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THE PREVALENCE AND DETERMINANTS OF NON-COMMUNICABLE DISEASES AMONG OLDER PERSON IN SOUTH AFRICA



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A RESEARCH REPORT SUBMITTED TO THE FACULTY OF HUMANITIES, SCHOOL OF SOCIAL SCIENCES, UNIVERSITY OF THE WITWATERSRAND, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN THE FIELD OF HEALTH DEMOGRAPHY

FEBRUARY 2021

DECLARATION

I, **Abiel Mothibakhoro Lekulo**, declare that this research report is my own original work. It is submitted to the Faculty of Humanities, School of Social Sciences in partial fulfilment of the requirements for the Masters of Arts in Demography and Population Studies at the University of the Witwatersrand, Johannesburg. To the best of my knowledge, this report has not been submitted before, in part or in full, of any other degree or examination at this or any other university.



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February 2021

DEDICATION

This work is dedicated to my mother ‘Mathube Angelina Lekulo and friends for the support they have granted me. Above all, this work is dedicated to Almighty God for the wisdom He has granted me to complete this report with success. Lastly, this work is dedicated to my supervisor Prof. Nicole De Wet- Billings who has provided me guidance, expertise, support and time throughout the whole process.

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ABSTRACT

Background: The prevalence of non-communicable disease is deemed to increase significantly in future in South Africa. At the same time, population ageing is inevitable. Arguably, it has been emphasised around the globe, that mortality rate and life expectancy cannot monitor state of health in a population. Thus, illnesses and psychosocial support should be mainstreamed across age groups, in addressing population health. Older persons are no exception, as their health and social needs form part of their improved health status and welfare.

Objective: To determine the levels and determinants of non-communicable disease among older persons in South Africa

Data and Methods: The study used General Household Survey (GHS) 2017 and South Africa Population and Housing Census 2011 datasets GHS 2017 dataset was used to address study objective while census 2011 was used solely in the calculation of projection estimates. Data was based on older persons aged 60 years and older. Descriptive statistics using percentages, tables and bar graphs were used to show the disease status among older persons aged 60+ years in South Africa. Age specific disease rates were computed to indicate disease burden among older persons in South Africa. The cohort component population projection was used to estimate the proportion of older persons aged 60 years and older, in South Africa in 2031. The change in population structure between 2011 and 2031 were depicted by population pyramids. Eventually, multivariate binary logistic regression was used to test the association of each disease by demographic and socio-economic factors. Stata v15 was used in the regression analysis.

Results: A high proportion of older persons aged 60 years and older, had diabetes (45.4%) while 54.6% did not have diabetes. On the same note, 15.1% of older persons in 2017 were diagnosed with the hypertensive disease while 84.9% did not have the disease. The married had a high prevalence of heart disease (44.8%) compared to the widowed, never married and divorced. The prevalence of hypertension was 454 cases per 1000 population, among older persons aged 60 years and older in South Africa. This was followed by diabetes with 151 cases per 1000 population in 2017. The total prevalence rate would increase from 638.5 cases per 1000 older

persons in 2017 to 660.8 cases per 1000 older persons in 2031. The chances of diabetes disease among the Indian/Asian population group were 55% higher compared to the African/Black population group. Older persons aged between 70-74 years were 1.28 times more likely to hypertensive disease compared to those aged 60-64 years. Again, older persons who lived in Free State Province were 1.66 times more likely to get heart disease than those who lived in Western Cape Province.

Conclusion: Increase in the prevalence of non-communicable diseases in South Africa implies an increase in household costs in line with health care needs among older persons. Indian/Asian population group is the major concern concerning non-communicable disease hence it is vital to establish leading factors, which make population groups more susceptible to non-communicable disease. Ageing population in South Africa is increasing at a faster pace. It is a country call to prevent and manage non-communicable disease holistically, while at the same time bearing in mind population changing lifestyles across age groups. Population health check initiatives should be established and where they exist, they have to be strengthened so that population health status may be improved. This will help support and encourage older persons in the management of non-communicable diseases at the grass roots level.

Key words: South Africa, ageing, projection, disease

CHAPTER ONE

INTRODUCTION

1.1 Background

Non-communicable disease (NCD) is a long term chronic illness and this illness is associated with the genetic, physiological, environmental and behavioural factors in a population (Onagbiye et al., 2019). The genetic determinants of non-communicable disease have been prominent in people of African ancestry relative to the Europeans; the environment determinants composed of early life influences as well as demographic shift towards the urbanisation (Nyirenda, 2016). Non-communicable disease in a population setting comes as combination or single factors in population and this include poor nutrition, physical inactivity, tobacco use and substance abuse (Zungu et al., 2019). The change in diet normally comes as a result of the change in the environmental setting, where people live, regarding the availability of food supply (Spires et al., 2016). The fast food in South Africa has become a norm and this expands dramatically in several parts of the country (2016). It is projected that NCD deaths will be five times communicable diseases in the low and medium income countries by 2030 (2019). The probability of dying from four major NCDs (Cardiovascular disease, cancer, respiratory infections and diabetes) in South Africa is 26.8% (Mendis & World Health Organization, 2014). This observed probability in South Africa comes after Sierra Leone (27.5%), which is higher than the rest of African countries such as, amongst others, Lesotho (24.2%), Egypt (24.5%), Nigeria (19.8%) and Zimbabwe (19.3%) (2014). On the other hand, shift in the population structure from the low to high proportion of older persons in inevitable. Such change eventually will yield in the high proportion of older persons in the country compared to the young population. Few studies have addressed ageing and health, therefore more studies of the similar manner need to be carried out to understand ageing and health holistically.

Population Ageing is described as an increase in the population median age resulting from a shift in population age structure (United Nations, 2015). The observed changes in fertility and mortality over time from high to low, contributes to a change in population structure in a country (Weeks, 2008). As evidenced in more developed countries, these interactions in the fertility and

mortality rates were brought about by the improvement in the standard of living of people, status of women as well as improvement in the medical technologies which advance older persons' longevity (Beard et al., 2012).

Globally, number of persons aged 60 years and older, was estimated at 967 million as at 2017 and projected to 2.1 billion in 2050 (United Nations, 2017). However, it has been emphasized that health expectancy for older persons aged 60 years and above, in future will be weakened by increasing prevalence of non-communicable diseases, which accounts for 80% of deaths in less and middle income countries worldwide (Ameh et al., 2014). Cardiovascular diseases are leading causes of death accounting to 17.9 million deaths yearly, cancer accounting for 9 million deaths, respiratory diseases at 3.9 million deaths and diabetes mellitus at 1.6 million deaths (WHO, 2017). In South Africa, 39% of mortality cases emanate from non-communicable diseases (Nojilana et al., 2016). The outcome variables used in the study are diabetes, hypertension and heart disease, as researches have pointed that these are among the leading causes of NCD deaths (Ndinda et al., 2018).

The observed trends of population aging, however, differ by regions. Literature pointed out that, the percentage of older persons aged 60+ years, in developed regions was nearly 22% of the total population relative to 9% of developing regions by 2011 (Statistics South Africa, 2014). Developing countries are expected to face a sudden increase in the number of older persons and this is suspected to quadruple in the next 50 years (Rabe, 2015). In the developed regions, number of older persons aged 60 years and above, is expected to increase from 310 million in 2017 to 427 million in 2050, representing an increase of 38% between the stated years (United Nations, 2017). On the other hand, in Africa, older person aged 60+ years, will increase from 69 million in 2017 to 226 million in 2050 (2017).

There have been observed trends and levels of ageing population in South Africa: older persons aged 60+ years, accounted to 8.1% of the population total in 2017 (Statistics South Africa, 2017). An increase in the share of older persons aged 60+ years, in South Africa, in future, is fuelled largely by significant decline in fertility rates over past decades (Makiwane, 2011). Total fertility rate in South Africa declined to 2.4 children per woman in 2018 from 3.5 children per woman in 1996 (Statistics South Africa, 2018). Therefore, determination of non-communicable disease prevalence as well as impact, among older persons in South Africa, shall provide a gist of

what is lacking with regard to public health interventions which aimed at improving their health status.

1.2 Problem Statement

Universally, the proportion of older persons aged 60+ years, is projected to grow at a faster pace than any of the lower age groups (WHO, 2012). Over the years, older persons welfare was dependent on the kinship support from their families, which no longer prevails lately due to modernization and urbanization (Aboderin, 2017). In addition, traditional ways of preparing food has changed immensely. In Africa, there is little evidence which addresses older persons situation in terms of support and welfare currently, and this suggests hardships in terms of meeting support they need (Barney & Jane, 2006). Studies revealed that older persons rely on their pension to attend check-ups as well as meeting their monthly dietary needs. However, few countries in Africa provide universal pension schemes for older persons, in which case, this becomes a hindrance for older persons' ability to meet their health and nutrition needs in majority of African countries.

In South Africa, a large proportion, 50.6% of older persons reside in extended families while 20.2% live alone (Makiwane, 2011). Like other Sub Saharan African countries, South Africa is characterized by highly skewed wealth distribution (2011). In future, the share of older persons in South Africa is expected to grow. An addition to the share of older persons suggests a demand in better health care, nutrition and public health initiatives, amongst others, aiming to address older persons welfare (WHO, 2015). However, studies revealed that South African Policy for older persons stresses only older age as fundamental human rights, rather than public health system in the country (Kelly et al., 2019). Failure to address the health system according to older persons needs in turn weakens their functional ability, which in turn shall contribute to mortality.

Apart from that, literature has pointed that older persons are susceptible to non-communicable diseases, and this is likely to happen in the future. Prevalence of non-communicable diseases contributed for 49% of deaths in south Africa and is expected to constitute 75% of all deaths by 2030 (Ministry of Health, 2013; Ndinda et al, 2018). Globally, non-communicable diseases are projected to rise by 17% and in Africa by 24% in the next decade (Pillay-van Wyk et al., 2016).

Among leading risk factors of non-communicable diseases are use of tobacco, lack of physical activity, poor diet as well as substance abuse (Pillay-van Wyk et al., 2016). High prevalence of non-communicable diseases in a country act as a thread to country development due to premature deaths, which ultimately hinder progress towards Sustainable Development Goals (WHO, 2018). Furthermore, this imposes a thread on individuals due to long term treatment, hence financial and economic implications in the future (Bloom et al., 2010).

Increase in proportion of older persons as well as rise in NCDs in South Africa stance as a public health concern. Older persons generally, are susceptible to other diseases which affect older persons more, such as dementia. The management of NCDs and other diseases needs more knowledge based information to older persons regarding their health system. There is a little evidence that suggest that South Africa is ready to address the growing needs of older persons through comprehensive strategies informed by the policies rendered to older persons welfare (Douglass, 2016). These policies take into account amongst other things, their food and health support. Nevertheless, these policies lack to address the environment factors, which fuel people to dwell on unhealthy habits, rather, support the social safety nets, nutrition and increasing production of unhealthy food (Spires et al., 2016). Even though the prevalence of non-communicable diseases in South Africa is increasing, lack of data imposes a challenge in the identification of the factors which put population at risk to the disease (Mudie et al., 2019; Ndinda et al., 2018).

1.3 Justification

Fertility and mortality rates in South Africa are declining, and such decline contributed to life expectancy increase due to improved health systems (Goodrick, 2013). As life expectancy increase, it portrays a possibility of ageing population and a reduction in the percentage of people to participate in labour force in the future due to declining fertility rates (Makiwane, 2011). This shall be accompanied by prolonged medical care at older ages hence policy concern to improve older persons health needs. Prolonged medical needs as well as rising NCDs prevalence in South Africa, will later contribute to complete epidemiological transition. However, many countries in Africa have not yet mainstreamed ageing in their national policies. Thus, about 40% of the population in African countries comprises of the youth population and policies are in line with

the young population; policies are in line with the young population welfare and survival, leaving the older persons behind (Aboderin, 2017).

South Africa, through the Department of Social Development, developed Policy for Older Persons, which outlined the aims and objectives to be met in addressing older person's welfare and support (Department of Social Development, 2005). Policy does not holistically view population ageing in South Africa as a major concern, and lack the full implementation of the set objectives (Goodrick, 2013). Other sets of policies and frameworks in South Africa have not yet fully mainstreamed ageing as one of the priority areas, in particular, policy on housing, health care, social welfare support and the study of gerontology in the university curriculum (Douglass, 2016). On the other hand, the prevalence of chronic diseases is expected to increase while, in particular, 3 in 650 psychiatrists in South Africa are old age psychiatrists (Zikali, 2018). South Africa is at second stage of both demographic and epidemiological transition, while at the same time population ageing is increasing (Gomez-Olive, 2015).

The identification of the non-communicable disease determinants among older persons, in South Africa, as a dependent population, is profound to the preparation of the country social protection. An increase in the share of the dependent population will in future suggest a public policy outlining the provision of pensions as well as their eligibility. This will also suggest economic policies for the creation of revenues using the smaller proportion of economically active persons (Goodrick & Pelser, 2014). In addition, policies will also have to consider the cost of long term chronic care medicines for older persons, which also are likely to increase (Sibai et al., 2004). The contribution of the study in the determination of the diseases and disease prevalence among older persons shall serve as a basis for prolonged health planning regarding older persons issues, with more emphasis to improve their social care (Walsh et al., 2016). This study will also aid in the better understanding of population structures and distributions, given the changing physical, genetic as well as environment which such population live. In addition, it is the study intends to explore angles put forward by South African Government in terms of improving public health systems to include older persons' needs, while at the same time suggesting their future needs regarding increasing prevalence of non-communicable diseases.

1.4 Research Question and Sub- Questions

Main Question

1.4.1 What are the levels and determinants of non-communicable diseases among older persons aged 60 years and older in South Africa?

Sub Questions

1.4.1.1 What is the prevalence of non-communicable disease among older persons' aged 60 years and older, in South Africa?

1.4.1.2 What is the projected prevalence of non-communicable disease among older persons' aged 60 years and older, in South Africa?

1.4.1.3 What are the determinants of non-communicable disease among older persons aged 60 years and older in South Africa?

