POLICY APPROACHES TO PREVENT CHRONIC NON-COMMUNICABLE DISEASES: THE ROLE OF POPULATION-BASED DATA

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A PhD thesis submitted in the fulfilment of the requirements for the degree of Doctor Philosophiae in the School of Public Health, University of the Western Cape

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29 November 2018

KEY WORDS

Population wide interventions

Policy and regulatory interventions

Tobacco control policy

Non-communicable disease prevention

Salt reduction legislation

Multisectoral approach

NCD Strategic Plan

ABBREVIATIONS

BP - blood pressure

CCHS - Canadian Community Health Survey

CVD – cardiovascular disease

DASH - Dietary Approaches to Stop Hypertension

DALY - Disability Adjusted Life Year

ETS - Environmental smoke

FCTC - Framework for Convention on Tobacco Control

IHD - Ischaemic Heart Disease

HHD - Hypertensive heart disease

LMIC - Low- and Middle-income countries

MSA - Multisectoral Action

NSP – National Strategic Plan for Prevention and Control of Non-communicable disease

NCD - Non-communicable Disease

NIDS - National Income Demographic Survey

PHC - Primary Health Care

SANHANES- South African National Health and Nutrition Examination Survey

SADHS - South African Demographic and Health Survey

SA - South Africa

StatsSA - Statistics South Africa

WHO - World Health Organisation

GLOSSARY

Discretionary salt – Salt added when cooking or at the table

NCD Strategic Plan -- A national NCD prevention and control plan is a detailed framework outlining the necessary steps to implement the NCD policy (where a written policy is available). It provides a clear and comprehensive picture of what the country hopes to achieve and corresponds to the commitments and directions that have been defined in the NCD policy. In South Africa, it is called the National Strategic Plan for the Prevention and Control of Non-communicable Diseases https://profiles.nlm.nih.gov/ps/access/NNBCMF.pdf.

Environmental interventions – Measures that alter or control the legal, social, economic and physical environment.

Population wide interventions – Interventions that target the whole population and aim to shift the entire population distribution of risk factors in a favourable direction.

Population-based data - Cross-sectional surveys of population exposure to major risk factors such as tobacco and salt for leading cause of death, allow continuous, reliable and timely data to monitor the health status of the population (Byass *et al*., 2004). These are conducted to understand the scope of the problem and its scale of response (Krishnan *et al.*, 2011).

Policy approaches - Policies for prevention and control of NCDs need to address the unhealthy behaviours of people including tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol as well as product reformulation and labelling in the case of salt reduction.

Community-based interventions – Interventions in which the unit of allocation to receive a preventive regimen is an entire community.

Downstream interventions – Individual level behavioural interventions for prevention or disease management.

Non-communicable diseases – These are usually thought of as chronic conditions that do not result from an acute infectious process and they usually develop over relatively long periods.

Secondary data analysis – Further analysis of data that has been collected for another purpose. Common sources of secondary data include censuses, large surveys and administrative records. The national statistical office, Statistics South Africa, has a large amount of data that can be used for secondary analysis.

Surveillance - focuses on coordinating and providing direction and support to strengthen NCD surveillance through providing information resources on risk factor burden, trends and distribution.

ABSTRACT

Background: Non-communicable diseases (NCDs) continue to rise in South Africa, accounting for 43% of total deaths in 2012. Smoking and a diet high in salt are among the major modifiable risk factors for NCDs that can be addressed through cost-effective policy interventions in the form of regulation or legislation and active multisectoral engagement. Population-based prevalence and mortality data are necessary for monitoring and evaluation such interventions. South Africa has developed a National Strategic Plan for NCDs but there is limited evaluation of NCD policies. Furthermore, there is a need to explore the availability of population-based data and the role that it can play to monitor interventions.

Aim: The overall aim of the thesis is to assess the implementation of policies for reducing risk factors for chronic NCDs in South Africa, and to explore the role of population-based data in supporting environmental and policy approaches to prevent NCDs. The thesis will also examine whether there are differences in urban and rural settings in the implementation of tobacco control and salt reduction regulation as well as the barriers to implement the National Strategic Plan for prevention of NCDs.

