in 2013-2015; hypertension had a high prevalence rate when compared to diabetes among female youth.

Furthermore, for the total hypertension prevalence rate, the table shows that like the female prevalence rate. The prevalence rate increased in all three periods. The figure shows that the hypertension prevalence rate was lowest between the 2005-2008 periods at about 8.53 hypertension diagnosis per 10,000 female youth. This was higher when compared to the diabetes prevalence rate in figure 4.4, thus highlighting that in 2005-2008 the prevalence rate for hypertension was high when compared to the diabetes prevalence. Subsequently, the prevalence rate for females increased between the 2009-2012 periods to about 17.9 hypertension diagnoses per 10,000 female youth. This was lower than the prevalence rate for diabetes in figure 4.4, thus highlighting that in 2009-2012, hypertension had a low prevalence rate when compared to diabetes among the youth population. Seemingly, the prevalence rate further increased to about 44.27 hypertension diagnosis per 10,000 female youth between 2012-2015. This was higher when

compared to the diabetes prevalence rate in figure 4.4, thus highlighting that in 2012-2015, hypertension had a high prevalence rate when compared to diabetes among the youth population.

4.8 Prevalence rate of NCDs among youth across South African provinces

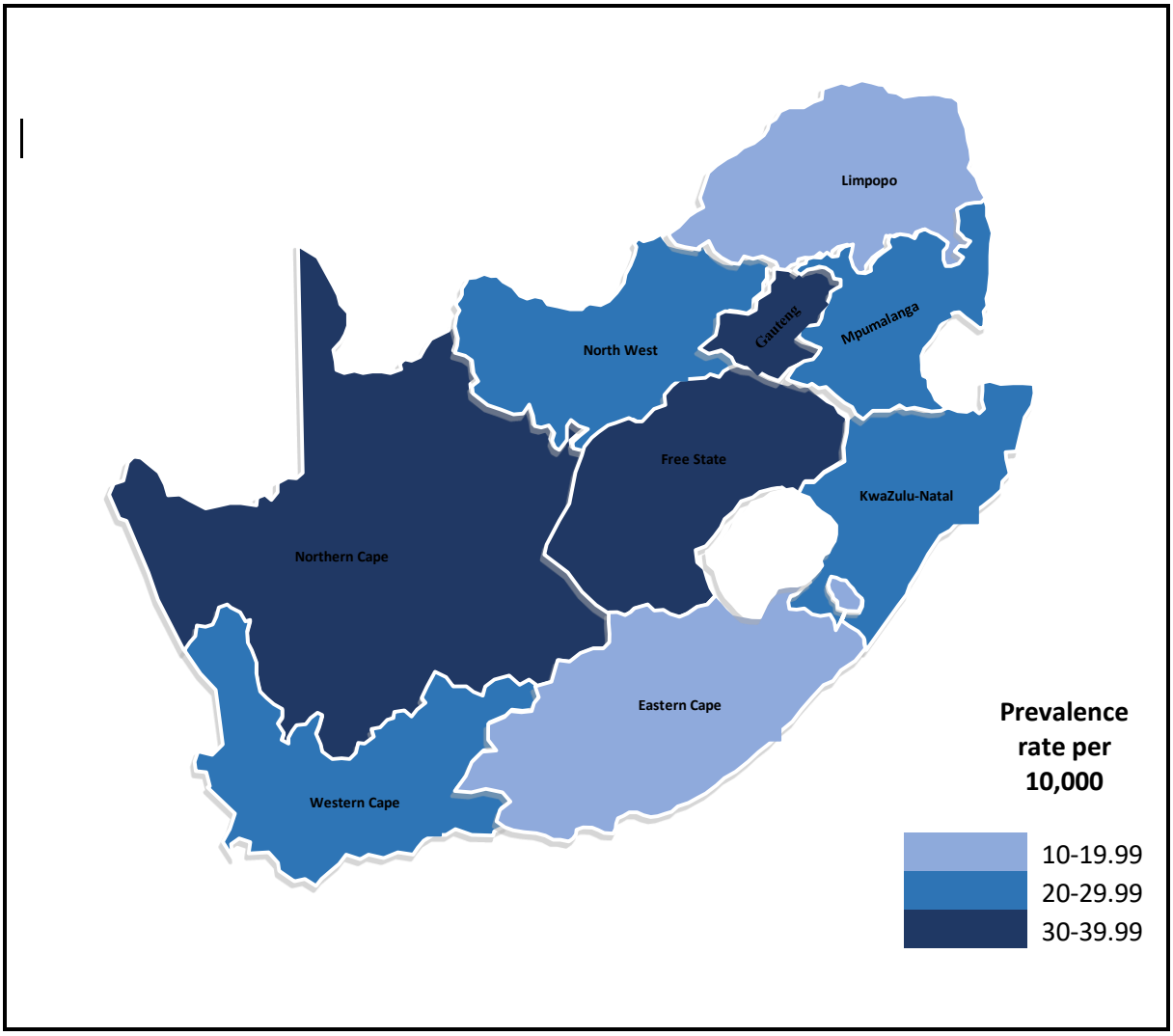


Figure 4.6: Map showing prevalence rate of NCDs (per 10,000) in all nine provinces of South Africa, 2005-2015

Figure 4.6 maps the rate of being diagnosed with NCDs per 10, 000 South Africa youth aged 15-24 years old across the nine provinces. The figure shows that across South African provinces, Gauteng, Northern Cape and Free State had the highest prevalence rate of NCDs (30-39.99 per 10,000 youth) in South Africa. Subsequently, the Western Cape, North West, KwaZulu Natal and Mpumalanga had the second highest prevalence rate. The Eastern Cape and Limpopo had the lowest prevalence of NCDs (10-19.99 per 10,000 youth) in South Africa.

4.9 Unadjusted and adjusted binary logistic regression on Diabetes

Table 4.5: Unadjusted and Adjusted binary logistic regression models producing odds ratios showing the association between diabetes and the selected characteristics among youth in South Africa, 2005-2015.

	Unadjusted Diabetes			Adjusted Diabetes		
	Odds ratio	**P-value**	**95% CI**	**odds ratio**	**P-value**	**95% CI**
Socio-demographic Factors						
Age group						
15-19 Years (RC)	1,00			1.00		
20-24 Years	1.27**	0.02	1.04-1.56	1.18	0.15	0.94-1.47
Gender						
Male (RC)	1.00			1.00		
Female	1.26**	0.03	1.03-1.55	1.31**	0.01	1.60-1.61
Race						
African/Black (RC)	1.00			1.00		
Coloured	1.85**	0.00	1.39-2.47	1.91**	0.00	1.29-2.83
Indian/Asian	1.32	0.47	0.63-2.81	1.17	0.70	0.53-2.57
White	3.82**	0.00	2.78-5.25	3.00**	0.00	2.01-4.46
Province						
Western Cape (RC)	1.00			1.00		
Eastern Cape	0.60**	0.02	0.40-0.91	0.89	0.64	0.55-1.45
Northern Cape	0.73	0.22	0.44-1.21	0.90	0.68	0.54-1.50
Free State	0.77	0.24	0.50-1.19	1.19	0.50	0.72-1.96
KwaZulu-Natal	0.62**	0.01	0.43-0.90	1.00	1.00	0.63-1.59
North West	0.64	0.06	0.40-1.03	0.97	0.90	0.57-1.66
Gauteng	1.00	0.98	0.71-1.43	1.41	0.11	0.93-2.14
Mpumalanga	0.46**	0.00	0.29-0.73	0.71	0.22	0.41-1.23
Limpopo	0.43**	0.00	0.27-0.67	0.65	0.13	0.37-1.13
Type of residence						
Urban (RC)	1.00			1.00		
Rural	0.70**	0.00	0.57-0.87	1.15	0.35	0.85-2.55
Education						
No education (RC)	1.00			1.00		
Primary education	0.45**	0.01	0.26-0.80	0.53**	0.03	0.30-0.94
Secondary education	0.46**	0.00	0.28-0.76	0.43**	0.00	0.26-0.70
Tertiary education	0.94	0.84	0.51-1.73	0.63	0.15	0.33-1.18
Access						
Medical Aid						
Yes (RC)	1.00			1		
No	0.55**	0.00	0.42-0.71	0,87	0,42	0.62-1.21

Grants						
Yes (RC)	1.00			1,00		
No	1.63**	0.01	1.14-2.35	1,36	0,12	0.92-2.01
House hold factors						
Sex of head						
Male (RC)	1,00			1,00		
Female	0,69**	0,00	0.57-0.85	0,78**	0,03	0.63-0.97
Age of Head						
Youth (RC)	1,00			1,00		
Adults	0,90	0,52	0.64-1.25	0,95	0,75	0.66-1.34
Elderly	1,10	0,62	0.75-1.63	1,39	0,13	0.91-2.15
Cooking method						
Electricity (RC)	1,00			1,00		
Other	0,76**	0,03	0.60-0.97	0,98	0,87	0.74-1.29
None	1,00			1,00		
Income source						
Salary/Wages (RC)	1,00			1,00		
Remittances	1,04	0,79	0.78-1.38	1,35	0,05	1-1.82
Grants	0,86	0,22	0.68-1.09	1,15	0,36	0.85-1.55
Other	1,87	0,08	0.92-3.81	1,97	0,06	0.97-4.02
No income	0,69	0,21	0.38-1.23	0,89	0,70	0.49-1.61
Food security(insufficient)						
Yes (RC)	1,00					
No	1,54**	0,02	1.07-2.22	1,38	0,10	0.94-2.01

RC denotes reference category, **p<0, 05 represents results at 95% level confidence, CI= Confidence Interval

Table 4.5 shows the results from the unadjusted and the adjusted binary logistic regression models depicting the association between diabetes and the selected characteristics from 2005-2015. In terms of the socio-demographic factors, age was found to be statistically significant (p-value<0.05) for the unadjusted regression model and statistically insignificant for the adjusted regression model (p>0.05). The results from the unadjusted regression model found that youth aged between 20-24 years old were 1.27 times more likely to be diagnosed with diabetes when compared to youth aged between 15-19 years old[OR=1.27; CI: 1.04-1.56].The results from the Adjusted regression model found that while controlling for other variables in the model, the odds slightly decreased and youth aged between 20-24 years were now 1.18 times more likely to be diagnosed with diabetes when compared to youth aged between 15-19 years old [AOR=1.18; CI:0.94-1.47].