1.5 Research Objective and Sub-Objectives

Main Objective

1.5.1 To determine the levels and determinants of non-communicable disease among older persons in South Africa.

Sub-objectives

1.5.1.1 To determine the prevalence of non-communicable disease among older persons aged 60 years and older, in South Africa

1.5.1.2 To determine the projected prevalence of non-communicable disease among older persons aged 60 years and older, in South Africa

1.5.1.3 To examine the determinants of non-communicable disease among older persons aged 60 years and older in South Africa.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Literature Review

Population ageing is increasing more in developed countries but differs by continents. The demographic interactions and its processes such as low fertility and mortality play a major role in increased ageing population (Statistics South Africa, 2014). In developed nations such as European and some Asian countries, population ageing is happening faster, and as a measure to cater for that, there are relevant policies in particular, addressing health care systems, as well as older persons economic support (Goodrick & Pelser, 2014). Globally fertility levels dropped from 3.2 children per woman in 1990 to 2.5 children in 2019 (United Nations, 2019). A decline in fertility rates suggest that in future, economically active persons or support ratios especially youth will decline while older persons increase, hence economic imbalance in country due to increased older persons demands (Lee & Reher, 2011). The imbalance will be caused by inadequate participation of the economically active persons in the labour force (Hock & Weil, 2012). It is projected that by 2050, the economic support ratios will decrease to 56%, globally, which in developed regions is expected to decline by 33% (Pillay & Maharaj, 2013). Furthermore, these support ratios, are expected to decline by 0.5%, in countries with high proportion of older persons such as China, South Korea, Italy and Spain (United Nations, 2015). On the other hand, it is estimated worldwide that non-communicable disease prevalence will increase at older ages as a result of improved standard of living, particularly change in life style chores, which in turn will propel strict improvements on health systems (Ndinda et al., 2018b). An improvement in primary health care section as first point of entry to health consultations will serve as a basis for advancement of older person's health. This, particularly, has to consider that older persons' health needs are met.

2.1.1 Ageing in Africa and Sub Saharan Africa

The decline in mortality levels as well as fertility in Africa, has contributed to improvement in the population lives for the better. This comes as a result of reduced fertility levels, and as such

happens; families are able to meet their health and nutrition needs. In particular, in Sub Saharan African countries, average number of live births per woman declined from 6.3 children per woman in 1990 to 4.6 children per woman in 2019, and it is projected to fall further from 2.2 children per woman in 2050 to 1.9 children in 2100 (United Nations, 2019). As population ability to meet its needs improve on a daily basis, the possibility of population ageing is envisaged. Share of older persons in the world is expected to increase from 9.1% in 2019 to 16% in 2050; the proportion of older persons is expected to remain high in the developed regions as opposed to the developing regions (United Nations, 2019). In Africa, older persons aged 60 years and older, is expected to rise from 38 million in 2000 to 212 million in 2025 and at the growth rate of 2.27% (Rabe, 2015; United Nations, 2011). United Nations has pointed out that number of older persons aged 60 years and older, in Africa, showed a significant increase from 42,4 million to 64.4 million between 2005-2015 (United Nations, 2015). This is projected further to 226 million in 2050 (United Nations, 2017). On the same note, 3% of the total population in the Sub Saharan African countries comprised of older persons and this is projected to increase by 0.3% in 2030 (United Nations, 2019). Kenya has the highest expected growth rate of older persons aged 60 years and older, in entire world post 2015 (Murphy, 2018).

Among factors contributing to an increase in older persons in Sub Saharan Africa in particular, is changing cultural norms and improved socio-economic status of the households (Pillay & Maharaj, 2013). In addition, some of the studies indicated that the shift of population to older ages comes as a result of improved standard of living and increase in life expectancy. However, from several countries, the support systems such as old age pensions, health care systems, retirement policy as well as economic planning for future have not been implemented in some African countries (Bloom, et al, 2010).

2.1.2 Ageing in South Africa

The number of older persons aged 60 years and older in South Africa has increased over time. Between 1996 and 2011 censuses, older persons aged 60 years and older, increased to 4.1 million from 2.8 million, representing 8.1% of total population in 2011 (Statistics South Africa, 2014). The annual growth rate for older persons aged 60 years and older increased from 1.09% in 2002 to 2.97% in 2020 (Statistics South Africa, 2020). The decline in mortality and fertility suggests

that there will be increase in ageing population in South Africa. Older persons population is projected at 7 million in 2030 in South Africa (Statistics South Africa, 2014). Older persons quality of life is explained by provision of pensions as well as improved medical interventions targeted at older population, however, some studies have indicated that few of the higher institutions in South Africa offer geriatric medicine education (Douglass, 2016). This will in turn pose a challenge in terms of addressing older persons illnesses, which in particular increasing prevalence of non-communicable diseases (Ndinda et al., 2018).

Older persons in South Africa are eligible for non-contributory pension on a monthly basis. In South Africa, like the rest of Sub Saharan Africa, older persons provide economic support to their families through these pensions (Munthree & Maharaj, 2012). Studies indicated that families with older persons act as attraction for more dependents due to pensions (Makiwane, 2011). Due to the low amount received, older persons' ability to afford their medical expenses through these pensions is limited. In addition, their ability to meet the required or recommended dietary needs becomes minimal. The Government interventions in public health initiatives is key to helping those in low income particularly older persons, such that eventually their health status may be improved (WHO, 2015).

Support of older persons in Africa has been families or kinship responsibilities. However, due to decreases in fertility in Africa, this states that in future, there will be changes in the support systems which kinship rendered, due to decline in the young population, which also include changes in the traditional norms (Aboderin, 2017). Therefore, because of these changes in the family structures, policies should holistically, in particular, address aging and health, curbing the prevalence of non-communicable diseases in South Africa, through multi sectoral approach mechanisms (Ndinda et al., 2018). In addition, African Union Agenda 2063 has pointed older persons general functioning and welfare as top of the agenda. This should specifically focus on non-communicable diseases including cancer, diabetes, heart disease as well as chronic respiratory diseases, affecting older persons beyond 65 years, in South Africa (Statistics South Africa, 2017).

2.1.3 Ageing and Prevalence of Non-Communicable Diseases

A change in population health over time can follow a theory of epidemiological transition. As explained by scholars, this is viewed as a change in disease patterns from contagious form to manmade and degenerative diseases (Omran, 1971). Major contributors to this transition are brought about by a significant decline in mortality levels over time and increase in the life expectancy at birth (Adogu et al., 2015). The theory of epidemiological transition is categorised into three stages namely: the age of pestilence and famine, the age of receding pandemics and the age of degenerative and manmade diseases (Omran, 1971). The latter, highlights reduction in mortality levels and increase in the life expectancy beyond 50 years. The increase in the life expectancy comes as a result of improved medical technologies, improved life standards and also improved nutrition among the population settings (WHO, 2018). Worldwide, life expectancy improved from 64 years in 1990 to nearly 73 years in 2019 (United Nations, 2019). In Sub Saharan Africa, life expectancy at birth increased from 49 years in 1990 to 61 years in 2019, and this is projected to further increase to nearly 69 years in 2050 (2019).

An improvement in the life standards in the population may at times brings about the adoption of new lifestyles, for instance, substance abuse and tobacco abuse. Manmade diseases take a form of non-communicable disease which research had depicted that it accounts majority of deaths worldwide (Nojilana et al., 2016). Behavioural factors including unhealthy diets, physical inactivity and alcohol abuse fuel the spread of non-communicable disease, leading to premature deaths, which is projected to increase to 10% of all deaths by 2030 (WHO, 2011). The burden of non-communicable diseases among the economically disadvantaged population including older persons put more strain on households' budget, for the management of such diseases (2011). On the other hand, pressures on health systems to accommodate older persons needs is deemed to be experienced especially in low and medium income countries (Waterhouse et al., 2017). Currently, the prevalence of hypertension is stands at 48% in Africa, while diabetes at 5.1%, and it is projected that by 2030, the non-communicable disease prevalence will overtake infectious disease prevalence (Mudie et al., 2019).

South Africa is divided into four ethnic groups namely, African or Blacks, Coloureds, Whites and Indians, according to Statistics South Africa. Among White population group, non-

communicable disease prevalence was high compared to rest of the groups between 1980 and 2012 (Bradshaw et al., 2019). On the same note, Blacks and Indian population groups accounted for high prevalence of infectious diseases after 1985; non-communicable diseases prevalence among black population group increased after 2005 (Bradshaw et al., 2019). This change in the disease patterns by population group illustrates the change in population dynamics to meet their daily needs. In particular, older persons coping mechanisms in terms of accessing heath needs differ by groups and so, like non-communicable disease patterns. The observed patterns in health by population group emanate from the social and environmental aspects where these older persons live (Nojilana et al., 2016).

Older peoples' health needs require special care in order to address their health problems. In order to meet this, it is a country initiative to advance geriatric medicine courses in its institutions of higher learning. Older persons are prone to geriatric syndromes and this comprise of pressure ulcers, frailty and urinary incontinence, amongst others (WHO, 2018). Introduction of gerontology in the institutions of higher learning serves as predictor of country's preparedness in future, to meet older persons' needs and demands. However, various Sub Saharan countries have not advanced curriculum to include the older persons medicine (Douglass, 2016). The increasing non-communicable diseases prevalence among older persons, bearing in mind other disease conditions affecting them shall impose a major challenge in future, which also shall lead to the economic imbalance in the country (Bloom et al., 2010).

There is a relationship concerning epidemiological transition and demographic transition theories. Demographic transition theory highlights the changes and trends in birth and death rates, which ultimately forms the derivative from economic and social changes of development and modernisation (Blue & Espenshade, 2011). The theory has four stages: in stage one, population was categorised by high birth and death rates. High prevalence of contagious diseases was observed in this stage. Death rates were high in this stage, at 30-50 per 1000 population (Kuate Defo, 2014). Additionally, population growth was low due to late entry into marriage, wars, famine as viewed as preventative and positive checks (Hofmann, 2013). In stage two, mortality declined and birth rates remained high under the control of traditional social institutions, hence population explosion due to rapid growth. In stage three, both birth and death rates declined because of urbanisation and improvement in primary health care, amongst others

(McNicoll, 2008). In stage four, birth and death rates reduced and population growth negligible and notably changes in disease patterns to non-communicable diseases (Atkinson, 2015). In 1990, 47% of all deaths in the developing countries emanated from non-communicable diseases and this is likely to increase to 69% in 2020 while in Sub Saharan Africa in particular, account to 27% (Adogu et al., 2015; Yaya et al., 2020). Thus, the epidemiological transition in Africa occurred over two decades ago and the burden of non-communicable disease stands at 24% (Yaya et al., 2020). Alternatively, low birth rates emanated from women involvement in decisions making as to when to have children and the like, while low death rates resulted from improved medical technologies and good sanitation (Chen, 2013). Studies have indicated that population ageing happens in this stage four of the demographic transition (Lesthaeghe, 2014).

Arising from the above, in South Africa, fertility was high at 4 children per between 1990-1995 (United Nations, 2015). The major reasons behind this included premarital fertility which accounted 38.9% of the total births (Garenne & Zwang, 2008). High prevalence of HIV/AIDS was estimated at 34% among pregnant women and AIDS related deaths were high (Shabangu, 2011). Due to the improvement in medical technologies, mortality declined and birth rates remained high under the control of traditional social institutions, hence population explosion due to rapid growth (McNicoll, 2008). Moreover, women involvement in decision making lead to a decline in fertility, and good sanitation amongst others continued to lower down the mortality (Statistics South Africa, 2014). That is, under-five mortality halved and crude death rates declined from 12.6 deaths per 1000 population to 9.1 deaths per 1000 population between 2002 and 2018 (Statistics South Africa, 2018). Therefore, decline in fertility and mortality along with life expectancy increases, yield to ageing population, due to the shift in age structure over time, from successive birth cohorts (Weeks, 2008). The increase in the life expectancy also suggests that due to changes in standard of living, which include the unhealthy eating habits, the chances of getting non-communicable diseases is inevitable (WHO, 2011). In South Africa, life expectancy has improved by 10 years over last 18 years. Thus, life expectancy at birth increased from 56 years in 2002 to 66 years in 2020 (Statistics South Africa, 2020).

Literature depicted that there are few studies which explore ageing with other areas such as health, food security, disability and rural development, amongst others (Murphy, 2018).

Therefore, this research is profound to aid South Africa regarding the provision of geriatric medicine for older persons in future, through its well-coordinated and informed strategic plans.

2.2 Theoretical Framework

Population ageing can be better explained by Demographic and Epidemiological Transition Theories. The former depicts change in birth and mortality rates over time in a country, while the latter translate to change in disease patterns from infectious to non-communicable disease (Omran, 1971). Total fertility in South Africa declined from 2.45 children per woman in 2002 to 2.33 children per woman in 2020 (Statistics South Africa, 2020). On the same note, high mortality rate observed in 2006 in South Africa declined significantly post mass initiation of antiretroviral treatments, to reduce the prevalence of infectious disease in the country, particularly, HIV/AIDS (2020). The change in disease patterns as well as reduction in fertility levels, at later stages lead to improved standard of living in the population. An improvement in the standard of living contributes to an increase in the life expectancy. All these, comes as a result of population ability to adapt to change in an environment under which such population live. Such change is deemed to be guided by the availability of resources to meet population demands. Population in a community is deemed to age due to decreases in fertility rates and increase in life expectancy at birth, which in turn increases chances of non-communicable diseases (Gyasi & Phillips, 2020). The link between these theories and population ageing can further be described through social determinants of health.

The social determinants of health encompasses a range of environment or community networks, economic, political and cultural factors towards population health in a given country (Ataguba et al., 2015). The three broad areas form the center of the framework namely: individual life factors, social and community networks as well as general socio-economic, cultural and physical environment (Dahlgren & Whitehead, 1991). Individual lifestyles and communities they live in, are governed by living and working conditions, for instance, access to health care services, unemployment, working environment, education, housing as well as food security (Exworthy, 2008). Literature pointed out that low-income levels from unemployment are linked to poor health. Poor health conditions in a community dictate country spending on public health mechanism, as a way of addressing health status in a country, in particular the observed health

needs. Moreover, gender plays part in the difference among diseases affecting males and females, especially at older ages. Personal attributes such as physical activity, smoking, diet and how to cope with stresses, put a burden on health outcomes (Psaltopoulou et al., 2017). In South Africa, researches have indicated that unemployment, cultural practices as well as living conditions in a population are among the leading contributing factors of population health and mortality (De Wet, 2014).