Methods: Multiple methods of data collection were used. A desk review of policies to address NCDs in South Africa was undertaken and semi-structured interviews with the NCD policymakers and managers in two provinces (the Eastern Cape and Western Cape) were undertaken, to explore challenges and successes of implementation of the NSP. The Cross-sectional baseline questionnaire and quantified food frequency data from the PURE study were used to determine the prevalence of smoking and the intakes of sodium and potassium in a selected urban and a rural community. Data collected using a validated community audit tool was used to assess the physical environment related to tobacco as well as questionnaire data from face-to-face interviews about perceptions about tobacco use in the urban and rural communities. Trends in mortality from tobacco related and high salt consumption related

conditions together with prevalence data from national health surveys were reviewed to assess the health impact.

Analysis: Descriptive statistics including percentages, 95% confidence intervals, mean and standard deviations, if normally distributed, or median and interquartile ranges to summarise the tobacco use and high salt consumption, demographic data, environmental and behaviours related to smoking. Differences were evaluated using the $\chi 2$ test for proportions and the t-test for continuous variables with a significance set at $P<0.05$. The daily intake of sodium and potassium was calculated for each food item consumed using the South Africa Medical Research Council Food database (SAFOOD) and quintile regression analysis was conducted to investigate whether there was a statistically significant difference between subgroups. Graphical display of mortality estimates was used to assess trends. Qualitative data were transcribed, cleaned and thematically analysed using Atlas ti. The six success factors identified for the WHO Stepwise framework were used to guide the analysis. Further policy analysis was conducted using the multiple stream theory of Kingdon.

Results: South Africa has been a world leader with using policy interventions to address NCDs. Tobacco control policies have been in place since 1993 with several amendments to address the shortfall in the previous policies. This study has found that tobacco use declined in the period 1998-2016. Similarly, mortality from tobacco related conditions such as lung cancer in males and aero-digestive cancer (the combined organs and tissues of the respiratory tract and the upper part of the digestive tract; including the lips, mouth, tongue, nose, throat, vocal cords, and part of the oesophagus and windpipe), in females declined. However, there has been stagnation in the decline in smoking, in both urban and rural settings. This study has identified high salt/sodium intake in both urban and rural settings in 2009/10. Discretionary salt intake was high, ranged between 55-58% of the sodium intake. Potassium intake was low and the N: K ratio was 2:1. Prevalence of hypertension and mortality directly related to hypertension have increased throughout the study period. Mortality from stroke, ischaemic heart disease and

hypertensive heart disease has declined over the period of study 1998- 2016. However, mortality from kidney disease has been shown to be increasing slightly. Challenges such as poor communication and support for action on NCDs from the National Department of Health (NDoH) and provincial NCD managers, limited multi-sectoral involvement and limited buy-in from the implementers, have been observed. The study also revealed the disjuncture between provincial and municipal/district health services in addressing NCDs, with limited awareness and implementation of the NSP at municipal level.

Conclusion: South Africa has adopted policies to reduce and control NCDs. However, there are gaps in implementation of these policies. This begs the need to improve the enforcement of legislations and other policy to reduce NCDs. This research found that the implementation of the National Strategic Plan for Prevention and Control of Non-Communicable Diseases 2013-17 is confronted by several challenges, therefore the creation of a task team by the National Department of Health to oversee the implementation process and feedback in the initial stages at provincial level may be useful. Epidemiological data supports the need for the salt reduction regulations. It was too early to demonstrate an impact of legislation but revealed the importance of health education to reduce salt intake and promote/increase the intake of food rich in potassium. The importance of population data used in this study has been demonstrated but there is a need to standardise methodology and the case definition questions. A clear assessment of the data gaps would be helpful in developing information systems for better monitoring of NCD risk factors. There should be monitoring of salt intake (using 24-hour urine collection) of the population as well as monitoring the sodium content of processed foods as prescribed by the regulation. Policy analysis highlighted the critical role of advocates together with political leadership for policy effective implementation.

DECLARATION

I declare that "Policy approaches on tobacco use and diet for prevention of chronic non-communicable diseases: the role of population-based data", is my own work and has not been submitted for any other degree or examination at any other University and that all the sources that I have used and quoted have been indicated and acknowledged by means of complete references.