Gender was found to be statistically significant (p-value<0.05) for both the unadjusted and the adjusted regression models. The results from the unadjusted regression model found that females

were 1.26 times more likely to be diagnosed with diabetes when compared to males [OR=1.26; CI: 1.03-1.155]. The results from the adjusted regression model found that while controlling for other variables in the model, the odds slightly increased and females were now 1.31 times more likely to be diagnosed with diabetes when compared to males [AOR=1.31; CI: 1.60-1.61].

With regards to race; being coloured and white was found to be statistically significant (p-value<0.05) for both the unadjusted and adjusted regression models. The results from the unadjusted regression model found that Coloured youth were 1.85 times more likely to be diagnosed with diabetes when compared to African/black Youth [OR=1.85; CI: 1.39-2.47]. White youth were 3.82 times more likely to be diagnosed with diabetes when compared to African/black youth [OR=3.82; CI; 2.78-5.25]. Subsequently, the results from the adjusted regression model found that while controlling for other variables in the model, the odds increased, and Coloured youth were now 1.91 times more likely to be diagnosed with diabetes when compared to African/black youth [AOR=1.91; CI: 1.29-2.83]. For White youth, the odds decreased, and they were now 3.00 times more likely to be diagnosed with diabetes when compared to African/black youth [AOR=3.00; CI: 2.01-4.46]. Although found to be statistically insignificant (p-value>0.05) for both the unadjusted and adjusted regression models, Indian /Asian youth were found more likely to be diagnosed with diabetes when compared to African/Black youth.

With regards to province of residence; Eastern Cape, KwaZulu Natal, Mpumalanga and Limpopo were found to be statistically significant for the unadjusted regression model and statistically insignificant for the adjusted regression model (p-value<0.05). The unadjusted regression model found that youth from the Eastern Cape [OR=0.60; CI: 0.40-0.91], KwaZulu Natal [OR=0.62; CI: 0.43-0.90], Mpumalanga [OR=0.46; CI: 0.29-0.73] and Limpopo [OR=0.43; CI: 0.27-0.67] were less likely to be diagnosed with diabetes when compared to youth in the Western Cape province. Subsequently, the adjusted regression model found that while controlling for other variables in the model, the youth residing in these four provinces remained less likely to be diagnosed with diabetes when compared to youth residing in the Western Cape. Furthermore, the adjusted regression model found that youth residing in the Free State [AOR= 1.19; CI: 0.72-1.96] and the Gauteng province AOR=1.41; CI: 0.93-2.14] bared the increased odds of being diagnosed with diabetes when compared to youth in the Western cape province.

Place of residence was found to be statistically significant (p-value<0.05) for the unadjusted regression model and statistically insignificant for the adjusted regression model. The unadjusted regression model found that youth residing in the rural areas were less likely to be diagnosed with diabetes when compared to those residing in the urban areas [OR=0.70; CI: 0.57-0.87]. Inversely, the adjusted regression model found that while controlling for other variables in the model, the odds increased and youth residing in the rural areas were now 1.15 times more likely to be diagnosed with diabetes when compared to those who resided in the urban areas [AOR=1.15; CI:0.85-2.55].

Primary and secondary education were found to be statistically significant (p-value<0.05) for both the unadjusted and adjusted regression models. The unadjusted regression model found that youth with a primary [OR=0.45; CI: 0.26-0.80] and secondary level education [OR=0.46; CI: 0.28-0.76] were less likely to be diagnosed with diabetes when compared to youth with no education. Similarly, the adjusted regression model found that while controlling for other variables in the model, although the odds increased, youth with a primary [AOR=0.53; CI: 0.30-0.94] and secondary level education [AOR=O.43; CI: 0.26-0.70] remained less likely to be diagnosed with diabetes when compared to those with no education.

In terms of the access characteristics, medical aid was found to be statistically significant for the unadjusted regression model and statistically insignificant for the adjusted regression model. The unadjusted regression model found that youth who reported having no medical aid were 0.55 times less likely to be diagnosed with diabetes when compared to those who had a medical aid [OR=0.55; CI:0.4-0.71]. Similarly, the adjusted model found that while controlling for other variables, although the odds slightly increased. Youth who reported having no medical aid remained less likely to be diagnosed with diabetes when compared to youth with a medical aid access [AOR=0.87; CI:0.62-1.21].

Access to grants was found to be statistically significant for the unadjusted regression model and statistically insignificant for the adjusted regression model. The unadjusted regression model found that youth who reported not receiving a grant were 1.63 times more likely to be diagnosed with diabetes when compared to those who received a grant [OR=1.63; CI: 1.14-2.35]. Subsequently, the adjusted regression model found that while controlling for other variables in the model, although the odds decreased. Youth who reported not receiving a grant were still found

more likely to be diagnosed with diabetes when compared to those who received a grant [AOR=1.36; C: 0.92-2.01].

In terms of household factors, sex of the head was found to be statistically significant (p-value=0.00) for both the unadjusted and the adjusted regression models -. The unadjusted regression model found that youth whose sex of the head was female were 0.69 times less likely to be diagnosed with diabetes when compared to youth whose sex of the head was male [OR=0.69; CI: 0.57-0.85]. Similarly, the adjusted regression model found that while controlling for other variables in the model, although the odds slightly increased. Youth who reported living in a female headed household were 0.78 times less likely to be diagnosed with diabetes when compared to youth whose reported living in a male headed household [AOR=0.78; CI:0.63-0.97].

Age of the head was found to be statistically insignificant for both the unadjusted and the adjusted regression models. The results from the unadjusted regression model found that youth whose head was categorized as an elderly were 1.10 times more likely to be diagnosed with diabetes when compared to youth whose head was categorized as youth [OR=1.10; CI:0.75-1.63]. Inversely, the adjusted regression model found that while controlling for other variables in the model the odds increased. And youth increased and youth whose head was categorised as an elderly was still more likely to be diagnosed with diabetes when compared to those whose head was categorized as youth [AOR=1.39; CI:0.91-2.15].

Cooking methods was found to be statistically significant (p-value<0.05) for the unadjusted regression model and statistically insignificant for the adjusted regression model. The results from the unadjusted regression model found that youth whose household used other cooking methods were 0.76 less likely to be diagnosed with diabetes when compared to youth whose household used electricity [OR=0.76; CI: 0.60-0.97]. The adjusted regression model found that while controlling for other variables increased the odds, youth who used other cooking methods had almost the same odds of being diagnosed with diabetes when compared to those whose households used electricity [AOR=0.98; CI:0.74-1.29].

The main source of income was found to be statistically insignificant for both the unadjusted and adjusted regression models (p-value>0.05), this was with the exception for the household who relied on remittances. The unadjusted regression model found that households who relied on remittances [OR=1.04; CI: 0.78-1.38] and other income sources [OR=1.87; CI: 0.92-3.81] were

more likely to be diagnosed with diabetes when compared to those whose households relied on a salary/wages. The results from the adjusted regression model found that while controlling for other variables in the model, the odds increased and the youth whose household relied on remittances [AOR=1.35; CI:1-1.82], grants [AOR=1.15; CI:0.85-1.55] and other income sources were more likely to be diagnosed with diabetes when compared to youth whose household relied on a salary/wages.

Lastly, Food security was found to be statistically significant for the unadjusted odds results and statistically insignificant for the adjusted odds results. The unadjusted regression model found that youth whose household reported having enough food were 1.54 times more likely to be diagnosed with diabetes when compared to youth whose households had enough food [OR=1.54; CI: 1.07-2.22]. Subsequently, the adjusted regression model found that while controlling for other variables in the model, the odds decreased. Youth whose household reported having enough food was still found more likely to be diagnosed with diabetes when compared to those who had insufficient food [AOR=1.38; CI:0.94-2.01].

4.10 Unadjusted and adjusted binary logistic regression on hypertension

Table 4.6: Unadjusted and Adjusted binary logistic regression producing odds ratios showing the association between hypertension and the selected characteristics in South Africa, 2005-2015.