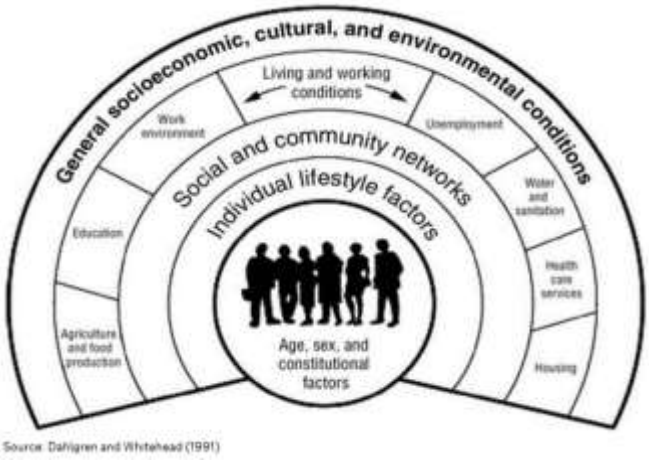


Figure 1: The Social Determinants of Health Model (Dahlgren and Whitehead 1991)

2.3 Conceptual Framework

Population ageing can occur as a result of different factors within sphere of people's lives. As indicated in Figure 2 below, population factors along with their socio-economic status play a crucial role in the determination of non-communicable disease at a given point in time. In particular, acquisition of better education in a population makes such population prone to better employment opportunities. Literatures have confirmed a diverse relationship between education and type of residence, for instance, in the rural areas, most of the population with lower educational attainment resides while urban areas are flooded with mostly population with formal qualification in South Africa (Statistics South Africa, 2017). Outstandingly, better employment opportunities in an environment or community which people live in, will mostly differ by population groups, family and household desires, gender and age. .

Due to the community networks in a population, the perceived health status determines people desire to consult health care workers if need be. This may come as a result of observed changes

in population daily endeavour in performing their life chores. The changing environment and lifestyle choices by population contribute to unhealthy habits, which at times may seem as norm in the places of residence which people live. On the other hand, poor standard of living in rural areas prolongs population to rely on available amenities, such as food supply available, which in turn may lead to poor nutrition. Combinations of changing lifestyles among population and their health status lead to increase in chances of non-communicable diseases. The combined effects of nutrition and other environmental factors, makes population prone to the non-combination diseases (Mudie et al., 2019). This is parallel to epidemiological transition, which illustrates a change in patterns of disease due to behavioural norms and change in lifestyle choices (Omran, 1971).

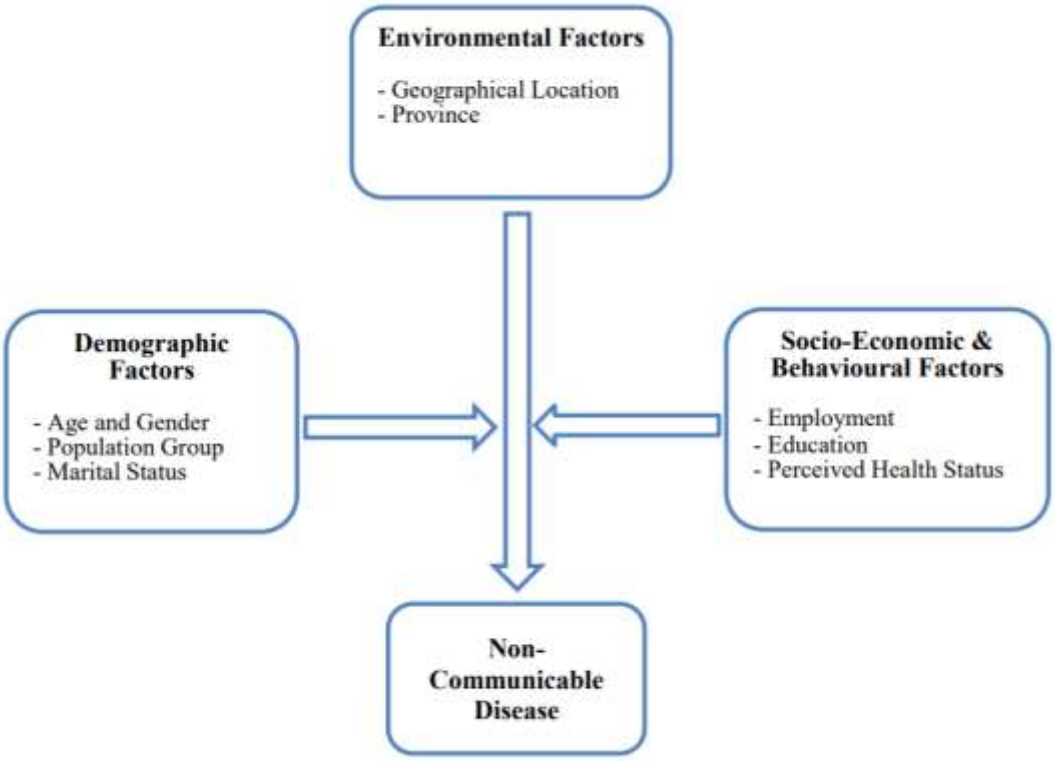


Figure 2: The Framework Analysing Determinants of Non-Communicable Diseases, adapted from Dahlgren & Whitehead, 1991

2.4 Hypothesis

H_0 : there is no association between population ageing and determinants of non-communicable diseases among older person aged 60 years and older, in South Africa.

H_1 : there is association between population ageing and determinants of non-communicable diseases among older person aged 60 years and older, in South Africa

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter outlines information towards meeting the study objectives. Study design, data source, study population and sample size, as well as variables under study were presented. Variables definitions and how the variables were coded in the study were also outlined. Furthermore, analysis plan pertaining statistical techniques in meeting the set objectives were described. Lastly, ethical considerations as well as limitations of the study were presented.

3.2 Study design

This is a cross-sectional study design using a nationally representative data sample of older persons in South Africa as collected by South Africa Census 2011 and General Household Survey 2017. Census 2011 was the third census to be conducted since 1994, and this was conducted in October 2011. At least 160,000 enumerators and supervisors collected data in all nine provinces of South Africa, following the standard guidelines. In the preparation of the data collection, 7000 staff was deployed and established 103,576 enumeration areas in South Africa. (Statistics South Africa, 2012).

General Household Survey (GHS) 2017 was conducted from January to December 2017, and this survey is carried out yearly since 2002, replacing the October Household Survey and conducted in all nine provinces of South Africa. The questionnaire for GHS was designed to cover the following broad areas: education, health and social development, housing, household access to services and facilities, food security and agriculture (Statistics South Africa, 2018). This was administered in the nine provinces of South Africa namely; Limpopo, Gauteng, Mpumalanga, Western Cape, Eastern Cape, Northern Cape, North West, KwaZulu-Natal and Free State, covering all private households with exception old age homes, students' hostels, prisons, military barracks and hospitals. The provincial boundaries as defined in December/January 2006 guided the sample and reporting. Kwazulu Natal, Free State and Northern Cape provinces were not

affected by changes in the new provincial boundaries. A total of 21,225 households were interviewed by 233 enumerators. These enumerators were supervised by 62 provincial and districts coordinators. Multi stage sample design was used in GHS 2017 survey. (Statistics South Africa, 2018)



South Africa Map, Source: **(Statistics South Africa, 2012)**

3.3 Data source

Study used the General Household Survey (GHS) 2017 dataset to address the study objective. A comprehensive coverage of living conditions and service delivery questionnaire was used to collect data in all nine provinces of South Africa. The questionnaire comprised of 10 sections and a total 213 questions were asked in the questionnaire through face to face interviews. Dataset was suitable for the study as it contained information on population demographic and socio-economic characteristics including health. This research also used South Africa Population and Housing Census 2011, Fertility 2016 and Mortality 2016 dataset to project population structure for the years 2021 and 2031 in South Africa. Thus, these datasets were used to respond to sub-objective 2. Usage of Census 2011, Fertility 2016 as well as Mortality 2016 datasets were key in the projection of older persons in 2031 as well as growth rate, which aided in the disease projection estimates using component population projection method. In addition, these datasets were used since they are latest datasets in South Africa, and fitting into the scope of this study.

These datasets were downloaded upon completed registration and approval on DataFirst and IPUMS International websites. Both datasets were weighted as to account for under-sampling or oversampling of some sections of the South Africa.

3.4 Study population and sample size

This research considered all persons aged 60+ years, in all provinces of South Africa. Total population used in the study consisted of weighted sample of 4,384,480 persons from General Household Survey 2017. This total included 1,754,282 (40.01%) males and 2,630,198 (59.99%) females aged 60+ years. This was based on stratified design with the probability proportional to primary sampling units' size selection at the initial stage. Systematic sampling was used in the subsequent stage in the sampling of dwelling units (Statistics South Africa, 2018). The population structure projection for 2031 was computed from total population of 51,770,559 from Census 2011. The underlying reason for the consideration was that, GHS 2017 was a representative of the total population in South Africa, while Census 2011 covered entire country.

3.5 Study variables

3.5.1 Outcome variable

The outcome variable of this study was non-communicable disease. Literature pointed that diabetes, hypertension, heart disease and cancer contributes to high mortality globally (Ndinda et al, 2018). The study focused on hypertension, diabetes and heart diseases, and these diseases were considered from GHS 2017 dataset. Cancer was discarded from the analysis due to low observations. The presence of disease among older person was determined from the individual questionnaire, whereby during the survey period, individuals were questioned if they had been told by health practitioner if they have such disease. Diseases were assigned codes as follows: "1" for the presence of disease and "0" for the absence of the disease. All unspecified responses in each disease were discarded from the analysis. The following table summarizes how all these variables were recoded:

Table 3.1: Categorisation of the Outcome Variable

Variable code	Variable Name	Original Codes	How variables were in this study
Q26HBP	Hypertension	Yes No Unspecified	0 – No 1 - Yes
Q26DBT	Diabetes	Yes No Unspecified	0 – No 1 - Yes
Q26HEART	Heart	Yes No Unspecified	0 – No 1 – Yes

3.5.2 Independent variables

General Household Survey 2017 dataset was used to obtain these variables. The definition of the independent variables was presented as follows:

Age group: This represented length of time which older persons have lived in South Africa. The length of time was given from 00 to 75+ hence those who aged 00-59 years were dropped from the study.

Educational attainment: this was the highest educational level reached by older persons aged 60+ years. The original codes were given from reception to higher education. Therefore, coding was performed out of these original variables as shown by table below, into those with no education, those with primary education, those with tertiary education and other forms of educational attainment. However, other unspecified responses were dropped from the analysis.

Residence type: this comprised of the province and geographical location whereby older persons aged 60+ years, lived in, in 2017. All nine provinces in South Africa were considered in the study and geographical types were classified into urban and rural types.

Gender: this variable consisted of classification of all persons aged 60 years and above, as male and female, typically assigned at birth

Marital Status: this represented older persons aged 60+ years current demographic situation in 2017. Older persons who were legally married as well as separated, though still together in 2017, were classified as married. The never married variable was made from combination of those who were living together like husband and wife, those who were single but have been living together and those who were single and never married. Therefore, classification of marital status here was given as those who were married, divorced, widowed and those who were never married.

Population group: this entailed classification of all persons aged 60+ years, by racial group. Racial groups were classified according to African/Blacks, Coloureds, Indians/Asians and Whites.

Employment Status: Refers to respondents being employed, unemployed or not economically active

Health care behaviour: Perceived health status among 60 years and above, in accordance with how they feel or self-description in 2017. Respondents were given responses in describing their health status ranging from excellent to poor.

Table 3.2: Categorization of Independent Variables for this Study

Variable code	Variable Name	Original Codes	How variables were in this study
Age_grp1	Age Group	60-64 65-69 70-74 75+	1. 60-64 2. 65-69 3. 70-74 4. 75+
Race	Population Group	African/ Black Coloured Indian/ Asian	1. African/ Black 2. Coloured 3. Indian/ Asian

		White	4. White
Gender	Sex	Male Female	1. Male 2. Female
Prov	Province	Western Cape Eastern Cape Northern Cape Free State Kwazulu Natal North West Gauteng Mpumalanga Limpopo	1. Western Cape 2. Eastern Cape 3. Northern Cape 4. Free State 5. Kwazulu Natal 6. North West 7. Gauteng 8. Mpumalanga 9. Limpopo
geotype	Geographical type	Urban Rural Traditional	1. Urban 2. Rural
Q12aMARST	Marital Status	• Legally married • Living together like husband and wife/ partners • Divorced • Separated, but still legally married • Widowed • Single but have been living together with someone as husband/wife before • Single and have never been married/ never lived together as husband/wife before	1. Married 2. Divorced 3. Widowed 4. Never married

		• unspecified	
Q15HIEDU	Educational attainment	• Grade R/0 • Grade 1/Sub A/Class 1 • Grade 2/Sub B/Class 2 • Grade 3/Standard 1/ABET/AET 1 • Grade 4/Standard 2 • Grade 5/Standard 3/ABET/AET 2 • Grade 6/Standard 4 • Grade 7/Standard 5/ABET/AET 3 • Grade 8/Standard 6/Form 1 • Grade 9/Standard 7/Form 2/ABET/AET 4/NC • Grade 10/Standard 8/Form 3/NCV Level 2/ Occupational certificate • Grade 11/Standard 9/Form 4/NCV Level 3/ Occupational certificate • Grade 12/Standard 10/Form 5/National Senior Certificate/Matric/NCV Level 4/ Occupational Certificate NQF Level 4 • NTC l/N1 • NTC ll/N2 • NTC lll/N3 • N4/NTC 4/Occupational Certificate-NQF Level 5 • N5/NTC 5/Occupational Certificate-NQF Level 5 • N6/NTC 6/Occupational Certificate-NQF Level 5 • Certificate with less than Grade 12/Standard 10 • Diploma with less than Grade 12/Standard 10 • Higher/National/Advance certificate wit Grade 12/Std 10/Occupational Certificate – NQF Level 5 • Diploma with Grade 12/Standard 10/Occupational Certificate NQF Level 6 • Higher Diploma/Occupational Certificate (Btech Diploma) NQF Level 7 • Post Higher Diploma (Masters Diploma and Masters Degree) NQF Level 9 • Bachelors Degree/Occupational	1. No education 2. Primary 3. Secondary 4. Tertiary

		Certificate – NQF Level 7 • Honours Degree/Postgraduate Diploma/Occupational Certificate - -NQF Level 8 • Doctoral Degrees (Doctoral Diploma and Phd) – NQF Level 10 • Other • No schooling • Unspecified	
Employ_status 2	Employment Status	Employed Unemployed Not economically active Not applicable	1. Employed 2. Unemployed 3. Not economically active
Q22GENHEALTH	Health status	Excellent Very good Good Fair Poor Not sure Unspecified	1. Excellent 2. Good 3. Fair 4. Poor

3.6 Ethical issues

This study used secondary analysis of existing datasets. Datasets were downloaded upon completed and approved registration on DataFirst and IPUMS International websites. Therefore, any personal information or name of the respondents was not identified in the dataset. For this reason, anonymity and confidentiality of the study respondents were guaranteed. The student protocol number is WDEM2019/07/01.