Beatrice Nojilana 29 November 2018

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Signature

ACKNOWLEDGEMENTS

First and foremost, I would like to thank Almighty God the Creator and the Guardian, to whom I owe my very existence for giving me the strength, knowledge, ability and opportunity to undertake this research study and to persevere and complete it satisfactorily. Without his blessings, this achievement would not have been possible.

I would like to express my utmost and sincere gratitude to Professor Thandi Puoane, my main supervisor, for her unreserved supervisory advice and painstaking guidance throughout my thesis. She has supported me throughout my thesis with her patience, motivation, enthusiasm, and immense knowledge. Her guidance assisted me throughout the research and writing of this thesis. Without her, this thesis, would not have been completed.

I wish to express my sincere gratitude to Professor David Sanders, my co-supervisor; without his intellectual input and invaluable guidance and support, this thesis would not have materialised.

I am also very grateful to Dr Debbie Bradshaw for her continuous support of my PhD research, for her patience, motivation, enthusiasm, and immense knowledge. Her guidance helped me throughout the research and writing of this thesis.

I would like to acknowledge PURE study leaders for giving me access to the data. I would like to acknowledge the Burden of Disease Research Team for access to mortality estimates, Pam Groenewald and the Tobacco Risk Assessment team for consolidated estimates of smoking data and Ria Laubscher for her statistical support with PURE (Sodium and Potassium).

I also would like to express my extreme gratitude to my colleague, Olwatoyin Awotiwon, for volunteering to review sections of my thesis.

My acknowledgement would not be complete without mentioning Mrs Elize de Kock, who encouraged and provided support during my time of study. I wish to thank the entire admin staff for their support;

Sulaiman for the tape transcripts, Monique for the initial EndNote entries and Ntsikelelo Velele for sorting the content of the document.

Last, but not least, my extreme appreciation goes to my family, my husband Koki Nojilana, my son, Thanduxolo Nojilana, and my daughter, Thandeka Jessica Nojilana, for being great and providing invaluable support, unconditional love, and care throughout my period of study. I am so grateful to my daughter Thandeka and Mrs Lucresia Siboya, sister and friend, who have provided me with moral and emotional support, particularly during this study. I acknowledge the wonderful role played by Ms Corinne Carolissen, through her willingness to accommodate my various requests, even when difficult.

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CHAPTER 1: INTRODUCTION

1.1 Background

In 2010, 35 million (65%) of total deaths were caused by non-communicable diseases (NCDs) worldwide (Alwan & Maclean, 2009; Kulik, 2013; Lozano *et al.*, 2012; Schmidt *et al.*, 2011; World Health Organisation, 2011a). It has been estimated that by 2020, nearly 60% of disability-adjusted life years (DALYs) and 75% of all deaths will be attributable to NCDs if nothing is done to address these conditions (Mathers & Loncar, 2006; World Health Organisation, 2008).

NCDs are diseases of long duration and generally slow progression (World Health Organisation, 2017c), and include cardiovascular diseases (CVDs), diabetes, cancers and chronic respiratory diseases with the largest increase and burden in low- and middle-income countries (LMICs) (Lozano *et al.*, 2012; Reddy, 2002; Schmidt *et al.*, 2011; World Health Organisation, 2011b). Most of the burden occurs prematurely and can be prevented or delayed through concerted policies that address modifiable risk factors such as smoking, excessive alcohol use, physical inactivity and poor dietary habits (Afshin, Micha, Khatibzadeh, & Mozaffarian, 2014; Alwan & Maclean, 2009; Ashfin, 2014; GBD 2015 Risk Factors Collaborators, 2016; Kulik, 2013; Schmidt *et al.*, 2011).

NCDs affect all sectors of society and many people who suffer from chronic illness survive for long periods, needing ongoing care (Geleijnse *et al.*, 2007). While many chronic conditions develop slowly, lifestyle changes and behaviours are occurring at a remarkable speed and affect many people (World Health Organisation, 2011a, 2014a).

1.2 Prevention of NCDs

For prevention of NCDs, people need to adopt healthy living choices facilitated by the implemented policies. However, knowledge, beliefs, attitudes and skills of people determine whether they adopt and maintain healthy behaviours. For decades, health-care systems and clinicians have focused on the medical treatment, however, recently, internationally, calls have

been made to tackle the ever-increasing burden of non-communicable diseases (Beaglehole, Bonita, Horton, *et al.*, 2011; World Health Organisation, 2011a) through addressing modifiable causes such as diet and lifestyle (Mozaffarian *et al.*, 2014).