	Unadjusted Hypertension			**Adjusted Hypertension**		
	Odds ratio	**P-value**	**95% CI**	**Odds ratio**	**P-value**	**95% CI**
Socio-Demographic Factors						
Age-Group						
15-19 Years old (RC)	1,00			1,00		
20-24 Years old	2,58**	0,00	2.18-3.05	2.26**	0,00	1.87-2.71
Sex						
Male (RC)	1,00			1,00		
Female	2,41**	0,00	2.03-2.86	2.53**	0,00	2.13-3.01
Race						
African/Black (RC)	1,00			1,00		
Coloured	1,45**	0,00	1.15-1.82	1.66**	0.00	1.23-2.25
Indian/Asian	0,96	0,91	0.51-1.80	1.45	0.27	0.75-2.79
White	1,73**	0,00	1.25-2.39	1.98**	0.00	1.34-2.89
Province						
Western Cape (RC)	1,00			1,00		
Eastern Cape	0,74	0,09	0.52-1.05	0.95	0.81	0.63-1.42

Northern Cape	1,58**	0,01	1.10-2.27	1.80**	0.00	1.25-2.60
Free State	1,71**	0,00	1.24-2.36	2.29**	0,00	1.58-3.33
KwaZulu-Natal	0,72**	0,04	0.52-0.99	0.93	0.72	0.63-1.38
North West	1,24	0,22	0.88-1.76	1.64**	0.02	1.09-2.46
Gauteng	1,02	0,92	0.74-1.40	1.32	0.14	0.92-1.90
Mpumalanga	1,10	0,56	0.79-1.54	1.43	0.08	0.96-2.12
Limpopo	0,58**	0,00	0.40-0.84	0.73	0.18	0.47-1.15
Type of Residence						
Urban (RC)	1,00			1,00		
Rural	0,82**	0,01	0.70-0.96	1.11	0.30	0.91-1.38
Education						
No Education (RC)	1,00			1,00		
Primary education	0,74	0,24	0.45-1.22	0.81	0.41	0.49-1.34
Secondary education	0,76	0,25	0.48-1.21	0.61**	0.04	0.39-0.97
Tertiary education	1,00	1,00	0.57-1.78	0.52**	0.03	0.29-0.95
Access						
Medical aid						
Yes (RC)	1,00			1,00		
No	1,04	0,79	0.80-1.33	1.19	0.25	0.89-1.60
Grants						
Yes (RC)	1,00			1,00		
No	2,56**	0,00	1.84-3.57	1.59**	0.01	1.11-2.27
House hold factors						
Sex of head						
Male (RC)	1,00			1.00		
Female	0,91	0,25	0.78-1.07	0.93	0.39	0.79-1.096
Age of head						
Youth (15-24) (RC)	1,00			1.00		
Adults (25-64)	0,49**	0,00	0.40-0.60	0.51**	0,00	0.41-0.63
Elderly (65+)	0,42**	0,00	0.32-0.55	0.46**	0.00	0-34-0.63
Cooking method						
Electricity (RC)	1,00			1.00		
Other	0,97	0,70	0.81-1.15	1.22	0.05	1.00-1.48
None	0,89	0,84	0.28-2.77	1.02	1.00	0.32-3.24
Income source						
Salary/Wages (RC)	1,00			1,00		
Remittances	0,99	0,92	0.80-1.23	0.94	0.61	0.75-1.19
Grants	0,86	0,11	0.72-1.03	1.06	0.61	0.85-1.31
Other	1,05	0,89	0.52-2.12	0.98	0.96	0.49-1.99
No income	0,77	0,22	0.51-1.17	0.83	0.38	0.54-1.27
Food security (Insufficient)						
Yes (RC)	1,00			1,00		

No	0,99	0,91	0.78-1.25	1.00	0.99	0.78-1.28

RC denoted reference category, **p<0, 05 represents results at 95% level confidence, CI= Confidence Interval

Table 4.6 presents the results from the unadjusted and the adjusted binary logistic regression models showing the association between hypertension and the socio-demographic, access and household characteristics. In terms of the socio-demographic factors, contrary to table 4.5; age was found to be statistically significant (p-value<0.05) for both the unadjusted and adjusted odds results. The results from the unadjusted regression model found that youth aged between 20-24 years were 2.58 times more likely to be diagnosed with hypertension when compared to those aged between15-19 [OR=2.58; CI:2.18-3.05]. This was an increase when compared to the results obtained from the unadjusted model in table 4.5. The adjusted regression model found that while controlling for other variables in the model, the odds decreased, and youth aged between 20-24 were now 2.26 times more likely to be diagnosed with hypertension [AOR=2.26; CI:1.87-2.71].

Like table 4.5, gender was found to be statistically significant (p-value<0.05) for both the unadjusted and the adjusted regression models. The unadjusted regression model found that, females were 2.41 times more likely to be diagnosed with hypertension [OR=2.41; CI: 2.03-2.86] when compared to males. This again was an increase when compared to the results of the unadjusted model in table 4.5. Seemingly, the adjusted regression model found that while controlling for other variables in the model, the odds increased, and females were now 2.53 times more likely to be diagnosed with hypertension [AOR=2.53; CI: 2.13-3.01]. This was again an increase when compared to the adjusted results on table 4.5.

Like table 4.5, being Coloured and White was found to be statistically significant (p-value<0.05) for both the unadjusted and adjusted regression models. Coloured youth and [OR=1.45; CI: 1.15-1.82] White youth [OR=1.73; CI; 1.25-2.39] were found more likely to be diagnosed with hypertension when compared to African/black youth. The results from the adjusted regression model found that while controlling for other variables in the model, the odds increased and Coloured [AOR=1.66; CI: 1.23-2.25] and White youth [AOR= 1.98; CI: 1.34-2.89] were found more likely to be diagnosed with hypertension when compared to African/black youth

With regards to province of residence, Northern Cape and Free State were found to be statistically significant for both the unadjusted and the adjusted regression models, whereas KwaZulu Natal, and Limpopo were found to be statistically significant for only the unadjusted regression model

(p-value<0.05). The unadjusted regression model found that youth residing in the Northern Cape [OR=1.58; CI: 1.10-2.27] and Free State [OR=1.71; CI: 1.24-2.36] were more likely to be diagnosed with hypertension when compared to youth in the Western Cape. Subsequently, youth residing in KwaZulu Natal [OR=0.72; CI: 0.52-0.99] and Limpopo [OR=0.58; CI: 0.40-0.84] were found less likely to be diagnosed with hypertension when compared to youth residing in the Western Cape. The adjusted regression model found that while controlling for other variables in the model, the odds increased and youth residing in the Northern Cape were now 1.80 times more likely to be diagnosed with hypertension [AOR=1.80; CI: 1.25-2.60]. Whereas youth residing in the Free State were now2.29 times more likely to be diagnosed with hypertension [AOR=2.29; CI: 1.58-3.33] when compared to youth residing in the Western Cape.

Furthermore, similar to table 4.5, although statistically insignificant, the unadjusted and adjusted regression model found that youth residing in the Gauteng province in both models were found to be more likely to be diagnosed with diabetes (OR=1.02; CI: 0.74-1.54; and AOR=1, 32; CI: 0.92-1.90) when compared to youth in the Western Cape. Place of residence was found to be statistically significant (p-value<0.05) for only the unadjusted odds results. Youth residing in the rural areas were 0.82 times less likely to be diagnosed with hypertension [OR=0.82; CI: 0.70-0.96] when compared to those residing in the urban areas. The adjusted regression model found that while controlling for other variables in the model the, odds increased and youth residing in the rural areas were now 1.11 times more likely to be diagnosed with hypertension [AOR=1.11; CI: 0.91-1.38] when compared to those who resided in the urban areas.

With regards to the level of education, contrary to table 4.5 secondary and tertiary education were found to be statistically significant (p-value<0.05) for the adjusted odds results only. For the unadjusted odds results, youth with tertiary education were found to have the same odds of being diagnosed with diabetes (OR=1) when compared to those with no education. Whereas for the adjusted odds results while controlling for other variables in the model, the odds decreased only for youth with a secondary and tertiary education. Youth with secondary education were found to be 0.61 times less like to be diagnosed with hypertension [AOR=0.61; CI:0.39-0.97] and youth with a tertiary education were also found to be 0.52 times less likely to be diagnosed with hypertension [AOR=O.52; CI:0.29-0.95] when compared to those with no education.

With regards to access, contrary to table 4.5 medical aid was found to be statistically insignificant for both the unadjusted and adjusted odds results ($p>0.05$). Contrary to table 4.5, for unadjusted odds results, youth who reported having no medical aid were found more likely to be diagnosed with hypertension [OR=1.04; CI:0.80-1.33] when compared to those who had medical aid access. Similarly, for the adjusted odds results, while controlling for other variables, the odds increased. However, youth who reported having access to no medical aid were found more likely to be diagnosed with hypertension [AOR=1.19; CI: 0.89-1.60] when compared to youth with a medical aid access.

Lastly, access to grants was found to be statistically significant for both the unadjusted and the adjusted odds results. Youth who reported not receiving a grant were 2.56 times more likely to be diagnosed with hypertension [OR=2.56; CI: 1.84-3/57] when compared to those who received a grant. Subsequently, for the adjusted odds results while controlling for other variables in the model, the odds decreased and youth who reported not receiving a grant were found to be 1.59 times more likely to be diagnosed with hypertension [AOR=1.59; CI:1.11-2.27] when compared to those who received a grant.

In terms of household factors, sex of the head was found to be statistically insignificant (p-value=0.00) for both the unadjusted and the adjusted odds results. For the unadjusted and adjusted odds results, youth whose sex of the head was female were found less likely to be diagnosed hypertension. With regards to Age of the head, contrary to table 4.5 it was found to be statistically significant for both the unadjusted and the adjusted odds results. For both the unadjusted and adjusted odds results, youth whose head was categorized as both adults and elderly were found less likely to be diagnosed with hypertension when compared to youth whose head was categorized as youth [OR=0.49; CI: 0.40-0.60; OR=0.42; CI: 0.32-0.55 and AOR=0.51; CI: 0.41-0.63; AOR=0.46; CI: 0.34-0.63 respectively].

Furthermore, contrary to table 4.5 cooking methods was found to be statistically insignificant (p-value<0.05) for both the unadjusted regression and adjusted odds results only. For the unadjusted odds results, although statistically insignificant youth whose household used other cooking methods to prepare food were found to be 0.97 times less likely to be diagnosed with hypertension when compared to youth whose household used electricity [OR=0.97; CI: 0.81-1.15]. for the adjusted odds results, although also statistically insignificant while controlling for other variables,

the odds increased and youth who used other cooking methods to prepare food were 1.22 times more likely to be diagnosed with hypertension when compared to youth whose household used electricity [AOR=1.22; CI: 1.00-1.48].