3.7 Data Analysis

Data was analysed using Stata v15. It was cleaned, and weighting was performed as to cater for under-sampling or oversampling errors. The analysis plan was performed according to study objectives as follows:

3.7.1 Research Question: What is the prevalence of non-communicable disease among older persons' aged 60 years and above, in South Africa?

To answer this question, descriptive statistics using percentages, tables and bar graphs were used to show the disease status among older persons aged 60+ years in South Africa. Furthermore, age specific disease rates were computed to indicate disease burden among older persons in South Africa. The disease prevalence rate (p) was calculated by the formula:

$$p = \frac{number\ of\ people\ with\ the\ disease\ or\ condition\ at\ a\ specified\ time}{number\ of\ people\ in\ the\ population\ at\ risk\ at\ the\ specified\ time} \times 10^n$$

Source:(Bonita et al., 2006)

Age specific disease rate is given by the formula:

$$p = \frac{number\ of\ disease\ to\ population\ aged\ 'a'}{population\ at\ risk\ aged\ 'a'} \times 1000$$

3.7.2 Research Question: What is the projected prevalence of non-communicable disease among older persons aged 60 years and older, in South Africa?

To address this question the cohort component population projection was firstly used to estimate the proportion of older persons aged 60+ years, in South Africa in 2021 and 2031. Projection of older persons in 2031 enabled study to obtain total population at risk of non-communicable disease. In order to compute this, the following were required:

- Population Census 2011 by sex
- Sex ratio as per 2011 population census
- Mortality 2016 data
- Fertility 2016 data

The following steps were taken in the construction of the population projection:

Step 1: calculation of survival rate for males and females using mortality data

Step 2: calculation of Age Specific Fertility Rate (ASFR) in 2016

Step 3: estimation of the total number of births between 2011 and 2015 using ASFR 2016 and female population from 2011 census

Step 4: the 2016 population projection was computed from multiplication of survival rate by population in 2011. However, for those aged 0-4 years, sex ratio as determined by 2011 census was multiplied with summation of ASFR 2016 to estimate the population.

Step 5: total number of births between 2016 and 2020 were calculated through the calculation of ASFR 2016 by projected female population in 2016.

Step 6: sex ratio 2011 multiplied by sum of ASFR 2016 to obtain males as well as females aged 0-4 years in 2021. The rest of the age groups were calculated by multiplication of survival rate in 2011 with projected population in 2016.

Step 7: step 3 to 6 were followed to get to the 2031 population projection.

The cohort component projection method used in calculation of the projections is given by:

$$P_{t+n} = survived\ population + births + net\ migrants$$

Where $P_{t+n} = total\ population\ at\ the\ time\ t + n$

Source:(George et al., 2004)

The change in population structure between 2011 and 2031 were depicted by population pyramids. The projection estimates were calculated using Microsoft Excel. The projected disease prevalence among older persons in 2031 was derived using the following steps:

Step 1: The annual population growth rate between 2011 and 2021 was calculated using the formula:

$$r = \frac{\ln \frac{p_n}{p_0}}{n}$$

Where:

p_n= projected population aged 60+ in 2021

p_0= total population aged 60+ from 2011 census

n= interval between 2011 and 2021

Source: (United Nations, 1983)

Step 2: obtained population of older persons aged 60+ from GHS 2017 and projected population in 2031

Step 3: obtained diseases cases among older persons aged 60+ in 2017

Step 4: computed current disease prevalence (2017) - cases in 2017 divided by population in 2017 per 1000 persons

Step 5: computed disease prevalence in 2031 through multiplication of population growth rate by disease prevalence rate in 2017

The assumptions under this projection estimate follow medium variant projection. It is believed that the current progress in socio-economic development will determine the fertility and mortality levels in future. In particular, the medium variant assumes that fertility levels will continue to decline in countries where fertility levels are high; however in countries where fertility level is below replacement level, there will be strategies to be deployed to increase fertility levels (United Nations, 2019). South Africa is no exception to this, as fertility levels continue to decline over time. Globally, projected gains in life expectancy in a country are likely to continue due to the advanced medical technologies to curb infectious diseases. Therefore, this research assumes a linear decline in fertility. In addition, the current interventions, which include health education, control and the treatment of infectious diseases in South Africa, will be advanced to control diseases spread. Again, the absence of or less major epidemics or wars in future envisaged, hence mortality assumed to remain constant.

3.7.3 What are the determinants of non-communicable disease among older persons' aged 60 years and older, in South Africa?

Finally, multivariate binary logistic regression was used to test the association of each disease by demographic and socio-economic factors. The adjusted odd ratios were used to show the association strength between each disease and the predictor variables. The hypothesis test was run at 95% significance level. The logistic regression formula is given as:

$$p = a + b_1x_1 + b_2x_2 + b_3x_3 + \cdots + b_ix_i$$

Where:

p= the probability that a case is in a particular category

a= the constant of the equation

b_i= the regression coefficients

x= independent variables **Source:**(Morrison, 2013)

CHAPTER FOUR

RESULTS

4.1 Descriptive Statistics Results

Table 4.1.1 – Distribution of Population by Socio-Demographic Characteristics, South Africa, 2017

Socio Demographic Characteristics		Frequency	Percent
N		**4 384 480**	**100**
Age Group	60-64	1 533 035	34.97
	65-69	1 130 719	25.79
	70-74	769 738	17.56
	75+	950 988	21.69
Population Group	African/Black	2 763 294	63.02
	Coloured	441 247	10.06
	Indian/Asian	161 486	3.68
	White	1 018 454	23.23
Gender	Male	1 754 282	40.01
	Female	2 630 198	59.99
Province	Western Cape	614 075	14.01
	Eastern Cape	635 597	14.5
	Northern Cape	114 456	2.61
	Free State	238 935	5.45
	KwaZulu-Natal	786 229	17.93
	North West	321 510	7.33
	Gauteng	988 730	22.55
	Mpumalanga	291 308	6.64
	Limpopo	393 639	8.98
Geographical Type	Urban	2 823 956	64.41
	Rural	1 560 525	35.59

Socio Demographic Characteristics		Frequency	Percent
	N	**4 384 480**	**100**
Marital Status	Married	2 101 745	47.94
	Divorced	191 282	4.36
	Widowed	1 488 356	33.95
	Never Married	603 097	13.76
Educational Attainment	No education	866 448	19.76
	Primary	1 300 231	29.66
	Secondary	1 620 550	36.96
	Tertiary	597 252	13.62
Employment Status	Employed	729 362	16.64
	Unemployed	31 077	0.71
	Not Economically Active	3 624 041	82.66

Table 4.1.1 above indicates population distribution by socio-demographic characteristics. Highest proportion (35.0%) of older persons aged 60+ years was in 60-64 years' age group while lowest proportion (17.6%) was represented in 70-74 years age group. The majority of older persons were African/Black, and represented 63.0% of the population in 2017. The study population was represented by highest proportion of females (60.0%) compared to males (40.0%). The majority of older persons aged 60 years and older, resided in Gauteng Province (22.6%) followed by Kwazulu Natal (17.9%). Northern Cape Province represented the lowest share of older persons in 2017. In 2017 64.4% of older persons lived in the urban areas while 35.6% lived in the rural areas. The highest proportion of older persons was married (47.9%). However, 4.4% of older persons were divorced. Older persons with secondary education accounted for 37.0% of the population in 2017 while 13.6% of older persons had tertiary education. The majority of older persons aged 60 years and older were not economically active (82.7%).

Figure 4.1.1 indicates disease status among older persons aged 60+ years in South Africa. A high percentage of older persons aged 60+ years, had diabetes (45.4%) while 54.6% did not have diabetes. Again, 15.1% of older persons in 2017 were diagnosed with the hypertensive disease while 84.9% did not have the disease. On the other hand, a small percentage of older persons

aged 60+ years, (3.4%), were diagnosed with heart disease in 2017, while 96.6% did not have heart disease.

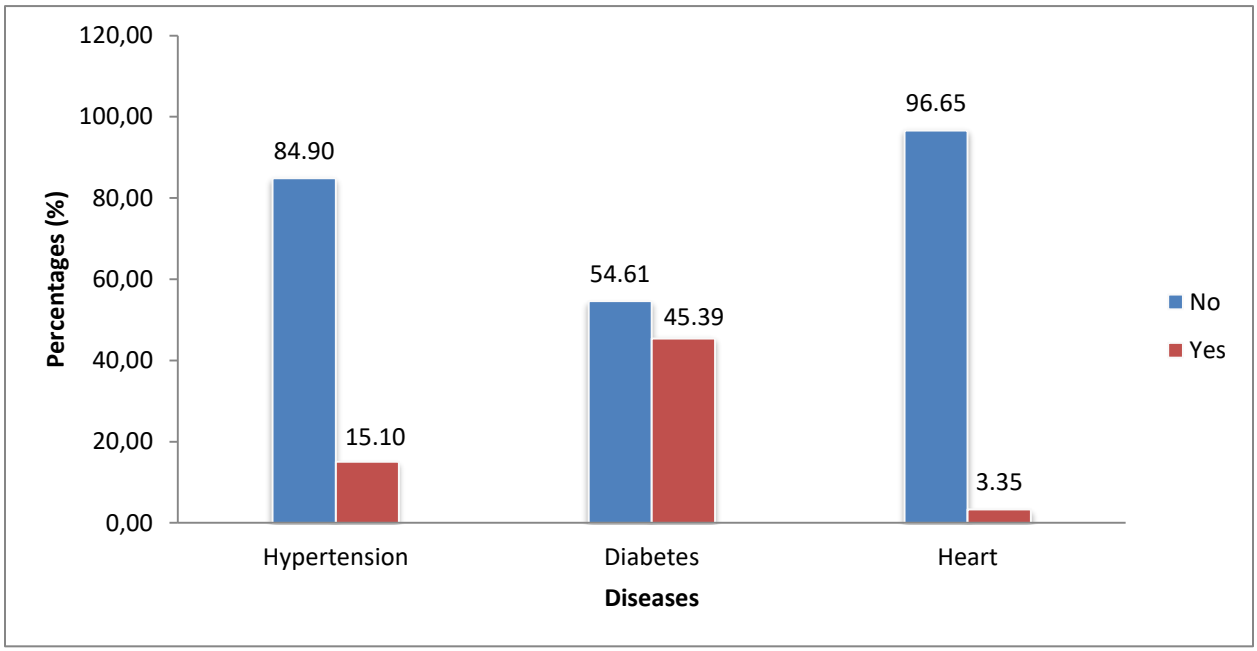


Figure 4.1.1- Disease Status Among Older Persons in South Africa

Table 4.1.2 – Demographic Characteristics by Diabetes Disease among Older Persons Aged 60 Years and Older in South Africa

Characteristics	Diabetes				Total
	No		Yes		
	N	%	N	%	
Age group					**χ2=2.3868; p=0.496**
60-64	1 318 258	35.42	214 777	32.43	1 533 035
65-69	946 503	25.43	184 217	17.82	1 130 719
70-74	646 770	17.38	122 968	18.57	769 738
75+	810 742	21.78	140 245	21.18	950 988
Total	3 722 273	100	662 207	100	4 384 480
Population Group					**χ2= 25.3780 ; p=0.000**
African/Black	2 340 861	62.89	422 433	63.79	2 763 294
Coloured	367 603	9.88	73 645	11.12	441 247
Indian/Asian	118 360	3.18	43 125	6.51	161 486
White	895 450	24.06	123 004	18,57	1 018 454
Total	3 722 273	100	662 207	100	4 384 480
Sex					**χ2= 1.7905; p=0.181**
Male	1 498 068	40.25	256 215	38.69	1 754 282
Female	2 224 206	59.75	405 993	61.31	2 630 198
Total	3 722 273	100	662 207	100	4 384 480
Province					**χ2= 72.1964 ; p=0.000**
Western Cape	527 414	14.17	86 660	13.09	614 075
Eastern Cape	507 794	13.64	127 804	19.30	635 597
Northern Cape	99 422	2.67	15 035	2.27	114 457
Free State	199 070	5.35	39 865	6.02	238 935
KwaZulu-Natal	640 874	17.22	145 355	21.95	786 229
North West	288 321	7.75	33 189	5.01	321 510
Gauteng	837 050	22.49	151 680	22.91	988 730
Mpumalanga	262 450	7.05	28 858	4.36	291 309
Limpopo	359 878	9.67	33 762	5.10	393 639
Total	3 722 273	100	662 207	100	4 384 480
Geographical Type					**χ2= 11.6963; p=0.001**
Urban	2 375 294	63.81	448 662	67.75	2 823 956
Rural	1 346 980	36.19	213 545	32.25	1 560 525
Total	3 722 273	100	662	100	4 384 480

Characteristics	Diabetes				Total
	No		Yes		
	N	%	N	%	
Marital Status					**χ2=29.7093; p=0.000**
Married	1 773 081	47.63	328 664	49.63	2 101 745
Divorced	165 891	4.46	25 390	3.83	191 282
Widowed	1 238 393	33.27	249 963	37.75	1 488 356
Never Married	544 907	14.64	58 190	8.79	603 097
Total	3 722 273	100	662 207	100	4 384 480
Educational Attainment					**χ2=15.0165; p=0.002**
No education	760 866	20.44	105 582	15.94	866 448
Primary	1 092 506	29.35	207 725	31.37	1 300 231
Secondary	1 360 949	36.56	259 601	39.2	1 620 550
Tertiary	507 952	13.65	89 300	13.49	597 252
Total	3 722 273	100	662 207	100	4 384 480
Employment Status					**χ2=8.2803 ; p=0.016**
Employed	641 723	17.24	87 639	13.23	729 362
Unemployed	28 133	0.76	2 944	0.44	31 077
Not Economically Active	3 052 417	82	571 624	86,32	3 624 041
Total	3 722 273	100	662 207	100	4 384 480
Health status					**χ2=162.5842; p=0.000**
Excellent	425 795	11.44	21 550	3.25	447 345
Good	2 051 909	55.13	288 214	43.52	2 340 123
Fair	944 701	25.38	260 694	39.37	1 205 395
Poor	299 869	8.06	91748.84	13.86	391 618
Total	3 722 273	100	662 207	100	4 384 480

Table 4.1.2 indicates a comparison of demographic characteristics by diabetes disease among older persons aged 60+ years in South Africa. The table shows that majority of older persons aged between 60-64 years (32.4%) were diagnosed with diabetes diseases in 2017. Again 18.6% of older persons in 70-74 years age group had diabetes as opposed to the rest of the age groups. Furthermore, among the population groups, African /Black population had highest proportion of those who were diagnosed with diabetes diseases in 2017 (63.8%) relative to White, Coloured and Indian/Asian population groups. The prevalence of diabetes was higher among females (61.3%) as opposed to males. Gauteng province had higher prevalence of diabetes diseases among older persons aged 60 years and older, compared to the rest of the province in South

Africa. On the other hand, diabetes prevalence was lower in Northern Cape Province. The diabetes prevalence in older persons who lived in urban areas in 2017 was high (67.8%) and lower among older persons who lived in the rural areas (32.3%). The prevalence also was greater among married (49.6%) followed by widowed (37.8%). It was lower among the divorced older persons (3.8%). Moreover, 86.3% of non-economically active older persons had diabetes compared to those who were employed as well as those who were unemployed in 2017. Diabetes disease prevalence was lower among older persons who stated their health conditions as excellent in 2017 in South Africa.