Tobacco control and salt reduction are among the priority interventions for the prevention and control of NCDs burden globally (Beaglehole, Bonita, Alleyne, *et al.*, 2011; Cappuccio, Capewell, Lincoln, & McPherson, 2011; World Health Organisation, 2011a). Evidence suggests that policies on tobacco use and salt reduction are very cost-effective and sustainable (Beaglehole, Ebrahim, Reddy, Voute, & Leeder, 2007; Cecchini *et al.*, 2010; Gaziano, 2007; World Health Organisation, 2011a) and are implementable at little additional cost. However, progress has been slow, and one of the possible reasons is that NCDs are regared as not a priority in some low income countries due to competeing priorities (Beaglehole, Bonita, Horton, *et al.*, 2011; Epping-Jordan, Galea, Tukuitonga, & Beaglehole, 2005; Geneau *et al.*, 2010) such as HIV/AIDS, TB, malaria etc (Ebrahim & Smeeth, 2005).

The threatening burden of NCDSs can be mitigated through comprehensive policy planning, integrated actions, intersectoral action, and commitment from the government in reducing risk factors for NCDs. The Lancet Series of 2007 suggested that potentially 32 million deaths from NCDs could be avoided in 10 years in 23 LMICs, including South Africa. This could be achieved if the adoption of two cost-effective interventions for tobacco use and salt intake were to be fully supported by global partners and governments (Asaria, Chisholm, Mathers, Ezzati, & Beaglehole, 2007). Consequently, in 2007, Beaglehole *et al*., (2007) called for support in the prevention and control of NCDs from partners such as the WHO and other organisations, and actions for prevention were outlined for hasty implementation of cost-effective interventions.

Population wide interventions in the form of legislation or policy, aim at reducing the level of risk factors for NCDs and avoid or delay the onset of disease in all individuals in the general population which are delivered outside the clinical care system (Rose, 1985). Population wide

interventions are pro-poor, have the potential to improve healthy life expectancy and reduce inequalities (Asaria *et al.*, 2007; Beaglehole *et al.*, 2007; Ranson, Jha, Chaloupka, & Nguyen, 2002; Shibuya *et al.*, 2003; Strazzullo, D'Elia, Kandala, & Cappuccio, 2009). Population wide interventions (Strong, Mathers, Leeder, & Beaglehole, 2005) are necessary to shift the risk level downwards to prevent diseases in a population (Rose, 1985). In addition, population wide interventions had a strong theory base and employed comprehensive strategies for prevention and control of chronic NCDs.

Several high-income countries have achieved major reductions in NCD (Beaglehole, Bonita, Horton, *et al.*, 2011; Schmidt & Barnhill, 2015; World Health Organisation, 2013b) . Food policy initiatives and consumer laws implemented in Mauritius, for example, and in Finland have shown some success in improving diets. Subsequently, several evidence-based interventions for populations and individuals have emerged for the prevention and control of NCDs, many of which are good value for money (Nissinen, Berrios, & Puska, 2001; World Health Organisation, 2011a).

Since the early 1970s, community-based programmes for the prevention of CVDs have existed in Europe and the USA (Nissinen *et al.*, 2001; Puska, 2002a). These programmes were aimed at reducing risk factors and effecting behaviour change in different populations at policy level, and were later expanded from CVDs to NCDs, mainly because of the common risk factors associated with NCDs (Nissinen *et al.*, 2001; Puska, 2002a).

These interventions have been successfully demonstrated in North Karelia in Finland and Stanford in the USA (Nissinen *et al.*, 2001; Puska, 2002a). The Karelia project was based on low-cost activities where people's participation and community organisations played an important role (Nissinen *et al.*, 2001; Puska, 2002a).