With regards to the main source of income, contrary to table 4.5 it was found to be statistically insignificant for both the unadjusted and the adjusted odds results only (p-value>0.05). For the unadjusted odds results, youth whose household relied mainly on remittances were found to have almost the same odds of being diagnosed with hypertension as those whose households relied on electricity (OR=0.99) when compared to those who relied on a salary/wages. Seemingly, those whose household relied on other sources of income were found more likely to be diagnosed with hypertension [AOR=1.05; CI: 0.52-2.12] when compared to those whose household relied on a salary/wages. Subsequently for the adjusted odds results while controlling for other variables in the model, youth whose household relied on grants were found to be more likely to be diagnosed with hypertension [AOR=1.06; CI:0.85-1.31] when compared to those whose households relied on salary/wages.

With regards to food security, it was found to be statistically insignificant for both the unadjusted and the adjusted odds results. For the unadjusted odds results, youth whose households reported having enough food was found to have almost the same odds of being diagnosed with hypertension [OR=0.99; CI:0.78-1.25] when compared to those who had insufficient food. Seemingly, the adjusted odds result show that while controlling for other variables youth whose households had enough food were found to have the same odds of being diagnosed with diabetes when compared to those who had insufficient food [AOR=0.99; CI:0.78-1.28].

4.11 Unadjusted and adjusted binary logistic regression on all NCDs

Table 4.7: unadjusted and adjusted binary logistic regression model producing odds ratios showing the association between all NCDs and all the selected characteristics among youth in South Africa, 2005-2015.

	Unadjusted			Adjusted		
	Odds ratio	**P-value**	**95% CI**	**Odds ratio**	**P-value**	**95% CI**
Socio-demographic Factors						
Age						
15-19 Years (RC)	1.00			1.00		
20-24 years	2.00**	0.00	1.74-2.29	1.82**	0.00	1.57-2.11

Sex						
Male (RC)	1.00			1.00		
Female	1.90**	0.00	1.66-2.18	1.98**	0.00	1.73-2.28
Race						
African/Black (RC)	1.00			1,00		
Coloured	1.67**	0.00	1.39-2.01	1.85**	0.00	1.44-2.37
Indian/Asian	1.14	0.61	0.69-1.87	1.38	0.22	0.82-2.33
White	2.56**	0.00	2.08-3.24	2.55**	0.00	1.92-3.38
Province						
Western Cape (RC)	1.00			1,00		
Eastern Cape	0.64**	0.00	0.48-0.85	0.92	0.64	0.67-1.28
Northern Cape	1.23	0.17	0.91-1.66	1.48	0.01	1.09-2.01
Free State	1.31**	0.05	1.00-1.71	1.93**	0.00	1.42-2.62
KwaZulu-Natal	0.67**	0.00	0.52-0.87	1.01	0.99	0.74-1.37
North West	0.96	0.80	0.72-1.29	1.41**	0.04	1.01-1.97
Gauteng	0.94	0.61	0.73-1.20	1.29	0.08	0.97-1.73
Mpumalanga	0.83	0.19	0.63-1.09	1.22	0.23	0.88-1.70
Limpopo	0.50**	0.00	0.37-0.67	0.73	0.09	0.51-1.05
Type of residence						
Urban (RC)	1.00			1,00		
Rural	0.76**	0.00	0.66-0.87	1.10	0.28	0.92-1.32
Education						
No Education (RC)	1.00			1,00		
Primary education	0.63**	0.02	0.42-0.93	0.70	0.09	0.48-1.05
Secondary education	0.64**	0.01	0.45-0.91	0.53**	0.00	0.37-0.76
Tertiary education	0.98	0.92	0.63-1.53	0.54**	0.01	0.34-0.85
Access						
Medical aid						
Yes (RC)	1,00			1,00		
No	0,76*8	0,01	0.63-0.92	1.01	0.94	0.80-1.27
Grants						
Yes (RC)	1,00			1,00		
No	2,05**	0,00	1.59-2.64	1.42**	0.01	1.08-1.86
House hold Factors						
Sex of head						
Male (RC)	1,00			1,00		
Female	0,84**	0,01	0.74-0.96	0.91	0.16	0.79-1.04
Age of head						
Youth (RC)	1,00			1		
Adults	0,60**	0,00	0.50-0.72	0.63**	0.00	0.52-0.76
Elderly	0,56**	0,00	0.44-0.70	0.63**	0.00	0.49-0.82

Cooking						
Electricity (RC)	1,00			1,00		
Other	0,86**	0,05	0.75-1.00	1.11	0.23	0.94-1.31
None	0,60	0,38	0.19-1.87	0.69	0.52	0.22-2.17
Income source						
Salary/Wages (RC)	1,00			1,00		
remittances	0,98	0,83	0.82-1.18	1.05	0.65	0.86-1.27
grants	0,85**	0,03	0.73-0.99	1.09	0.34	0.91-1.31
other	1,38	0,22	0.82-2.32	1.35	0.26	0.80-2.27
No income	0,79	0,17	0.56-1.11	0.91	0.61	0.64-1.30
Food Security(insufficient)						
Yes (RC)	1,00			1,00		
No	1,12	0,26	0.92-1.38	1,08	0.46	0.87-1.34

RC denoted reference category, **p<0,05 represents results at 95% level confidence, CI= Confidence Interval

Table 4.7 shows the results from the unadjusted and adjusted odds ratios for binary logistic regression showing the association between all the selected characteristics and all NCDs. In terms of the socio-demographic factors, the table shows that age was statistically significant (p-value<0.05) for both the unadjusted and adjusted odds results. For the unadjusted odds results, youth aged 20-24 were found 2 times more likely to be diagnosed with all NCDs when compared to those aged 15-19 [OR=2.00; CI: 1.74-2.29]. subsequently for the adjusted odds results while controlling for other variables in the model, the odds decreased, and youth aged 20-20 were found 1.82 times more likely to be diagnosed with all NCDs when compared to those aged between 15-19 [AOR=1.86; CI:1.57-2.11].

With regards to sex, it was also found to be statistically significant (p-value<0.05) for both the unadjusted and adjusted odds results. For the unadjusted odds results, females were 1.90 times more likely to be diagnosed with all NCDs when compared to males [OR=1.90; CI: 1.66-2.18]. Seemingly, for the adjusted odds results while controlling for other variables in the model, the odds increased, and females were 1.98 times more likely to be diagnosed with all NCDs when compared to males [AOR=1.98; CI:1.73-2.28].

With regards to race, being coloured and white was found to be statistically significant (p-value<0.05) for both the unadjusted and adjusted odds results. For the unadjusted odds results, Coloured youth were found 1.67 times more likely to be diagnosed with all NCDs when compared to African/black youth [OR=1.67; CI: 1.39-2.01]. Whereas, White youth were found 2.56 times

more likely to be diagnosed with all NCDs when compared to African/Black youth [OR=2.56; CI; 2.08-3.24]. Subsequently, for the adjusted odds results while controlling for other variables in the model, the odds increased, and Coloured youth were found 1.85 times more likely to be diagnosed with NCDs when compared to African/black youth [AOR=1.85; CI:1.44-2.37]. For White youth the odds decreased slightly, and they were found 2.55 times more likely to be diagnosed with all NCDs when compared to African/Black youth [AOR=2.55; CI: 1.92-3.38].

With regards to province, Eastern Cape, Free State, KwaZulu Natal and Limpopo were found to be statistically significant (p-value<0.05) for the unadjusted odds results and the Free State and North West were found to be statistically significant for the adjusted odds results. For the unadjusted odds results, youth residing in the Eastern Cape [OR=0.64; CI: 0.48-0.85], KwaZulu Natal [OR=0.67; CI: 0.52-0.87] and Limpopo [OR=0.50; CI: 0.37-0.67] were found less likely to be diagnosed with all NCDs when compared to youth in the Western Cape. Seemingly, Youth that resided in the Free State were 1.31 times more likely to be diagnosed with NCDs when compared to youth in the Western Cape [OR=1.31; CI:1.00-1.71]. subsequently, for the adjusted odds results while controlling for other variables in the model, the odds increased and youth residing in the Free State were found more likely to be diagnosed with all NCDs when compared to youth in the Western Cape [AOR=1.93; CI: 1.42-2.62]. Seemingly, youth residing in the North West were found more likely to be diagnosed with all NCDs when compared to youth in the Western Cape [AOR=1.41; CI: 1.01-1.97].

Furthermore, with regards to the place of residence, it was found statistically significant (p-value<0.05) for the unadjusted odds results only. for the unadjusted odds results, youth in the rural areas were found 0.76 times less likely to be diagnosed with all NCDs when compared to youth in the urban areas [OR=0.76; CI: 0.66-0.87]. seemingly, for the adjusted odds results although found to be statistically insignificant and while controlling for other variables in the model, youth residing in the rural areas were found more likely to be diagnosed with all NCDs when compared to those in urban areas [AOR=1.10; CI:0.92-1.32).

With regards to education, primary and secondary education was found to be statistically significant for the unadjusted odds results and secondary as well as tertiary education were found to be statistically significant for the adjusted odds results. The unadjusted results show that youth who had primary [OR=0.63; CI: 0.42-0.93] and secondary education [OR=0.64; CI: 0.45-0.91]

were less likely to be diagnosed with diabetes when compared to youth with no education. Subsequently, the adjusted odds result show that while adjusting for all the other variables in model the odds decreased and youth with secondary [AOR=0.53; CI:0.37-0,76] and tertiary education [AOR=0.54; CI:0.34-0.85].

In terms of access, medical aid access was found to be statistically significant ($p<0.05$) only for the unadjusted odds results. For the unadjusted odds results, youth who reported having no medical aid were found to be 0.76 times less likely to be diagnosed with all NCDs when compared to youth with a medical aid [OR=0.76; CI:0.63-0.92]. subsequently, for the adjusted odds results although statistically significant and while controlling for other variables the odds increased and youth without medical aid were found more likely to be diagnosed with all NCDs [AOR=1.01; CI:0.80-1.27].