Table 4.1.3 - Demographic Characteristics by Hypertension Disease among Older Persons Aged 60 Years and Older in South Africa

Characteristics	Hypertension				Total
	No		Yes		
	N	%	N	%	
Age group					**χ2= 47.4917; p=0.000**
60-64	923 490	38.57	609 545	30.63	1 533 035
65-69	604 791	25.26	525 929	26.42	1 130 719
70-74	385 351	16.10	384 387	19.31	769 738
75+	480 548	20.07	470 440	23.64	950 988
Total	2 394 179	100	1 990 301	100	4 384 480
Population Group					**χ2= 11.8948; p=0.008**
African/Black	1 506 401	62.92	1 256 893	63.15	2 763 294
Coloured	216 883	9.06	224 365	11.27	4 412 471
Indian/Asian	88 614	3.7	72 871	3.66	1 614 856
White	582 282	24.32	436 172	21.91	1 018 454
Total	2 394 179	100	1 990 301	100	4 384 480
Sex					**χ2= 110.2444; p=0.000**
Male	1 094 424	45.71	659 858	33.15	1 754 282
Female	1 299 755	54.29	1 330 443	66.85	2 630 198
Total	2 394 179	100	1 990 301	100	4 384 480
Province					**χ2= 186.2308; p=0.000**
Western Cape	359 147	15.00	254 928	12.81	614 075
Eastern Cape	336 435	14.05	299 162	15.03	635 597
Northern Cape	48 498	2.03	65 958	3.31	114 457
Free State	101 025	4.22	137 910	6.93	238 935
KwaZulu-Natal	450 880	18.83	335 349	16.85	786 229
North West	174 280	7.28	147 231	7.40	321 510
Gauteng	481 883	20.13	506 846	25.47	988 730
Mpumalanga	156 692	6.54	143 617	6.76	291 309
Limpopo	285 339	11.92	108 300	5.44	393 639
Total	2 394 179	100	1 990 301	100	4 384 480
Geographical Type					**χ2= 60.2111; p=0.000**
Urban	1 464 207	61.16	1 359 749	68.32	2 823 956
Rural	929 972	38.84	630 553	31.68	1 560 525
Total	2 394 179	100,0	1 990 301	100	4 384 480

Characteristics	Hypertension				Total
	No		Yes		
	N	%	N	%	
Marital Status				**$\chi 2$= 52.3077 ; p=0.000**	
Married	1 218 444	50.89	883 302	44.38	2 101 745
Divorced	101 390	4.23	89 892	4.52	1 912 818
Widowed	712 963	29.78	775 394	39.96	1 488 356
Never Married	361 383	15.09	241 714	12.14	6 030 969
Total	2 394 179	100	1 990 301	100	4 384 480
Educational Attainment				**$\chi 2$= 56.5696 ; p=0.000**	
No education	513 403	21.44	353 045	17.74	866 448
Primary	667 590	27.88	632 642	31.79	1 300 231
Secondary	820 737	34.28	799 813	40.19	1 620 550
Tertiary	392 450	16.39	204 802	10.29	597 252
Total	2 394 179	100	1 990 301	100	4 384 480
Employment Status				**$\chi 2$= 55.3548 ; p=0.000**	
Employed	483 045	20.18	246 317	12.38	729 362
Unemployed	16 143	0.67	14 934	0.75	31 077
Not Economically Active	1 894 990	79.15	1 729 051	86.87	3 624 041
Total	2 394 179	100	1 990 301	100	4 384 480
Health status				**$\chi 2$= 370.3675 ; p=0.000**	
Excellent	315 085	13.16	132 260	6.65	447 345
Good	1 430 113	59.73	91 010	45.72	2 340 123
Fair	504 130	21.06	701 265	35.23	1 205 395
Poor	144 852	6.05	246 766	12.40	391 618
Total	2 394 179	100	1 990 301	100	4 384 480

Table 4.1.3 above depicts a comparison of population characteristics by hypertensive disease among older persons aged 60+ years in South Africa. The hypertensive disease prevalence was higher among older persons in the age groups: 65-69 and 70-74 respectively. The majority of African/Black population group (63.2%) were diagnosed with the hypertensive disease in 2017 as compared to the coloured, white and Indian Population groups. Also, hypertensive disease prevalence was higher among female population, (66.9%). The prevalence of hypertensive diseases was higher among older persons who stayed in Gauteng province (25.5%) compared to rest of the provinces. The diagnosis of hypertensive disease was more prevalent among older persons who lived in the urban areas (68.3%) in 2017. A highest proportion of married older

persons (44.4%) were diagnosed with the hypertensive disease in 2017 as opposed divorced, never married and widowed population. Hypertensive disease prevalence was higher among older persons who possessed secondary education (40.2%), in relation to those who had no education, primary and tertiary education. Non-economically active older persons had hypertensive disease (86.9%) compared to those who were employed and unemployed. Furthermore, hypertensive disease was more prevalent among older persons who stated their health status as good (45.7%), compared to those who stated their health as excellent, fair and poor in 2017.

Table 4.1.4 - Demographic Characteristics by Heart Disease among Older Persons Aged 60 Years and Older in South Africa

Characteristics	Heart Disease				Total
	No		Yes		
	N	%	N	%	
Age group					**χ2=5.0411; p=0.169**
60-64	1 489 076	35.14	43 959	29.95	1 533 035
65-69	1 099 973	25.96	30 747	20.95	1 130 719
70-74	745 343	17.59	24 395	16.62	769 738
75+	903 302	21.32	47 685	32.49	950 988
Total	4 237 694	100	146 786	100	4 384 480
Population Group					**χ2= 38.3730; p=0.000**
African/Black	2 701 067	63.74	62 227	42.39	2 763 294
Coloured	416 649	9.83	24 598	16.76	441 247
Indian/Asian	146 536	3.46	14 949	10.18	161 486
White	973 442	22.97	45 012	30.66	1 018 454
Total	4 237 694	100	146 786	100	4 384 480
Sex					**χ2= 0.4259; p=0.514**
Male	1 699 026	40.09	55 257	37.64	1 754 282
Female	2 538 668	59.91	91 530	62.36	2 630 198
Total	4 237 694	100	146 786	100	4 384 480
Province					**χ2= 79.3866; p=0.000**
Western Cape	579 866	13.68	34 209	23.31	614 075
Eastern Cape	613 844	14.49	21 754	14.82	635 597
Northern Cape	109 565	2.59	4 892	3.33	114 457
Free State	218 729	5.16	20 206	13.77	238 925
KwaZulu-Natal	768 710	18.14	17 519	11.94	786 229
North West	314 067	7.41	7 444	5.07	321 510
Gauteng	954 146	22.52	34 584	23.56	988 730
Mpumalanga	288 396	6.81	2 912	23.56	291 309
Limpopo	290 372	9.21	3 267	2.23	393 639
Total	4 237 694	100	146 786	100	4 384 480
Geographical Type					**χ2= 34.4729; p=0.000**
Urban	2 702 504	63.77	121 452	82.74	2 823 956
Rural	1 535 190	36.23	25 335	17.26	1 560 525
Total	4 237 694	100	146 786	100	4 384 480

Characteristics	Heart Disease				Total
	No		Yes		
	N	%	N	%	
Marital Status					**$\chi 2$=5.5207; p=0.137**
Married	2 036 048	48.05	65 698	44.76	2 101 745
Divorced	187 185	4.42	4 097	2.79	191 282
Widowed	1 425 116	33.63	63 241	43.08	1 488 356
Never Married	589 346	13.91	13 751	9.37	6 030 969
Total	4 237 694	100	146 786	100	4 384 480
Educational Attainment					**$\chi 2$= 15.0165; p=0.002**
No education	760 866	20.44	105 582	15.94	866 448
Primary	1 092 506	29.35	207 725	31.37	1 300 231
Secondary	1 360 949	36.56	259 601	39.2	1 620 550
Tertiary	507 952	13.65	89 300	13.49	597 252
Total	4 237 694	100	146 786	100	4 384 480
Employment Status					**$\chi 2$= 3.1484; p=0.207**
Employed	712 374	16.81	16 988	11.57	729 362
Unemployed	30 062	0.71	1 015	0.69	31 077
Not Economically Active	3 495	82.48	128 783	87.74	
Total	4 237 694	100	146 786	100	4 384 480
Health status					**$\chi 2$= 53.6318; p=0.000**
Excellent	439 132	10.36	8 212	5.59	447 345
Good	2 288 039	53.99	52 084	35.48	2 340 123
Fair	1 148 070	27.09	57 325	39.05	1 205 395
Poor	362 453	8.55	29 164	19.87	391 618
Total	4 237 694	100	146 786	100	4 384 480

Table 4.1.4 above shows the comparison of demographic characteristics by heart disease among older persons aged 60+ years, in South Africa in 2017. Indicated from the table is that, 32.5% of older persons aged 75+ years, were diagnosed with heart disease. From the table, 10.2% of the Indian/Asian population group were diagnosed with heart disease, and this group had lowest prevalence among all population groups in 2017. Heart disease prevalence was lower among males (37.6%) and higher among females (62.4%). Among all nine provinces in South Africa, heart diseases prevalence was higher in Gauteng and Mpumalanga provinces and lower in Limpopo Province. The table further portrays that 82.7% of older persons who lived in urban areas had heart disease as opposed to 17.3% of older persons who lived in the rural areas in

2017. The married had a high prevalence of heart disease (43.1%) compared to the divorced, widowed and never married. The majority of older persons who attained primary education had heart diseases 31.4% compared to those who had no education, primary as well as tertiary education. Heart disease prevalence was higher among older persons who were not economically active in 2017 compared to those who were employed and unemployed. Moreover, heart disease was more prevalent among older persons who stated their health conditions as fair in relation to those who stated as excellent, good and poor.

Figure 4.1.2 shows the age-specific disease rate among older persons aged 60+ years in South Africa. Among older persons aged 60-64 years, hypertension prevalence was higher, representing 139 cases per 1000 population in 2017. This was followed by diabetes prevalence at 49 cases per 1000 population in a similar age group. Notably, across all age groups, hypertension prevalence was higher than the rest of the diseases in 2017. However, hypertension prevalence was 87 cases per 1000 population group among 70-74-year-olds. On the other hand, heart disease prevalence across all age groups was the lowest of the top three non-communicable diseases, representing the utmost 10.9 cases per 1000 population. Moreover, the prevalence of hypertension was 454 cases per 1000 population, among older persons aged 60 years and older, at the national level. This was followed by diabetes with 151 cases per 1000 population in 2017.

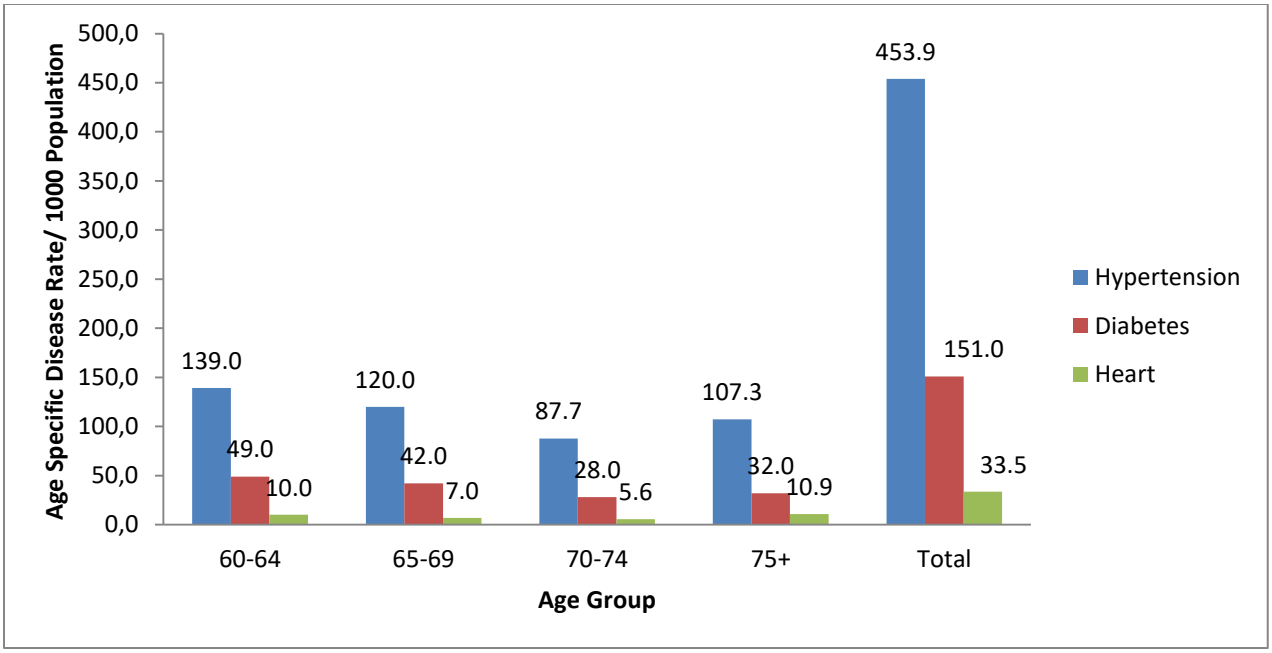


Figure 4.1.2 Age Specific Disease Rate Among Older Persons Aged 60 Years and Older, in South Africa

Table 4.1.5 - Age-Sex Projection for 2011, 2021 and 2031 for Persons Age 60 Years and Above in South Africa

Age group	Year					
	2011		2021		2031	
	Males	Females	Males	Females	Males	Females
60 – 64	612 364	773 404	844 972	1 054 191	1 045 233	1 231 474
65 – 69	401 548	556 256	641 181	833 405	822 855	1 078 549
70 – 74	293 498	454 832	451 533	631 775	623 049	861 143
75 – 79	165 283	315 984	272 807	430 091	435 611	644 379
80+	176 237	402 352	257 502	462 467	399 072	810 222

Table 4.1.5 above shows age-sex projection estimates for 2021 and 2031 years. Across all age groups, it is noted that the proportion of female population would be higher compared to male population in both years. Notably, older persons aged 80 years and older would double in 2031.