Lastly, access to grants was found to be statistically significant for both the unadjusted and the adjusted odds results. for the unadjusted odds results, youth who reported not receiving a grant were 2.05 times more likely to be diagnosed with diabetes when compared to those who received a grant [OR=2.05; CI: 1.59-2.64]. subsequently, for the adjusted odds results while controlling for other variables, the odds decreased and youth who reported not receiving a grant were 1.42 times more likes to be diagnosed with diabetes when compared to those who received a grant [AOR=1.42; CI: 1.08-1,86].

In terms of household factors, sex of the head was found to be statistically significant (p-value<0.00) for only the unadjusted odds results. for the unadjusted odds results, youth whose sex of the head was female were 0.84 times less likely to be diagnosed with diagnosed with all NCDs when compared to youth whose sex of the head was male [OR=0.84; CI: 0.74-0.965]. Subsequently for the adjusted odds results although statistically insignificant, while controlling for other variables in the model the odds slightly increased and youth whose sex of the head was female were found more likely to be diagnosed with all NCDs when compared to youth whose sex of the head was male.

With regards to Age of the head, the age of the head categorized as adults or elderly was found to be statistically significant (p-value<0.05). Youth who lived with a head categorized as an adult [OR=0.60; CI: 0.50-0.720] or elderly [OR=0.56; CI: 0.44-0.70] were less likely to be diagnosed with all NCDs when compared to youth who lived with a head categorized as youth. Subsequently,

for the adjusted odds results while controlling for other variables, the odds slightly increased and youth whose head was categorised as an adult [AOR=O.63; CI:0.52-0.76] or elderly [AOR=0.63; CI:0.49-O.82] were found less likely to be diagnosed with all NCDs when compared to youth whose head was categorised as youth.

Furthermore, using other cooking methods was found to be statistically significant (p-value<0.05) only for the unadjusted odds results only. for the unadjusted odds results, youth whose household used other cooking methods to prepare food were found 0.86 time less likely to be diagnosed with diabetes when compared to those whose household used electricity [OR=0.86; CI:0.75-1.00]. Subsequently for adjusted odds results although statistically insignificant, while controlling for other variables the odds increased and youth who used other cooking methods to prepare food were found more likely to be diagnosed with all NCDs [AOR=1.11; CI:0.94-1.31] when compared to those whose households used electricity.

With regards to the main source of income, reliance on grants was found to be statistically significant for the unadjusted odds results only (p-value<0.05). For the unadjusted odds results, youth whose household on grants were found to be less likely to be diagnosed with all NCDs when compared to youth whose household relied on a salary/wages [OR= 0.85; CI:0.73-0.99]. Subsequently, for the adjusted odds results although statistically insignificant, while controlling for other variables the odds increased and youth whose households relied on a grants were found more likely to be diagnosed with all NCDs when compared to youth whose households relied on salary/wages [OR=1.09; CI:0.91-1.31].for the adjusted odds results while controlling for other variables in the model, the odds for youth whose household relied on remittances increased, and they remained more likely to be diagnosed with all NCDs [AOR=1.35; CI:1-1.82].

With regards to food security, it was found to be statistically insignificant for the unadjusted and adjusted odds results only. However, youth whose households reported having enough food was found to be 1.12 times more likely to be diagnosed with all NCDs when compared to youth whose households had insufficient food [OR=1.12; CI:0.92-1.38]. subsequently, for the adjusted odds results while controlling for other variables in the model, the odds slightly decreased and the youth whose households reported having enough foods where found more likely to be diagnosed with all NCDs when compared to youth whose households had insufficient food [AOR=1.08; CI:0.87-1.34].

4.12 Testing of the hypothesis

The hypotheses for this study were tested using the estimated prevalence as well as the full model for the multilevel analysis.

The first hypothesis was as follows:

- H_0: The trends and prevalence of non-communicable diseases among youth (15-24 years old) in South Africa is decreasing overtime.
- H_1: The trends and prevalence of non-communicable diseases among youth (15-24 years old) in South Africa is increasing overtime

Given that the Prevalence of both of non-communicable diseases was high and increasing for the female population. This study rejects the null hypothesis and concludes that the trends and prevalence of non-communicable diseases have increased overtime.

The second hypothesis tested was as follows:

- H_0: The is no significant association between the demographic, access and household characteristics and non-communicable diseases among youth in South Africa.
- H_1: The is a significant association between the demographic, access and household characteristics and non-communicable diseases among youth in South Africa

Assumption: Significance level: α=0, 05

Given that the p-value for all the models was less than 0.05 and although some variables included in the model were more than 0.05 this study rejects the null hypothesis and concludes that there is a significant association between the demographic, access and household characteristics and non-communicable diseases among youth in South Africa.

CHAPTER FIVE: DISCUSSION

The main objective of the study was to assess the trends, prevalence and factors associated with NCDs among youth (15-24 years old) in South Africa from 2005-2015. In order to decrease the burden of NCDs in South Africa, there is a need to understand the disease distribution among youth, with regards to who is at risk, where the risk is more prevalent and how trends have evolved overtime. This is important particularly among youth as they are central to the social and economic development of the country.

The findings of this study provide evidence of the burden of NCDs among youth in South Africa. This study found that there is a growing prevalence of NCDs among youth, disproportionately affecting females, whose levels of NCDs increased from 2005 to 2015 and in addition, whose prevalence rate per 10,000 youth was considerably higher when compared to that of males and the overall prevalence rate. This prevalence may be attributed to the fact that males and females have different levels of exposure and susceptibility to NCD risk factors. Several studies have found that females are more likely to be obese and overweight, and these are prominent determinants of various NCDs including hypertension and diabetes (Kimani-Murage et al., 2010; Maimela et al., 2016; Nojilana et al., 2016; Phaswana-Mafuya, Peltzer, Chirinda, Musekiwa, & Kose, 2013a; Wagner & Brath, 2012; Wu et al., 2015; Yaya, Ekholuenetale, & Bishwajit, 2018).

Research has found that being overweight and obese is linked to a high calorie diet and physical inactivity. One multi-country study conducted using data from countries that implemented the World Health Organization's Study on global AGEing and adult health (SAGE) found that South Africa had the highest prevalence of obesity at 45.2% and the highest prevalence of physically inactivity when compared to the other countries (Wu et al., 2015). Another study found high prevalence of physical inactivity in females was linked to high prevalence in overweight/obesity (Peer, Bradshaw, et al., 2013).

Contrary to the female prevalence, this study found that the prevalence of males was lower when compared to that of females and the overall prevalence rate, and in addition the NCD prevalence for males decreased from 2005-2015. This may indicate that there is indeed a low prevalence of NCDs in male or that male seeking health behaviour is lower than that of females. This is possible

since research has found that females are more likely to seek health services when compared to males (MacLean, Hunt, Smith, & Wyke, 2012).

Additionally, these findings could be attributed to the narrative that has continuously been reinforced in public about health being largely something only females need to worry about. This creating the notion that rather than seeking healthcare services, males must 'toughen it out' and be strong (MacLean et al., 2012). This study also found in agreement with previous studies that sex is a factor associated with being diagnosed with NCDs even after adjusting for the influences of other demographic and socioeconomic characteristic. The likelihood of being diagnosed with NCDs was high among females when compared to males. These findings are in line with several studies which found that females are more likely to be diagnosed with hypertension and diabetes when compared to males (Chinnakali, et al., 2012; Lalkhen & Mash, 2015; Bradshaw et al., 2003; Mayosi et al., 2009; Phaswana-Mafuya, Peltzer, Chirinda, Musekiwa, & Kose, 2013b). This, as highlighted above could be attributed to the predominant risk factors that are linked with NCDs such as being overweight/obesity and physical inactivity that exposes females and makes them more susceptible to NCDs (Peer, Bradshaw, et al., 2013).

Furthermore, this study found that the prevalence of hypertension was considerably higher than the prevalence of diabetes among the different genders. The prevalence for females increased overtime and decreased for males. These findings are supported by a study conducted by (Wu et al., 2015) which found that South Africa had the highest burden of hypertension with 78% (Wu et al., 2015). Other Countries with a higher prevalence included the Russian Federation with 69%, followed by China, Ghana and Mexico with over 50%. India had the lowest prevalence rate (Wu et al., 2015).

Furthermore, age is associated with being diagnosed with NCDs. Other research has found that the prevalence of NCDs increased with age (Maimela et al., 2016). As expected, the study found that more than 60% of those aged between 20-24 years old had been diagnosed with NCDs when compared to the younger youth (15-19 years). While adjusting for influences of other characteristics included in the study, hypertension and all NCDs, age is a significant predictor of being diagnosed with NCDs. The results also show that older youth are more likely to be diagnosed with NCDs. These findings are in line with a study conducted by Peer and colleagues (2013) which found that the odds for being overweight increased for those aged between 20-24 years old when

compared to youth aged between 15-19 years. Youth in this age group are the most susceptible due in part to their exposure to their dietary patterns; eating food high in calories and engaging in hazardous /harmful alcohol use and tobacco use. Another study found that young people in this age group often engaged in unhealthy dietary choices, lack of physical activity and the use of substances (alcohol and drugs) were found to have a higher prevalence of obesity and hypertension (Singh et al., 2006). In South Africa, research has found that about 23% and 3% of men and women reported hazardous/harmful use of alcohol (Bradshaw, Steyn, Levitt, & Nojilana, 2011.). This is in addition to other behavioural risk factors that they likely to engage in; such as the dissemination of knowledge and trends from developed countries and the adoption of western diets (Wagner & Brath, 2012)

This study found the Prevalence of both diabetes and hypertension were highest among Black/African youth and the Indian/Asian youth reported the lowest Prevalence of NCDs. It must be noted that in all the surveys used for this study, the response rate was high among black/African youth when compared to other population groups. Moreover, African/Black seemed to be evenly distributed across rural and urban areas in South Africa when compared to other population group. This could mean that the distribution of diseases among other population may be underestimated (Puoane et al.,2015). Another plausible reason for the observed difference could be as a result of weight perceptions by gender in African culture, where being overweight or obese is seen as desirable trait and linked to good health. One study conducted in a largely African/Black township, Khayelitsha in Cape Town found that being overweight was a preferred weight by females as it made them more likable and they seemed healthier (Puoane et al., 2005).

In addition, the study found that white youth were more likely to be diagnosed with both diabetes and hypertension when compared to African/black youth. These findings are in line with a study conducted by Nojilana and colleagues (2016) which found the prevalence of NCDs and mortality rates were higher for the White population group when compared to other population groups. This may be explained by one of the study limitations where data was missing for about a quarter of the deaths as such imputation was done. This may have resulted in population bias, considering that the study used vital registrations, which often has incomplete data. Moreover, this study included the youth among older people.

This study also found that being White and Coloured was a significant predictor of being diagnosed with diabetes, hypertension and all NCDs, where white youth and coloured youth were found more likely to be diagnosed with NCDs. This may be because of the idea of race in South Africa rooted in history and politics. In South Africa, black people are largely the marginalized group as previously disadvantaged by apartheid as a result the differences that are observed among population groups could be attributed to socio-demographic differences. These differences are simulated in access to basic health, social services and education. As a result, many people, particularly those said to be disadvantaged remain undiagnosed increasing their risk of getting NCDs, of which could have been prevented had they had early screening (Yaya et al., 2018).

By province, the results of this study found that Gauteng had the highest prevalence of diabetes and Northern Cape had the lowest prevalence. This was expected although Gauteng is the smallest province, it is considered the economic hub of the country characterized highly by access to basic health services. The findings of this study also found that the prevalence of hypertension was high in Free State and lowest in Limpopo. These findings are in line with one study (2013) which found a striking variation in hypertension prevalence across different provinces in South Africa(Kandala, Tigbe, Manda, & Stranges, 2013) . Similar to this study, Free state among other provinces had the highest prevalence and Limpopo had the lowest prevalence of hypertension. It is worth noting that the healthcare sector in South Africa highlights the country's past economic and geographic segregation. Limpopo is largely a rural area characterised by increased poverty and poor access to health care service, therefore majority of the youth could be undiagnosed. One study conducted with high proportion of the respondents residing in rural areas, they found that the prevalence of NCDs was low. This they argued could have been as a result of high rate of unemployment in the rural areas which could potentially be highlighting the role of poverty as a key impairment to achieving good health (Yaya et al., 2018).

This study found that the prevalence of both diabetes and hypertension was high in the urban areas when compared to the rural areas. While adjusting for other characteristics in the model, the results showed that living in the rural areas was not a predictor of being diagnosed with NCDs and youth residing in the rural areas were found less likely to be diagnosed with NCDs. This could be as a result of the rural to urban migration. One study conducted in Cameroon found that migration to urban areas was associated with high body-mass index, fasting blood sugar, and blood pressure.

All of these are determinants of both diabetes and hypertension (Ibrahim & Damasceno, 2012) . Another study found that South Africans who have spent most of their life in urban areas are more likely to be hypertensive than those from rural areas (Ibrahim & Damasceno, 2012). Urbanisation affects dietary patterns and also increases physical inactivity, with individuals in urban areas more likely to eat food high in calories(Ibrahim & Damasceno, 2012; Peer, Kengne, Motala, & Mbanya, 2013)

Education is associated with lower likelihood of NCD diagnosis. This study found that youth with a secondary education had the highest level of both diabetes and hypertension. This is supported by one study which found the association between low education attainment and reduced treatment seeking behaviour(Manning, Senekal, & Hebron, 2016). So, higher educational attainment could lead to positive health-seeking practices, where educated persons are more likely to have knowledge about diseases essentially leading to making decisions to seek healthcare.

In terms of access, South Africa is among the most unequal societies in the world, thus wealth inequality in this country provides an opportunity to examine the distribution of NCDs among the poor (Schneider, Bradshaw, Steyn, Norman, & Laubscher, 2009). This study found that the majority of youth in South Africa who had been diagnosed with NCDs had no access to medical aid. While controlling for the socio-demographic, access and household factors, medical aid access was found not to be a predictor of being diagnosed with NCDs. However, youth were found more likely to be diagnosed with hypertension. The challenges youth in Sub-Saharan Africa face, particularly poverty and unemployment increase their risk of hypertension related with stress (Ibrahim and Damasceno 2012).

This study found that over 90% of youth who did not receive any social grant had been diagnosed with NCDs. This may be attributed to the mean age of the study population (19.3) meaning majority of the youth are 19 and others possibly older and as such might not be qualifying for any social grants since in South Africa the cut of age for grant is 18, irrespective of one's poor living circumstances. A systematic review found that that individuals from high socio-economic groups to be less physically active and had unhealthy diet habits than individuals from low socio-economic groups thus making them more susceptible to NCDs (Allen, Williams, & Wickramasinghe, 2017). One study found that factors associated with hypertension and obesity which is often a precursor for diabetes increased with the accumulation of wealth (Schneider et al.,

2009).

This study also found that the prevalence of diabetes was high among households headed by a male when compared to a female headed household. These results were expected as females generally have higher rates of disease awareness and control than males, as such they are more likely to seek health care services even for their family members (Ibrahim & Damasceno, 2012). Furthermore, with regards to the age of the head of the house, this study found youth whose head was categorised as an adult or elderly to be a significant predictor for being diagnosed with hypertension and all NCDs. Youth who fell under this category were also less likely to be diagnosed with diabetes. These findings are consistent with one study which found that young adults were more likely to perceive health assessments as a time-consuming process compared to middle-aged and older-aged adults (Kaba, Khamisa, & Tshuma, 2017). Consequently, increasing their chances of being diagnosed with NCDs.

CHAPTER SIX: CONCLUSION, RECOMMENDATIONS AND LIMITATIONS

6.1 Conclusion

In conclusion, youth in South Africa are suffering from NCDs. This debunks the belief that youth are only prone to infectious disease and this means that programmes in the country need to accommodate for NCD burden among young people. This study has found that NCDs represent a significant and unfortunately growing burden for young people, and this will compromise the healthy transition to adulthood and the country's future social and economic development.

6.2.1 Policy recommendations

The evidence provided by this study on the extent of the NCD burden among youth in South Africa can be addressed by a combination of primary interventions and policy targeting the whole population particularly youth as the most susceptible group. The National Department of Health (NDoH) and the government has made several strides to improve NCD management by setting up several units to deal with the problem. Also, NCD control related policies have been created over the years, these include the 2011 Tobacco Products Control Amendment Regulations, the 2013 National Drug Masterplan, 2013 Salt Reduction Regulations and the Strategic plan for the prevention and control of non-communicable diseases 2013-2017. Notably, all these policies were designed and implemented with the main aim of reducing and controlling some of the modifiable risk factors such as smoking, alcohol, unhealthy diets and physical inactivity. While some of these policies were formulated long before the global drive for the prevention and control of NCDs, problems persist. There is a need to re-assess NCDs prevalence and focus on who is at risk and where the highest prevalence is.

Moreover, there is an urgent need for the monitoring and evaluation of some of these policies mentioned above, since most of the people are unaware of such policies. Thus, this calls for the government to collaborate with communities, schools, institutions of higher learning, and different organizations such as the South Africa Non-Communicable Diseases Alliance (SANCDA). The government working together with different stakeholders will offer an overarching framework for NCDs in South Africa. Moreover, there is a need to raise more awareness about these policies and make people understand the reason behind the formulation. This will aid in advocating for strategies such as early screening, detection as well as changing the narrative about NCDs especially among young people since NCDs have been dubbed "old" people's diseases.

Furthermore, still focused on young people, the NYP 2015-2020 which was formulated with the main aim of addressing challenges and immediate needs of young people in South Africa could be used as a driver to create more awareness campaigns around NCDs among young people. In addition, health dangers more especially among youth is often underestimated thus there should be drive that will seek to understand health behavioural risk factors among youth.

Also, the Primary Health Care re-engineering model was introduced by the South African Department of Health in 2011. The model proposes different formats to be followed by the government to respond to different health needs of the population including chronic diseases. Under the model, community health workers (CHWs) are to visit needy households to offer health information and education, health screening and referral to nearby community clinics. To date, studies have shown older people with hypertension and diabetes are the major beneficiaries of the services offered by the CHWs, while young people who are also vulnerable to NCDs are not largely targeted for family planning, antennal and postnatal care services. There is a need for the government to make CHWs to also target young people for NCDs screening and refer them to the clinic (Thorogood et. al, 2014).

6.2.2 Future research

Understanding the distribution of NCDs and relationship of risk factors pattern and burden of NCDs in South Africa presents an important challenge to addressing the prevalence of NCDs. From literature, this study found that there is a dearth of research that focuses on NCDs among young people, and research that is there focuses more on older people or studies young people within the older group.

Therefore, there is a need for future research to focus on males and their health seeking behaviours. This to ascertain if the low and decreasing prevalence of NCDs among males is the true reflection of what is going on in South Africa. Secondly, research should also take a qualitative or a mixed method study, where young people are questioned on their knowledge about NCDs and risk factors. NCDs among young people can potentially extend it to other NCDs such a cancer as well as comorbidity of NCDs. In addition, there is a dearth of studies that are conducted using longitudinal data. Such a study has potential to determine some of the factors that are associated with NCDs.