Figure 4.1.3: Population Pyramid of South Africa, 2011

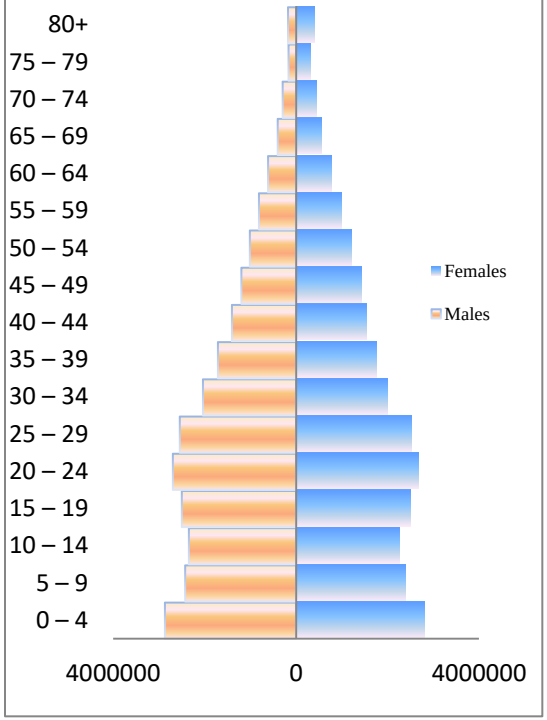


Figure 4.1.4: Projected Population Pyramid of South Africa, 2021

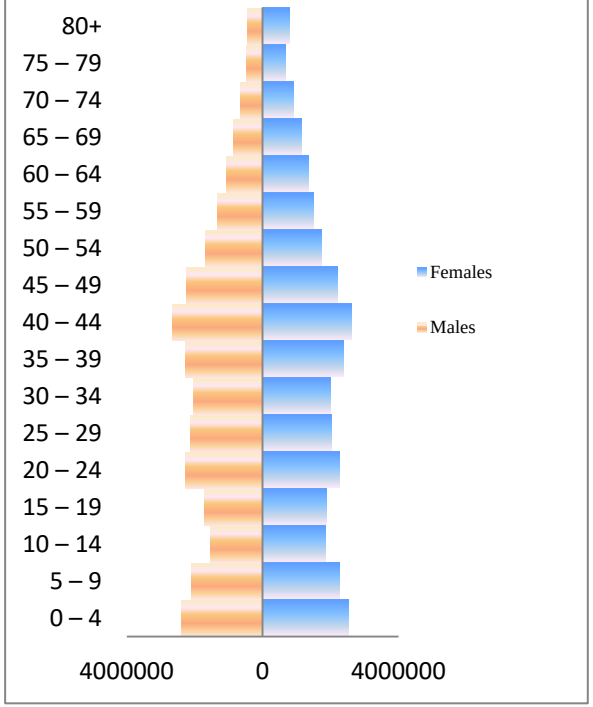
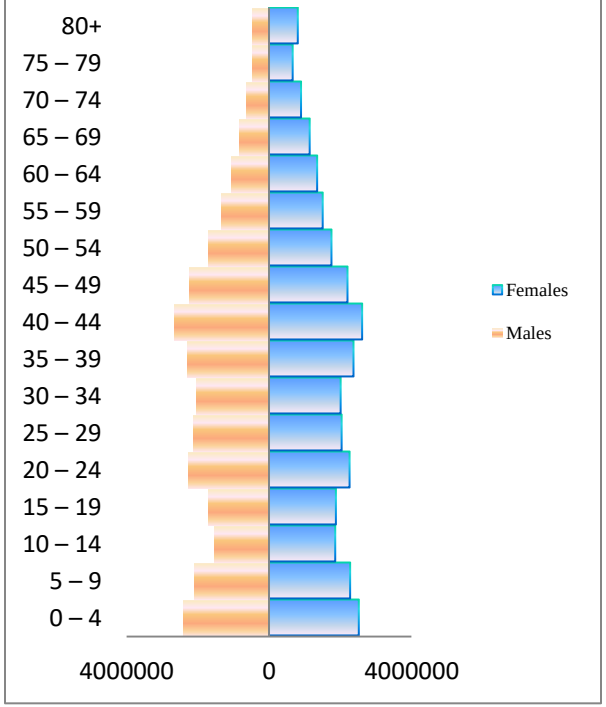


Figure 4.1.5: Projected Population Pyramid of South Africa, 2031



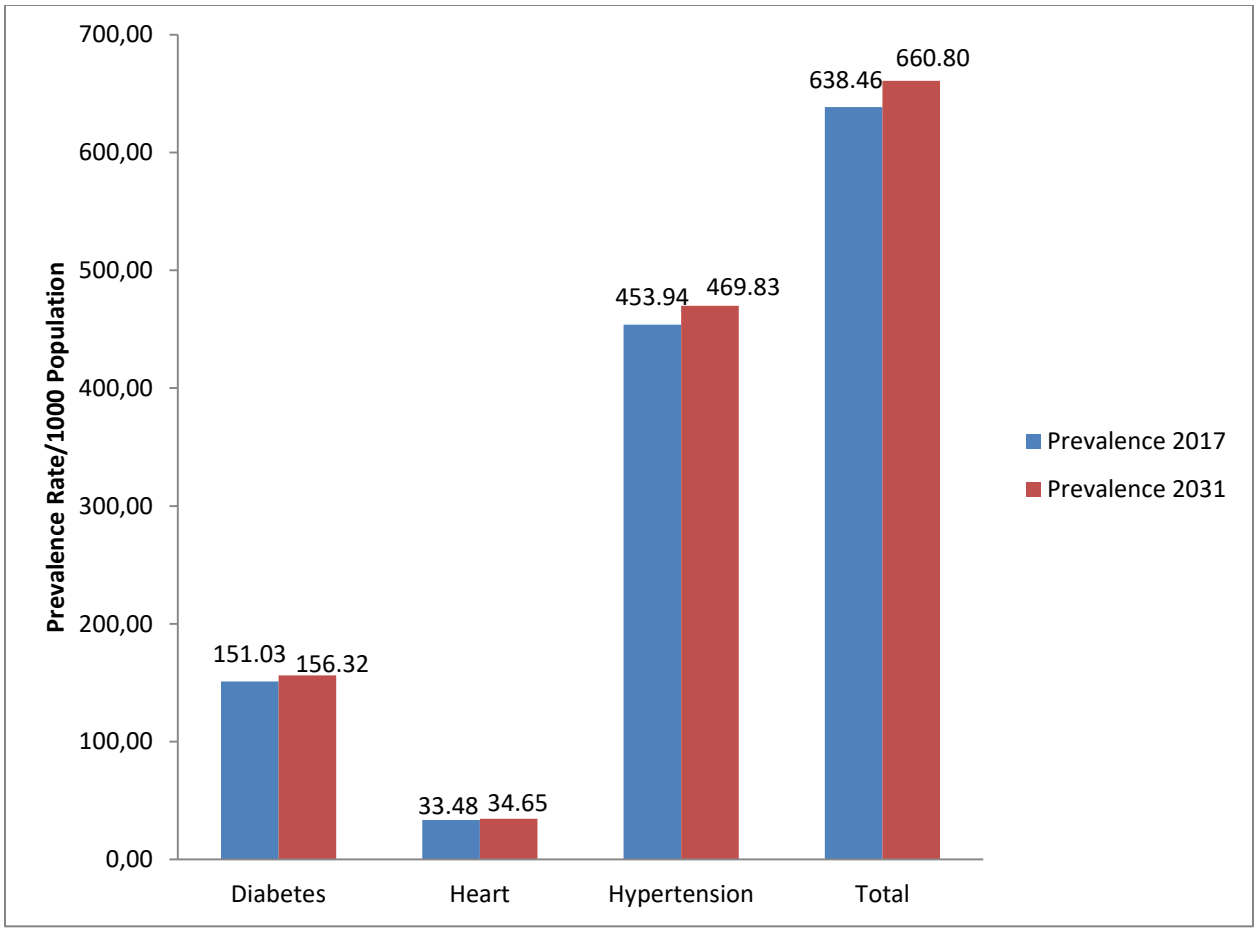


Figure 4.1.6: Projected Non-Communicable Diseases Prevalence Among Older Persons Aged 60 and Older, in 2031, in South Africa

Figure 4.1.6 above shows the projected disease prevalence among older persons aged 60+ years in South Africa between in 2031. The findings indicate that the total prevalence rate would increase from 636.5 per 1000 older persons in 2017 to 660.8 per 1000 older persons in 2031. The prevalence of hypertension is projected to increase to 469.8 per 1000 population in 2031 from 453.9 in 2017. Additionally, the diabetes prevalence rate would be estimated at 156.3 per 1000 older persons aged 60+ years, in 2031 from 151.0 per 1000 older persons in 2017. Furthermore, it is projected that heart disease prevalence among older persons aged 60+ years, increase from 33.5 per 1000 persons in 2017 to 34.7 per 1000 persons in 2031.

Based on the stated projected figures, expected in South Africa is that, the percentage of older persons would increase. Figures: 4.1.3, 4.1.4 and 4.1.5 above, show change in population structure in South Africa from 2011, 2021 and 2031 respectively. The percentage of older

persons is expected to increase with time, from 8.01% in 2011 to 13.31% of the total population in 2031. Again, further fertility decline is expected, between 2011 and 2031. However, it is projected that in 2031, there would be a high percentage of female population aged 80 years and older. In general, among older persons aged 60+ years, there would be more female population than males.

4.2 Inferential Statistics Results

Table 4.2.1Unadjusted Logistic Regression Showing Odds Estimates of Diabetes, Hypertension and Heart Diseases by Selected Population Characteristics in South Africa

Characteristic	Diabetes				Hypertension				Heart			
	OR	p>Z	[95% Conf. Interval]		OR	p>Z	[95% Conf. Interval]		OR	p>Z	[95% Conf. Interval]	
Age Group												
60-64	RC				RC				RC			
65-69	1.19	0.000	1.19	1.20	1.32	0.000	1.31	1.32	0.95	0.000	0.93	0.96
70-74	1.67	0.000	1.16	1.18	1.51	0.000	1.50	1.52	1.11	0.000	1.09	1.13
75+	1.06	0.000	1.05	1.07	1.48	0.000	1.48	1.49	1.79	0.000	1.77	1.81
Population Group												
African/Black	RC				RC				RC			
Coloured	1.11	0.000	1.10	1.12	1.24	0.000	1.23	1.25	2.56	0.000	2.52	2.60
Indian/Asian	2.02	0.000	1.99	2.04	0.99	0.005	0.98	0.99	4.43	0.000	4.35	4.51
White	0.76	0.000	0.76	0.77	0.90	0.000	0.89	0.90	2.01	0.000	1.98	2.03
Sex												
Male	RC				RC				RC			
Female	1.07	0.000	1.06	1.07	1.70	0.000	1.69	1.70	1.11	0.000	1.10	1.12
Province												
Western Cape	RC				RC				RC			
Eastern Cape	1.53	0.000	1.52	1.55	1.25	0.000	1.24	1.27	0.60	0.000	0.59	0.61
Northern Cape	0.92	0.000	0.90	0.94	1.92	0.000	1.89	1.94	0.76	0.000	0.73	0.78
Free State	1.22	0.000	1.20	1.24	1.92	0.000	1.90	1.94	1.57	0.000	1.54	1.59
KwaZulu-Natal	1.38	0.000	1.37	1.39	1.05	0.000	1.04	1.06	0.39	0.000	0.38	0.39

North West	0.70	0.000	0.69	0.71	1.19	0.000	1.18	1.20	0.40	0.000	0.39	0.41
Gauteng	1.10	0.000	1.09	1.11	1.48	0.000	1.47	1.49	0.61	0.000	0.61	0.62
Mpumalanga	0.67	0.000	0.66	0.68	1.21	0.000	1.20	1.22	0.17	0.000	0.17	0.18
Limpopo	0.57	0.000	0.56	0.58	0.54	0.000	0.53	0.54	0.14	0.000	0.14	0.15
Geographical Type												
Urban	RC				RC				RC			
Rural	0.84	0.000	0.84	0.84	0.73	0.000	0.72	0.73	0.37	0.000	0.36	0.37
Marital Status												
Married	RC				RC				RC			
Divorced	0.83	0.000	0.81	0.84	1.22	0.000	1.21	1.24	0.68	0.000	0.66	0.70
Widowed	1.09	0.000	1.08	1.10	1.50	0.000	1.49	1.51	1.38	0.000	1.36	1.39
Never Married	0.58	0.000	0.57	0.58	0.92	0.000	0.92	0.93	0.72	0.000	0.71	0.74
Educational Attainment												
No education	RC				RC				RC			
Primary	1.37	0.000	1.36	1.38	1.38	0.000	1.37	1.39	1.47	0.000	1.44	1.50
Secondary	1.38	0.000	1.36	1.39	1.42	0.000	1.41	1.43	2.21	0.000	2.17	2.25
Tertiary	1.27	0.000	1.26	1.28	0.76	0.000	0.75	0.76	1.65	0.000	1.62	1.69
Employment Status												
Employed	RC				RC				RC			
Unemployed	0.77	0.000	0.74	0.80	1.81	0.000	1.77	1.86	1.42	0.000	1.33	1.51
Not Economically Active	1.37	0.000	1.36	1.38	1.79	0.000	1.78	1.80	1.55	0.000	1.52	1.57
Health Status												
Excellent	RC				RC				RC			
Good	2.78	0.000	2.74	2.81	1.52	0.000	1.51	1.53	1.22	0.000	1.19	1.25
Fair	5.45	0.000	5.38	5.53	3.31	0.000	3.29	3.34	2.67	0.000	2.61	2.73
Poor	6.05	0.000	5.95	6.14	4.06	0.000	4.02	4.10	4.30	0.000	4.20	4.41

RC denotes Reference Category, Test was run at 95% significance level, p<0.05

Table 4.2.1 above indicates unadjusted logistic regression showing odds estimates of diabetes, hypertension and heart diseases by selected population characteristics in South Africa. The odds of diabetes and hypertension diseases among older persons aged 65+ years were higher compared to those aged 60-64 years, which was selected as reference category. Again, odds of heart diseases among older persons who were 70+ years were higher as compared to those who were aged between 60-64 years. Those who were 65- 69 years (CI: 0.93 – 0.96) were 0.95 times less likely to heart diseases than those aged 60 to 64 years.