6.2.3 Limitations of the study

This study had a few limitations. The study used cross-sectional data from the General Household surveys collected annually thus it cannot infer causality. Most variables, including whether one has ever been diagnosed with either diabetes or hypertension were measured by self-report as such desirable responses may have been given to the fieldworkers especially considering the nature of the diseases and the stereotype behind the diseases affecting old people. Therefore, this may have resulted in self-report bias as well as underreporting of NCDs among young people. The questionnaire for the GHS series was revised extensively in 2009 as a result some questions in the surveys were not comparable, as such the health variable had to be excluded from the study because. For example, prior to 2009, participants were asked whether one had consulted with a health practitioner about the illness, this referring to the diagnosis. In 2009, the question was asked if one had been taking medication for the condition. This question had to be excluded from study as it was not a good measure for health.

REFERENCES

Abegunde, D. O., Mathers, C. D., Adam, T., Ortegon, M., & Strong, K. (2007). The burden and costs of chronic diseases in low-income and middle-income countries. *The Lancet*, *370*(9603), 1929–1938.

Aboyade, O., Beauclair, R., Mbamalu, O., Puoane, T., & Hughes, G. (2016). Health-seeking behaviours of older black women living with non-communicable diseases in an urban township in South Africa. *BMC Complementary and Alternative Medicine*, *16*(1), 410.

Adeyi, O., Smith, O., & Robles, S. (2007). *Public policy and the challenge of chronic noncommunicable diseases*. World Bank Publications.

Alwan, A., MacLean, D. R., Riley, L. M., d'Espaignet, E. T., Mathers, C. D., Stevens, G. A., & Bettcher, D. (2010). Monitoring and surveillance of chronic non-communicable diseases: progress and capacity in high-burden countries. *The Lancet*, *376*(9755), 1861–1868.

Barouki, R., Gluckman, P. D., Grandjean, P., Hanson, M., & Heindel, J. J. (2012). Developmental origins of non-communicable disease: implications for research and public health. *Environmental Health*, *11*(1), 42.

Bennett, J. E., Stevens, G. A., Mathers, C. D., Bonita, R., Rehm, J., Kruk, M. E., Riley, L. M., Dain, K., Kengne, A. P., & Chalkidou, K. (2018). NCD Countdown 2030: worldwide trends in non-communicable disease mortality and progress towards Sustainable Development Goal target 3.4. *The Lancet*, *392*(10152), 1072–1088.

Bertram, M. Y., Jaswal, A. V., Pillay-van Wyk, V., Levitt, N. S., & Hofman, K. J. (2013). The non-fatal disease burden caused by type 2 diabetes in South Africa, 2009. *Global Health Action*, *6*(1), 206–2012.

Bradshaw, D., Steyn, K., Levitt, N., & Nojilana, B. (n.d.). *Non-communicable Diseases- A race against time*. www.health.uct.ac.za_MRC_policy_brief

Chapman, A. (2009). Globalization, human rights , and the social determinants of health. *Bioethics*, *23*, 97–111.

Dalal, S., Beunza, J. J., Volmink, J., Adebamowo, C., Bajunirwe, F., Njelekela, M., Mozaffarian, D., Fawzi, W., Willett, W., Adami, H.-O., & Holmes, M. D. (2011). Non-communicable diseases in sub-Saharan Africa: what we know now. *International Journal of Epidemiology*, *40*(4), 885–901. https://doi.org/10.1093/ije/dyr050

Gore, F. M., Bloem, P. J., Patton, G. C., Ferguson, J., Joseph, V., Coffey, C., Sawyer, S. M., & Mathers, C. D. (2011). Global burden of disease in young people aged 10–24 years: a systematic analysis. *The Lancet*, *377*(9783), 2093–2102.

Hauerslev, M., & Allen, L. (2018). Young people and non-communicable diseases-vulnerable to disease, vital for change. *International Jounal of Noncommunicable Diseases*, *3*(2), 45–48.

hilawe, E., Yatsuya, H., Kawachi, L., & Aoyama, A. (2013). *Difference by sex in the prevalence of diabetes mellitus, impared fasting glycaemia and impaired glucose tolerance in sub-Saharan Africa: a systematic review and meta-analysis.* Bulletin of the World Health Organization.

Ibrahim, M. M., & Damasceno, A. (2012). Hypertension in developing countries. *The Lancet*, *380*(9841), 611–619.

International Diabetes Federation. (2015). *IDF Diabetes Atlas* (Seventh Edition). Brussels, IDF.

International Diabetes Federation. (2017). *IDF Diabetes Atlas* (Eighth edition). International Diabetes Federation.

Kaba, Z., Khamisa, N., & Tshuma, N. (2017a). Age-group differences in risk perceptions of non-communicable diseases among adults in Diepsloot township, Johannesburg, South Africa: A cross-sectional study based on the Health Belief Model. *SAMJ: South African Medical Journal*, *107*(9), 797–804.

Kaba, Z., Khamisa, N., & Tshuma, N. (2017b). Age-group differences in risk perceptions of non-communicable diseases among adults in Diepsloot township, Johannesburg, South Africa: A cross-sectional study based on the Health Belief Model. *South African Medical Journal*, *107*(9), 797–804.

Kandala, N., Tigbe, W., Manda, S. O., & Stranges, S. (2013). Geographic variations of Hypertension in Sub-Saharan Africa: A case study of South Africa. *Ameican Journal of Hypertension*, *26*(3), 382–391.

Kane, J., Landes, M., Carroll, C., Nolen, A., & Sodhi, S. (2017). A systematic review of primary care models for non-communicable disease interventions in Sub-Saharan Africa. *BMC Family Practice*, *18*(1), 46.

Keegan, T. H., Kushi, L. H., Li, Q., Brunson, A., Chawla, X., Chew, H. K., Malogolowkin, M., & Wun, T. (2018). Cardiovascular disease incidence in adolescent and young adult cancer survivors: a retrospective cohort study. *Journal of Cancer Survivorship*, 1–10.

Kimani-Murage, E. W., Kahn, K., Pettifor, J. M., Tollman, S. M., Dunger, D. B., Gómez-Olivé, X. F., & Norris, S. A. (2010). The prevalence of stunting, overweight and obesity, and metabolic disease risk in rural South African children. *BMC Public Health*, *10*(1), 158.

Labadarios, D., Shisana, O., & Simbayi, L. (2014). SANHANES: a unique survey series in the health landscape. *SAMJ: South African Medical Journal*, *104*(10), 675–676.

Levitt, N. (2008). Diabetes in Africa: epidemiology, management and healthcare challenges. *Heart*.

MacLean, A., Hunt, K., Smith, S., & Wyke, S. (2012). Does Gender matter? An analysis of men's and wome's accounts of responding to symptoms of lung cancer. *Social Science & Medicine*, *191*, 134–142.

Maimela, E., Alberts, M., Modjadji, S. E., Choma, S. S., Dikotope, S. A., Ntuli, T. S., & Van Geertruyden, J.-P. (2016a). The prevalence and determinants of chronic non-communicable disease risk factors amongst adults in the Dikgale health demographic and surveillance system (HDSS) site, Limpopo Province of South Africa. *PLoS One*, *11*(2), e0147926.

Maimela, E., Alberts, M., Modjadji, S. E., Choma, S. S., Dikotope, S. A., Ntuli, T. S., & Van Geertruyden, J.-P. (2016b). The prevalence and determinants of chronic non-communicable disease risk factors amongst adults in the Dikgale health demographic and surveillance system (HDSS) site, Limpopo Province of South Africa. *PloS One*, *11*(2), e0147926.

Mangena, P., Saban, S., Hlabyago, K., & Rayner, B. (2016). An approach to the young hypertensive patient. *SAMJ: South African Medical Journal*, *106*(1), 36–38.

Manning, K., Senekal, M., & Harbron, J. (2016). Non-communicable disease risk factors and treatment preference of obese patients in Cape Town. *African Journal of Primary Health Care & Family Medicine*, *8*(1), 1–12.

Mayosi, B. M., Flisher, A. J., Lalloo, U. G., Sitas, F., Tollman, S. M., & Bradshaw, D. (2009). The burden of non-communicable diseases in South Africa. *The Lancet*, *374*(9693), 934–947.

Mbanya, J. C. N., Motala, A. A., Sobngwi, E., Assah, F. K., & Enoru, S. T. (2010a). Diabetes in sub-saharan africa. *The Lancet*, *375*(9733), 2254–2266.

Mbanya, J. C. N., Motala, A. A., Sobngwi, E., Assah, F. K., & Enoru, S. T. (2010b). Diabetes in sub-saharan africa. *The Lancet*, *375*(9733), 2254–2266.

Miranda, J. J., Kinra, S., Casas, J. P., Davey Smith, G., & Ebrahim, S. (2008). Non-communicable diseases in low-and middle-income countries: context, determinants and health policy. *Tropical Medicine & International Health*, *13*(10), 1225–1234.

Mohamed, S. F., Mwangi, M., Mutua, M. K., Kibachio, J., Hussein, A., Ndegwa, Z., Owondo, S., Asiki, G., & Kyobutungi, C. (2018). Prevalence and factors associated with pre-diabetes and diabetes mellitus in Kenya: results from a national survey. *BMC Public Health*, *18*(3), 1215.

Mutyambizi, C., Pavlova, M., Chola, L., Hongoro, C., & Groot, W. (2018). Cost of diabetes mellitus in Africa: a systematic review of existing literature. *Globalization and Health*, *14*(1), 3. https://doi.org/10.1186/s12992-017-0318-5

Naicker, A., Venter, C., MacIntyre, U., & Ellis, S. (2017). Prevalence of Selected Intermediate Risk Factors for Non-Communicable Diseases in an Apparently Healthy Indian Community in KwaZulu-Natal, South Africa. *Journal of Community Health*, *42*(1), 122–128. https://doi.org/10.1007/s10900-016-0238-y

Namusisi, O., Sekandi, J. N., Kasasa, S., Wasswa, P., Kamara, N. T., Medard, B., Mihayo, P., Gitta, S. N., & Mukanga, D. (2011). Risk factors for non-communicable diseases in rural Uganda: a pilot surveillance project among diabetes patients at a referral hospital clinic. *Pan African Medical Journal*, *10*.

Nojilana, B, Bradshaw, D., Pillay-van Wyk, V., Msemburi, W., Laubscher, R., Somdyala, N., Joubert, J. D., Groenewald, P., & Dorrington, R. E. (2016). Emerging trends in non-communicable disease mortality in South Africa 1997-2010. *South African Medical Journal*, *106*(5), 477–484.

Nojilana, Beatrice, Bradshaw, D., Pillay-van Wyk, V., Msemburi, W., Laubscher, R., Somdyala, N. I., Joubert, J. D., Groenewald, P., & Dorrington, R. E. (2016). Emerging trends in non-communicable disease mortality in South Africa, 1997-2010. *SAMJ: South African Medical Journal*, *106*(5), 477–484.

Nojilana, Beatrice, Bradshaw, D., Pillay-van Wyk, V., Msemburi, W., Somdyala, N., Joubert, J. D., Groenewald, P., Laubscher, R., & Dorrington, R. E. (2016). Persistent burden from non-communicable diseases in South Africa needs strong action. *South African Medical Journal*, *106*(5), 436–437.

Oni, T., Youngblood, E., Boulle, A., McGrath, N., Wilkinson, R. J., & Levitt, N. S. (2015). Patterns of HIV, TB, and non-communicable disease multi-morbidity in peri-urban South Africa-a cross sectional study. *BMC Infectious Diseases*, *15*(1), 20.

Parkin, D. M., Sitas, F., Chirenje, M., Stein, L., Abratt, R., & Wabinga, H. (2008). Part I: Cancer in Indigenous Africans—burden, distribution, and trends. *The Lancet Oncology*, *9*(7), 683–692.

Peer, N., Bradshaw, D., Laubscher, R., Steyn, N., & Steyn, K. (2013). Urban–rural and gender differences in tobacco and alcohol use, diet and physical activity among young black South Africans between 1998 and 2003. *Global Health Action*, *6*(1), 19216. https://doi.org/10.3402/gha.v6i0.19216

Peer, N., Kengne, A. P., Motala, A. A., & Mbanya, J. C. N. (2013). Diabetes in the African region: An update. *Diabetes Research and Clinical Practice*, *103*(2014), 197–205.

Peer, N., Steyn, K., Lombard, C., Lambert, E. V., Vythilingum, B., & Levitt, N. S. (2012). Rising diabetes prevalence among urban-dwelling black South Africans. *PloS One*, *7*(9), e43336.

Phaswana-Mafuya, N., Peltzer, K., Chirinda, W., Musekiwa, A., & Kose, Z. (2013). Sociodemographic predictors of multiple non-communicable disease risk factors among older adults in South Africa. *Global Health Action*, *6*(1), 20680.

Pheiffer, C., Pillay-van Wyk, V., Joubert, J. D., Levitt, N., Nglazi, M. D., & Bradshaw, D. (2017). The prevalence of type 2 diabetes in South Africa: a systematic review protocol. *BMJ Open*, 1–4.

Presidency of South Africa. (2015). *National Youth Policy 2015 – 2020.* Presidency of South Africa.

Puoane, T., Fourie, J., Shapiro, M., Rosling, L., Tshaka, N., & Oelefse, A. (2005). 'Big is beautiful'–an exploration with urban black community health workers in a South African township. *South African Journal of Clinical Nutrition*, *18*(1), 6–15.

Ramachandran, A., Jali, M., Mohan, V., Snehalatha, C., & Viswanathan, M. (1988). High prevalence of diabetes in an urban population in south India. *Bmj*, *297*(6648), 587–590.

Reddy, S. P., Resnicow, K., James, S., Kambaran, N., Omardien, R., & MBewu, A. D. (2009). Underweight, overweight and obesity among South African adolescents: results of the 2002 National Youth Risk Behaviour Survey. *Public Health Nutrition*, *12*(2), 203–207. https://doi.org/10.1017/S1368980008002656

Seck, S. M., Dia, D. G., Doupa, D., Diop-Dia, A., Thiam, I., Ndong, M., & Gueye, I. (2015). Diabetes Burden in Urban and Rural Senegalese Polpulations: A Cross-sectional Stusy in 2012. *International Journal of Endocrinology*, 1–6.

Shaw, J. E., Sicree, R. A., & Zimmet, P. Z. (2010). Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Research and Clinical Practice*, *87*(1), 4–14.

Singh, A. K., Maheshwari, A., Sharma, N., & Anand, K. (2006). Lifestyle associated risk factors in adolescents. *The Indian Journal of Pediatrics*, *73*(10), 901–906.

Sliwa, K., Wilkinson, D., Hansen, C., Ntyintyane, L., Tibazarwa, K., Becker, A., & Stewart, S. (2008). Spectrum of heart disease and risk factors in a black urban population in South Africa (the Heart of Soweto Study): a cohort study. *The Lancet*, *371*(9616), 915–922.

Ssewanyana, D., Abubakar, A., Van Baar, A., Mwangala, P. N., & Newton, C. R. (2018). Perspectives on Underlying Factors for Unhealthy Diet and sedentary lifestyle of adolescents at a Kenyan coastal setting. *Frontiers in Public Health*, *6*, 11.

Statistics South Africa. (2006). *General household survey 2005* (Statistical release P0318).

Statistics South Africa. (2007a). *General household survey 2006* (Statistical release P0318).

Statistics South Africa. (2007b). *General household survey 2006* (Statistical release P0318). Statistics South Africa.

Statistics South Africa. (2008). *General household survey 2007* (Statistical release P0318). Statistics South Africa.

Statistics South Africa. (2009). *General household survey 2008* (Statistical release P0318). Statistics South Africa.

Statistics South Africa. (2010). *General household survey 2009* (Statistical release P0318). Statistics South Africa.

Statistics South Africa. (2011). *General household survey 2010* (Statistical release P0318). Statistics South Africa.

Statistics South Africa. (2012). *General household survey 2011* (Statistical release P0318). Statistics South Africa.

Statistics South Africa. (2013). *General household survey 2012* (Statistical release P0318). Statistics South Africa.

Statistics South Africa. (2014). *General household survey 2013* (Statistical release P0318).

Statistics South Africa. (2015). *General household survey 2014* (Statistical release P0318).

Statistics South Africa. (2016). *General household survey 2015* (Statistical release P0318). Statistics South Africa.

Statistics South Africa. (2017). *South Africa Demographic and Health Survey: Key Indicator Report 2016*. Statistics South Africa.

Stats, S. (2011). Statistics South Africa (2016). *Statistical Release P0302: 2016 Mid-Year Population Estimates*.

Terzic, A., & Waldman, S. (2011). Chronic diseases: the emerging pandemic. *Clinical and Translational Science, 4*(3), 225–226.

Tollman, S. M., Kahn, K., Sartorius, B., Collinson, M. A., Clark, S. J., & Garenne, M. L. (2008a). Implications of mortality transition for primary health care in rural South Africa: a population-based surveillance study. *The Lancet, 372*(9642), 893–901.

Tollman, S. M., Kahn, K., Sartorius, B., Collinson, M. A., Clark, S. J., & Garenne, M. L. (2008b). Implications of mortality transition for primary health care in rural South Africa: a population-based surveillance study. *The Lancet, 372*(9642), 893–901.

Unwin, N., Setel, P., Rashid, S., Mugusi, F., Mbanya, J.-C., Kitange, H., Hayes, L., Edwards, R., Aspray, T., & Alberti, K. (2001). Non-communicable diseases in Sub-Saharan Africa: where do they feature in the health research agenda. *Bulletin of the World Health Organization*, *79*(10), 947–953.

Wagner, K.-H., & Brath, H. (2012). A global view on the development of non-communicable diseases. *Preventive Medicine*, *54*, S38–S41.

Wandai, M., Aargaard- Hansen, J., Day, C., Sartorius, B., & Hofman, K. J. (2017). Available data sources for monitoring non-communicable diseases and their risk factors in South Africa. *South African Medical Journal*, *107*(4), 331–337.

World Health Organization. (2010). *A conceptual Framework for Action of the Social Determinants of health*. World Health Organization, Geneva.

World Health Organization. (2011a). *Global status report on noncommunicable diseases 2010*. World Health Organization.

World Health Organization. (2011b). *Global status report on noncommunicable diseases 2010*. Geneva: World Health Organization.

World Health Organization. (2014). *Global status report on noncommunicable diseases 2014*. World Health Organization.

World Health Organization. (2015). *Global Strategy on Women's, Children and Adolescent's health (2016-2030)*. World Health Organization.

World Health Organization. (2018). *Global health estimates 2016: deaths by cause, age, sex, by country and by region, 2000-2016*. World Health Organization, Geneva. http://www.who.int/healthinfo/global_burden_disease/estimates/en/

Wu, F., Guo, Y., Chatterji, S., Zheng, Y., Naidoo, N., Jiang, Y., Biritwum, R., Yawson, A., Minicuci, N., & Salinas-Rodriguez, A. (2015). Common risk factors for chronic non-communicable diseases among older adults in China, Ghana, Mexico, India, Russia and South Africa: the study on global AGEing and adult health (SAGE) wave 1. *BMC Public Health*, *15*(1), 88.

Yaya, S., Ekholuenetale, M., & Bishwajit, G. (2018). Differentials in prevalence and correlates of metabolic risk factors of non-communicable diseases among women in sub-Saharan Africa: evidence from 33 countries. *BMC Public Health*, *18*(1), 1168.