Indians/Asians population group (CI: 1.99 – 2.04) were 2.02 times more likely to diabetes diseases than the African/Black. On the other hand, Indians/Asians and Whites were 0.99 (CI: 0.986 – 0.99) and 0.90 (CI: 0.89 – 0.90) times less likely to hypertensive diseases than African/Blacks. The Coloureds (CI: 1.23 – 1.25) were 1.24 times more likely to the hypertensive disease than the Africans/Blacks. Apart from that, The Coloured, Indians/Asians, and Whites were at least 2 times more likely to heart diseases than the African/Blacks. The odds of diabetes, hypertensive and heart diseases were higher among females in relation to males in 2017.

The chances of diabetes diseases among older persons who lived in Eastern Cape, Free State, Kwazulu Natal, and Gauteng Provinces were at least 10% higher compared to those who lived in Western Cape. On the same note, the chances of diabetes diseases among older persons who lived in North West, Mpumalanga and Limpopo were lower compared to those who lived in Western Cape. Older persons who lived in Limpopo (CI: 0.53 – 0.54) were 0.54 times less likely to the hypertensive diseases than those who lived in Western Cape.

Moreover, older persons who lived in the rest of the provinces in South Africa, except, Limpopo, were at least 1.05 times more likely to the hypertensive disease as opposed to those who lived in Western Cape. The chances of getting heart disease among older persons who lived in Free State Province (OR: 1.57 CI: 1.54 – 1.59) were 57% higher compared to older persons who lived in Western Cape Province. The chances of getting heart disease among older persons who lived in Eastern Cape, Northern Cape, Kwazulu Natal, North West, Gauteng, Mpumalanga and Limpopo Provinces were less compared to those who lived in Western Cape Province. Older persons who lived in rural areas less likely to diabetes, hypertensive and heart diseases in 2017, compared to those who lived in urban areas.

The divorced and the never-married were 0.83 (CI: 0.81 – 0.84) and 0.58 (CI: 0.57 – 0.58) times respectively, less likely to diabetes diseases compared to the married. Furthermore, older persons who were widowed (CI: 1.49 – 1.51) in 2017 were 1.50 times more likely to the hypertensive diseases than those who were married. Those who were never married (CI: 0.92 – 0.93) were 0.92 times less likely to the hypertensive disease than the married. The chances of heart diseases among older persons who were divorced and also never married were less compared to those who were married. On the same note, widowed (CI: 1.36 – 1.39) were 1.38 times more likely to heart diseases than the married.

The chances of diabetes diseases among older persons, who attained at least form of education were higher compared to those with no education. Older persons who attained primary and secondary education were 1.38 (CI: 1.37 – 1.39) and 1.42 (CI: 1.41 – 1.43) times respectively, more likely to the hypertensive diseases than those with no education. Older persons with secondary education (CI: 2.17 – 2.25) were 2.21 times more likely to heart diseases than those with no education. Those who had tertiary education (CI: 1.62 – 1.69) were 1.65 times more likely to heart diseases than those who had no education.

The odds of diabetes diseases among older persons who were not economically active (OR: 1.37 CI: 1.36 – 1.38) were higher compared to the employed, as selected for reference category. In addition, odds of hypertensive and heart diseases were higher among older persons who were unemployed and not economically active compared to those who were employed.

Older persons who stated their health status as poor, fair and good were 6.05, 5.45 and 2.78 times more likely to diabetes diseases than those who stated their health status as excellent. Again, older persons who stated their health status as good, fair and poor, were 1.52, 3.31 and 4.06 times more likely respectively, to the hypertensive diseases than those who stated their health status as excellent. Older persons with poor (OR: 4.30 CI: 4.20 – 4.41) and fair health status (OR: 2.67 CI: 2.61 – 2.73) in 2017 were at least 2 times more likely to heart diseases than those with excellent health status.

Table 4.2.2 Adjusted Logistic Regression Showing Odds Estimates of Diabetes, Hypertension and Heart Diseases by Selected Population Characteristics in South Africa

	Diabetes				Hypertension				Heart			
Characteristic	**OR**	**p>Z**	**95% Conf. Interval**		**OR**	**p>Z**	**[95% Conf. Interval]**		**OR**	**p>Z**	**[95% Conf. Interval]**	
Age Group												
60-64	RC				RC				RC			
65-69	1.13	0.000	1.11	1.12	1.25	0.000	1.24	1.26	0.91	0.000	0.90	0.92
70-74	0.98	0.000	0.98	0.99	1.28	0.000	1.27	1.28	0.90	0.000	0.89	0.92
75+	0.85	0.000	0.85	0.86	1.15	0.000	1.14	1.16	1.21	0.000	1.20	1.23
Population Group												
African/Black	RC				RC				RC			
Coloured	1.03	0.000	1.02	1.05	1.17	0.000	1.16	1.18	1.56	0.000	1.53	1.59
Indian/Asian	1.55	0.000	1.53	1.57	0.84	0.000	0.83	0.85	5.67	0.000	5.54	5.80
White	0.64	0.000	0.63	0.65	0.83	0.000	0.83	0.84	1.51	0.000	1.49	1.54
Sex												
Male	RC				RC				RC			
Female	1.04	0.000	1.03	1.05	1.58	0.000	1.58	1.58	0.92	0.000	0.91	0.93
Province												
Western Cape	RC				RC				RC			
Eastern Cape	1.45	0.000	1.43	1.47	1.19	0.000	1.19	1.21	0.82	0.000	0.81	0.84
Northern Cape	0.79	0.000	0.77	0.80	1.48	0.000	1.46	1.50	0.67	0.000	0.65	0.69
Free State	1.05	0.000	1.03	1.07	1.64	0.000	1.63	1.66	1.66	0.000	1.63	1.70
KwaZulu-Natal	1.16	0.000	1.14	1.17	0.97	0.000	0.96	0.98	0.30	0.000	0.30	0.31
North West	0.69	0.000	0.68	0.70	1.20	0.000	1.19	1.22	0.54	0.000	0.53	0.56
Gauteng	1.09	0.000	1.08	1.10	1.50	0.000	1.48	1.51	0.59	0.000	0.58	0.60
Mpumalanga	0.68	0.000	0.67	0.69	1.27	0.000	1.27	1.29	0.25	0.000	0.24	0.26

Limpopo	0.62	0.000	0.61	0.63	0.58	0.000	0.57	0.59	0.27	0.000	0.26	0.28
Geographical Type												
Urban	RC				RC				RC			
Rural	0.91	0.000	0.90	0.92	0.78	0.000	0.78	0.79	0.70	0.000	0.69	0.71
Marital Status												
Married	RC				RC				RC			
Divorced	0.77	0.000	0.76	0.78	1.01	0.669	0.99	1.02	0.68	0.000	0.66	0.71
Widowed	0.98	0.000	0.97	0.99	1.10	0.000	1.10	1.11	1.39	0.000	1.37	1.41
Never Married	0.52	0.000	0.51	0.52	0.75	0.000	0.74	0.75	0.93	0.000	0.91	0.94
Educational Attainment												
No education	RC				RC				RC			
Primary	1.28	0.000	1.27	1.29	1.34	0.000	1.33	1.35	1.16	0.000	1.13	1.18
Secondary	1.56	0.000	1.54	1.57	1.50	0.000	1.49	1.51	1.52	0.000	1.48	1.54
Tertiary	1.85	0.000	1.83	1.87	0.96	0.000	0.96	0.97	1.22	0.000	1.19	1.25
Employment Status												
Employed	RC				RC				RC			
Unemployed	0.87	0.000	0.84	0.91	2.11	0.000	2.06	2.17	2.00	0.000	1.87	2.14
Not Economically Active	1.13	0.000	1.12	1.14	1.32	0.000	1.31	1.33	1.22	0.000	1.20	1.24
Health Status												
Excellent	RC				RC				RC			
Good	2.93	0.000	2.89	2.97	1.47	0.000	1.46	1.49	1.22	0.000	1.19	1.25
Fair	6.00	0.000	5.92	6.09	3.07	0.000	3.05	3.10	2.79	0.000	2.72	2.86
Poor	6.93	0.000	6.82	7.04	3.87	0.000	3.85	3.92	4.86	0.000	4.74	4.99

RC denotes Reference Category, Test was run at 95% significance level, p<0.05

Table 4.2.2 above indicates adjusted logistic regression showing odds estimates of diabetes, hypertension and heart diseases by selected population characteristics in South Africa. Older persons aged 65-69 years (CI: 1.11 – 1.12) were 1.13 times more likely to diabetes diseases than those aged 60-64 years, which was selected as reference category. However, older persons aged 75 years and older (CI: 0.85 – 0.86), were 0.85 times less likely to diabetes diseases than those aged 60-64 years. Likewise, older persons aged between 70-74 years (CI: 1.27 – 1.28) were 1.28 times more likely to hypertensive diseases compared to those aged 60-64 years. Again those aged 65-69 years (CI: 1.24 – 1.26) were 1.25 times more likely to hypertensive diseases in relation to those aged between 60-64 years. On the other hand, older persons in the age groups: 65-69 and 70-74 were less likely to heart diseases than those who were in the 60-64 years age group. Those who aged 75+ years (CI: 1.20 – 1.23), were 1.21 times more likely to heart diseases than those aged between 60-64 years.

Coloured population group (CI: 1.02 – 1.05) was 1.03 times more likely to diabetes diseases than the African/Black population group. In addition, the Coloured population group (CI: 1.16 – 1.18) was 1.17 times more likely to hypertensive diseases compared to the African/Blacks. The odds of diabetes diseases among the Indian/Asian population group (OR: 1.55 CI: 1.53 – 1.57) were 55% higher compared to the African/Black population group. Among the White population group (OR: 0.64 CI: 0.63 – 0.65), the odds of diabetes diseases were 36% lower compared to the African/Black. The Indian/Asian population group and Whites were 0.84 and 0.83 times less likely to hypertensive diseases as opposed to the African/ Black population group. Furthermore, Indians/Asians population group (CI: 5.54 – 5.80) were 5.67 times more likely to heart diseases than the African/Blacks.

Females (CI: 1.03 – 1.05) were 1.04 times more likely to diabetes diseases than males in 2017. Correspondingly, females (CI: 1.58 – 1.58) were 1.58 times more likely to hypertensive diseases than males in 2017. However, the chances of heart diseases among females (OR: 0.92 CI: 0.91 – 0.93) were lower compared to males, which was selected as reference category.

Older persons who lived in Eastern Cape, Free State, Kwazulu Natal, and Gauteng Provinces were all at higher odds of diabetes diseases than older persons who lived in Western Cape. On the same note, those who lived in Northern Cape, North West, Mpumalanga and Limpopo Provinces were 0.79, 0.69, 0.68 and 0.62 times respectively, less likely of diabetes diseases than

those who lived in Western Cape. Additionally, the chances of hypertensive diseases among older persons who lived in Kwazulu Natal (OR: 0.97 CI: 0.96 – 0.98) and Limpopo (OR: 0.58 CI: 0.57 – 0.59) provinces were less as compared to those who lived in the Western Cape Province. Apart from that, odds of heart diseases among older persons who lived in Free State Province (CI: 1.63 – 1.67) were 1.64 times higher compared those who lived in Western Cape Province, which was selected as reference category. Older persons who lived in rural areas were less likely to diabetes (OR: 0.91 CI: 0.90 – 0.92), hypertensive (OR: 0.78 CI: 0.78 – 0.79) and heart (OR: 0.70 CI: 0.69 – 0.71) diseases than those who lived in the urban areas in 2017.

The Divorced, widowed and never-married persons were 0.77, 0.98 and 0.52 times respectively, less likely to diabetes diseases than the married. The odds of hypertensive diseases were higher among widowed (OR: 1.10 CI: 1.10 – 1.11) than the married, which was selected as reference category. However, the never-married (CI: 0.74 – 0.75) were 0.75 times less likely to hypertensive diseases than those who were married. The widowed (CI: 1.37 – 1.41) were 1.39 times more likely to heart diseases than the married.

The chances of diabetes disease among older persons who attained primary education (OR: 1.28 CI: 1.27 – 1.29) were 28% higher compared to those with no education. Older persons with secondary and tertiary education were 1.56 (CI: 1.54 – 1.57) and 1.85 (CI: 1.83 – 1.87) times respectively, more likely to diabetes diseases than those with no education. Similarly, older persons with primary and secondary education were 1.34 (CI: 1.33 – 1.35) and 1.50 (CI: 1.49 – 1.51) times respectively, more likely to hypertensive diseases than those with no education.

The odds among older persons who were not economically active were higher of diabetes diseases than employed, which was selected as reference category. On the other hand, the odds were lower of diabetes and hypertension diseases among older persons who were unemployed compared to the employed. Older persons who were unemployed were 2 times (CI: 1.87 – 2.14) more likely to heart disease than those who were employed.

Older persons who declared their health status as good (CI: 2.89 – 2.97), were 2.93 times more likely to diabetes diseases than those who have excellent health status. Older persons with poor health status (CI: 6.82 – 7.04) were 6.93 times more likely to diabetes diseases than those with excellent health status. Those who stated their health status as fair and poor were 3.07 (CI: 3.05 –

3.10) and 3.87 (CI: 3.85 – 3.92) times respectively, more likely to get the hypertensive disease than those who stated their health status as excellent. Older persons who stated their health status as poor (CI: 4.74 – 4.99) were 4.86 times more likely to heart diseases than those who stated their health status as excellent.

CHAPTER FIVE

DISCUSSION

The increase in the prevalence of non-communicable diseases leads to decrease in older persons' quality of life. In particular, as pointed out by literature, increase in the life expectancy in a population determines health interventions rendered at meeting such population health needs. The study main objective was to determine the levels and determinants of non-communicable disease among older persons in South Africa. The study was needed in order to provide the depiction of the non-communicable diseases status among older persons in South Africa, with reference to increase in the number of older persons aged 60+ years in South Africa, which has been observed over time. Additionally, identification of the non-communicable diseases prevalence shall serve as a country call towards meeting older persons health needs in years to come. Moreover, this study shall contribute to an existing literature and projected older persons' quality of life in South Africa in 2031.

Findings from this study indicated that the chances of population susceptibility to non-communicable diseases will increase in future. The study revealed that older persons aged 65 years and older are more prone to diabetes and hypertensive diseases more. This can be explained by the lack of physical activity older persons post their economically active period, as in South Africa, the retirement age occurs between the age group 60-65 years (Department of Social Development, 2005). The point of ageing by population in South Africa, suggests that there would always be a linear pattern towards increase in the population ageing and non-communicable diseases due to of deterioration of older persons health (Rarau et al., 2019). Thus, the less physical activity as a result of age will attract the chances of diseases among population in South Africa (Neupane et al., 2016). This is consistent with finding by Werfalli et al., 2018 which aimed at reviewing current policies, programmes and any other interventions in relation to diabetes in South Africa, that older persons aged 60 years and older are more susceptible to diabetes, which is fuelled by the frailty, functional limitation, changes in mental health and dependency.

The study also found that amongst the population group, Indians/ Asians were more likely to have diabetes and heart diseases as opposed to African/ Blacks. On the other hand, the findings portrayed that Whites were less likely to have diabetes as opposed to African/Blacks. The major differences in population setting take into account the various life choices as well as culture or population norms, which determines the quality and affordability of health needs in a community under which such population lives (Kobayashi et al, 2019). In addition, South Africa has high inequality; hence population ability to meet standard health needs differ. This study is consistent with past studies which indicated that socioeconomic inequalities play a major role in population affordability to sufficient health access. The multivariate regression indicated that the coloured population group was more likely to suffer from the disease as opposed to the other population groups. This is more consistent with past researches which aimed at determining hypertension and associated factors in South Africa; which found that there is an association between coloured population group and hypertension (Peltzer & Phaswana-Mafuya, 2013). .

Moreover, older persons vulnerability to non-communicable disease by state of not being able to participate in labour force degrade their health status. Thus, low income levels among older persons who are not economically active and those who are unemployed in South Africa put restriction to sufficient health access (Mutyambizi et al, 2019). Older persons with primary education and more, depicts high risk to diabetes and heart diseases. The chances may be brought by poor nutrition and obesity, which emanates to fast foods amongst others. Diabetes prevalence in Africa, however impose challenge in the management of disease as three-quarters of people with diabetes in Africa remain undiagnosed (Marquez & Farrington, 2013). Furthermore, lifestyle differences among populations contribute to diabetes susceptibility; hence the need for adequate health interventions especially at primary care to manage the disease (Mutyambizi et al, 2019).

Apart from that, the findings from this study show that there would be more females in 2031 in relation to males. The females' susceptibility to non-communicable diseases is consistent with other studies; finding by Zungu (2019) found that females were more susceptible to non-communicable diseases than males. It is envisaged that this susceptibility among females is linked to physical inactivity as well as obesity (Zungu et al., 2019). In addition, findings also depict that the prevalence of non-communicable diseases among older persons would increase,

with hypertensive diseases being the leading disease in 2031. It is worth noting that with the increase in the share of older persons over time in South Africa, it is expected that the quality of life will be decreased, with chances of disability, stroke and macrovascular diseases amongst others as per literature (Werfalli et al., 2018). Therefore, increase in population ageing in South Africa, will suggests other medical supplies specially formulated to meet older needs at relatively cheaper costs. The older persons' inability to undertake routine medical visits, high poverty levels in the households as well as unhealthy habits shall contribute to slow detection and management of diseases among older persons (Bosu et al, 2019). The progression in age by older persons exposes them at higher risk of being diagnosed with non-communicable diseases, as literature portrayed that hypertension was strongly associated with older persons aged 80 years and older (Jardim et al., 2018).

Non-communicable diseases variations exist by province among older persons aged 60+ years, as shown in the study. The differences observed in the provinces can be explained by the older persons' norms as well as supportive measures from the municipalities within South Africa in terms of improving the lives of older persons for the better. Both multivariate-adjusted and unadjusted results indicated that older persons who lived in Northern Cape, North West, Mpumalanga and Limpopo provinces were less likely to diabetes and hypertensive diseases compared to those who stayed Western Cape. This is also consistent with some past studies which found that Western Cape province is experiencing a high prevalence of diabetes in developing countries (Erasmus et al., 2012). Older persons in almost provinces in South Africa are more likely to suffer from hypertension. In South Africa, the hypertensive diseases prevalence is higher compared to the rest of Sub-Saharan Africa (Statistics South Africa, 2019). In particular, studies revealed that hypertension prevalence in South Africa is 77.3%; and this is higher compared to Ethiopia (41.9%) and Senegal (65.4%) (Shukuri et al., 2019). Notably, the prevalence of hypertension and diabetes in Sub Saharan Africa is 48% and 5.1% respectively (Mudie et al., 2019).

Moreover, non-communicable diseases in a population are explained by both demographic and socio-economic characteristics. Notably, older persons who attained primary or more educational levels were more susceptible to suffer from non-communicable diseases. These findings depicted that there are different lifestyle choices among population, which are also linked with the

population's socioeconomic statuses. The attainment of the better education by older persons over time has propelled them to change their lifestyles from the stage they were, prior to their education. Literature found that high educational levels in a population make them prone to better opportunities, which eventually propel change in lifestyles over time (Rarau et al., 2019). Adoption of different lifestyle eventually makes population susceptible to the disease, which they did not have before (Williams et al., 2016). The link between increase in educational levels and population ageing can be better understood through the improved standard of living in a country. Therefore, a full change in disease patterns from contagious to manmade ones is probable in South Africa.

The outcomes from the study also show that older persons who were widowed are more prone to heart diseases. The widowed persons struggle to meet the household needs as well as medical care may put more strain on their health. This in turn contributes to the low standard of living status, which further weakens their capacity to attain healthy lives. The high prevalence may be associated with residence types among older persons in a country. Literature depicted that amongst the widowed population, the population living in urban centres and persons whose socioeconomic status is low, chances of heart diseases are higher compared to their counterparts (Gatimu et al., 2016). The high odds of hypertension among the divorced, widowed and never married is consistent with more cross-sectional studies that have pointed that there is a significant association between divorced/separated/widowed/never married and hypertension as opposed to the married population (Ramezankhani et al., 2019).

This study has a positive relationship with the social determinants of health theory. Findings showed that the improvement in socio-economic status among older persons, in particular the employment and educational statuses shall have an effect on non-communicable diseases. This comes as result of change in lifestyles or poor nutrition (fast foods) and physical inactivity, which also comes due to population ageing. The community and social networks where older persons live, differ by provinces/ residence types. Access to health care services unavailability put older persons' lives at disadvantage. Thus, health systems fail to create a conducive environment to meet the demands of older persons. Accessibility of health care services can be made possible by the government, such that the living conditions of older persons may be improved. The theory is suitable to the study as it outlines the root cause of non-communicable

diseases in older persons as governed by the lifestyle they have had over time, the social status where they live as well as their socioeconomic, cultural and environmental conditions. The improvement in the living and working conditions among older persons shall help them in improving their quality of life.

Strength of the study

This is one of the studies in South Africa on the subject of population ageing and non-communicable diseases, which adopted quantitative approach. The quantitative research designs are normally undertaken on the topics which are under studied; hence the design was best approach in the generalisations of the results to older persons aged 60+ years' health needs. Again, there has never been a study in South Africa which explored population ageing and non-communicable diseases. That has side-lined older persons' medical needs to progress their quality of life. Main outcomes from this study will therefore assist policy makers in South Africa, to plan for future sustainability due to increasing number of older persons, and also planning for health needs in years to come for older persons.

Limitations

The study used secondary dataset; therefore identification of the causal attributes to non-communicable diseases increases, among older persons was not identified. The projection of population age structure in South Africa, in 2031, used the South African Population and Housing Census Dataset 2011 since it is the most recent census data in South Africa. The availability of dataset post 2011 would be able to provide a better population structure for South Africa in 2031. The projection of 2031 population structure used sex ratio determined by population and housing census in 2011, and 2016 mortality and fertility data from Statistics South Africa, as outlined in the methodology section. An updated sex ratio as well as current mortality and fertility figures in South Africa would be able to project better population structure for 2031. Furthermore, the component population projection assumed zero migration, due to projecting for two upcoming census periods in South Africa. Projecting population beyond 2021 would require data availability between 2031 and 2021 to estimate migration residual, which is not available yet. Lastly, the projected total cases in 2031 were calculated using the population

growth rate figure, between 2021 and 2011. The assumption that number of cases may increase parallel to population growth may not be true.

CHAPTER SIX

CONCLUSIONS, RECOMMENDATION AND POLICY IMPLICATIONS

6.1 Conclusion

This study has identified both demographic and socioeconomic determinants associated with non-communicable diseases among older persons aged 60 years and older, in South Africa. It found that older persons with educational attainment beyond primary, and those who are not economically active, have high odds of being prone to non-communicable diseases. This comes as a result of change in diet, lifestyles chores such as smoking and physical inactivity amongst others. Non-communicable diseases increase in South Africa implies an increase in household costs in line with health care needs among older persons (Kuate Defo, 2014). There is a parallel observation between population ageing and increasing non-communicable diseases prevalence. Diabetes, hypertension and heart diseases are all fuelled by population lifestyle choices and socioeconomic statuses (Steyn et al., 2006). It has been found that among older persons with poor health statuses, the chances of getting non-communicable diseases are high (2014). One cited the reason for this comes from lack of financial means to access health consultations, which ultimately may bring multi-morbidity among older persons (Waterhouse, et al, 2017). Population group is the major concern concerning non-communicable disease hence it is vital to establish leading factors, which make population groups more susceptible to heart disease.

Ageing population in South Africa is increasing at a faster pace. It is expected that the increase in population ageing shall contribute to an increase in prevalence of non-communicable diseases in the future (Nojilana et al., 2016). In 2031, it is expected that prevalence of non-communicable increase significantly, and this shall negatively affect life expectancy among older persons in South Africa (2016). Bearing notion of decreases in labour force population and an increase in older persons who may need medical support, the South African Government must deploy the plans in the management of diseases among older persons in the future. In particular, there is a need for the expansion of curriculum at higher institutions in South Africa regarding geriatric medicine (Douglass, 2016). Furthermore, improvement in the health sector, especially at primary health centres, will enable older persons to access medical check-up regularly for early detection as well as management of non-communicable diseases (WHO, 2011).

Apart from that, as evidenced by scholars, population ageing in South Africa comes through the interaction of fertility and mortality; fertility, as well as mortality in South Africa, has declined over time (Statistics South Africa, 2018). A high percentage of older persons in future will lead to a high old-age dependency ratio. The old-age dependency ratio increase states that a country would have more of its dependent population than the rest of the population engaged in the labour force (Hock & Weil, 2012). Thus, a large fraction of the economically active persons' income will be redistributed to older persons' needs, which will ultimately force the economically active person to limit their fertility (Hock & Weil, 2012). Increasing ageing population and older persons health needs and welfare in South Africa should be part of the top priority such that their longevity may be in the quality state form.

The non-contributory pension in South Africa forms part of the fundamental older persons rights, but it is not enough to address daily challenges faced by the older persons in their endeavours, as well as increase in population ageing (Aboderin, 2017). In the legal perspective, there must be established legal clinic to target older persons (2017). Eventually, the government must support non-governmental organisations in intensifying rights and health education to further sensitise the older persons to their existing rights and make them aware of gaps in the legal framework for protection of their rights and health needs (Waterhouse et al., 2017). Population health check initiatives should be established and where they exist, they have to be strengthened so that population health status may be improved. This will help support and encourage older persons in the management of non-communicable diseases at the grass roots level.

6.2 Recommendations

South Africa needs to deploy strategies to take as an initiative to support and maintain the welfare of population ageing in the coming years. Declining fertility and mortality levels suggest that in the future, few people will be engaged in labour force, while the proportion of older persons to increase. For instance, dependency ratios have, unlike in all other regions of the world, correspondingly risen. It is fundamental to consider health needs of older persons as priority in South Africa, since health and disability, economic security and living conditions of the older persons form top priorities throughout the globe (Barney & Jane, 2006). Policies in South Africa should also be accommodative, such that older persons may be given chance if willing, to participate in labour force beyond the age of 60 or 65 years. It is also vital for the

Department of Health to organise special health days at the grassroots levels with emphasis on the physical activity and diet (Hofman, 2014). Through health promotion initiatives, early detection of the disease may be experienced. The early detection will assist in the management of the diseases among older persons as well as prevention. The early detection on the other hand, will aid in the reduction of premature deaths from non-communicable disease in South Africa by 25% in 2025 (Hofman, 2014).

Furthermore, not bearing aside the individual lifestyle choices in South Africa, broad health sensitization should be introduced as to alarm people on the long term effects of the harmful activities to their health. For instance, health sensitizations should encourage older persons to undertake routine medical check-ups and take action upon the realization of early signs of illness. This will help in the speedy diagnosis of diseases and effective management. It is a country call to prevent and manage non-communicable disease holistically, regarding population changing lifestyles across age groups. This includes the establishment of adequate palliative care services across the country according to WHO Global Action Plan for the Prevention and Control of Non-communicable diseases 2013-2020.

6.3 Contribution to Existing Policy, Programmes Implications and Future Research

This study is beneficial to both Department of Health and Social Development in South Africa. Section 3.7 of the South African Policy for Older Persons outlines work and ageing labour force, to allow older persons' participation in the labour force (Department of Social Development, 2005). That may not hold in the future, due to the population desire to retire when they approach the legal term as well as anticipated non-communicable disease prevalence increases. Therefore, to cater to an imminent increase in number of older persons in the country, a review of migration policies in South Africa would help the country to sustain its economic growth, which ultimately would grant it an opportunity to support its older persons (United Nations, 2017). Besides, the creation of legislation, as well as a policy framework to address the need of older persons, should be taken as important, as it has not been made a priority yet in South Africa (Mushwana, 2014). In addition, the study will contribute to the amendment of the policy for Older Persons, highlighting the notion of increasing prevalence of non-communicable disease and interventions towards control and prevention. In particular, the overall objective would be to promote

interventions that are preventative, protective, promotive and transformative to improve older persons' health status.

It is of paramount importance for further research on the causal relationships of these non-communicable diseases among older persons with low socioeconomic status. The impact of such will enable in the construction of plans to combat the high non-communicable disease prevalence in the population settings. Once the causes have been identified, the plans will be easily deployed both by state as well as non-state actors to alleviate the harm among older persons. Furthermore, section 4 of the policy for older persons stresses the need for the improvement of health and wellbeing of older persons (Department of Social Development, 2005). Particularly, the policy addresses treatment guidelines to suit older persons' illnesses, accessibility to medical drugs for the management of their illnesses and undertaking preventative measures for the incidence of non-communicable diseases including HIV/AIDS (2005). Also, older persons act no 13 of 2006, stresses the creation of an supporting environment for the older persons, about making their needs and services as the top priority (Parliament of the Republic of South Africa, 2006). This therefore calls for revised strategies to implement them such that older persons' needs are met, specifically, expansion of geriatric medicine in the institutions of higher learning in South Africa.

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