Major declines in cardiovascular mortality observed during the 1970s and the 1980s have been attributed to favourable population-based strategies, either focussing on a change in health

behaviours or risk factors, i.e. tobacco use, body weight, cholesterol and blood pressure (Backholer *et al.*, 2011; Gaziano, 2007; Puska, 2002b; Reddy & Yusuf, 1998; Stringhini *et al.*, 2012; Unal, Critchley, & Capewell, 2004; World Health Organisation, 2011a). However, because of data constraints, there has been limited information on trends in mortality rates in LMICs (Beaglehole, Bonita, Alleyne, *et al.*, 2011; Mathers & Loncar, 2006). Furthermore, it has been predicted that the burden of NCDs will continue to rise in LMICs because of population ageing and possible lifestyle changes associated with socio-economic development and urbanisation (Maher, Harries, Zachariah, & Enarson 2009; Reddy & Yusuf, 1998; Strong, Mathers, & Bonita, 2007; World Health Organisation, 2013b).

Calls have been made by scientists to increase the priority given to NCDs, to reduce their socioeconomic and development impact, to save lives and help alleviate poverty (World Health Organisation, 2011a, 2014a). This was endorsed by the "call to action" on chronic diseases by Beaglehole *et al*, (2007). The call includes implementation of comprehensive tobacco control and salt reduction through legislation, regulation and voluntary agreements with food industries (Asaria *et al.*, 2007).

Despite the improvements in Finland and other countries, NCDs are still pervasive, and the international community has paid little attention to the challenge of reducing this burden (Beaglehole & Yach, 2003; Strong, Mathers, Epping-Jordan, & Beaglehole, 2006; World Health Organization, 2013a). The WHO has highlighted the importance of tackling the growing burden of NCDs globally through policy interventions (World Health Organisation, 2011a).

In 2005, calls were made to set a target to reduce chronic disease mortality by 2% per annum (Beaglehole *et al.*, 2007; Strong *et al.*, 2005). The UN high-level summit on the prevention and control of NCDs organised by the United Nations in September 2011, marked a global commitment to address this growing burden (Beaglehole, Bonita, Alleyne, *et al.*, 2011). After the meeting, countries agreed to adopt nine global targets (World Health Organisation, 2013a),

including the 25x25 all-encompassing target of reducing premature mortality from the main NCDs (CVDs, chronic respiratory diseases, cancers, and diabetes) by 25%, compared to their 2010 levels by 2025 (Alwan *et al.*, 2010).

After the Political Declaration on NCDs in 2011, the WHO moved forward with the production of a global monitoring framework with indicators and voluntary targets to enable tracking of progress in preventing and controlling NCDs and their key risk factors (World Health Organisation, 2012a).

The WHO also urged countries to consider developing their own national NCDs targets and indicators, building on the global monitoring framework (World Health Organisation, 2013b). Surveillance and monitoring are fundamental to provide countries with information that is needed for development of policies and programmes and to track progress.

1.3 Policy approaches

The global burden of NCDs can be lowered through cost-effective interventions that combine public health policies and population wide interventions, aimed at behaviour modification of the whole population.(Asaria *et al.*, 2007; Gaziano, 2007; World Health Organisation, 2011a).

Policies that support tobacco control, good nutrition, physical activity and prevention of harmful use of alcohol, are being increasingly recognized and play a key role in NCD prevention and control and improving population health (Brownson, Koffman, Novotny, Hughes, & Eriksen, 1995). These policies require a comprehensive approach for addressing risk factors, a concept that has been effectively applied to settings in developed countries (Coitinho, Monteiro, & Popkin, 2002; The World Bank, 2007; UK Health Policy and National Health Service, 2010; Wimbush, Young, & Robertson, 2007). A supportive environment must be created through policies and actions by governments to reduce the burden of chronic NCDs.

Policies can be defined as legislation, laws, regulations, formal and informal rules and understandings that are adopted on a collective basis to guide individual and collective behaviour

and have the potential to affect the environment (Brownson *et al.*, 1995; Sallis, Bauman, & Pratt, 1998; Schmid, Pratt, & Howze, 1995). They control the legal, social, economic, and physical environment as stated by Brownson *et al*. (1995). Legislation is influenced by policy and is often an expression of the policy of government (Sallis *et al.*, 1998).

Policy approaches include health education, regulation, legislation and fiscal measures that intend to have a positive impact on the population's health (Asaria *et al.*, 2007; Cecchini *et al.*, 2010; World Health Organisation, 2011a, 2014a) have shown to be very cost-effective. The costs of implementing policy interventions are relatively low because extensive health-systems strengthening is not required (Asaria *et al.*, 2007; Beaglehole, Bonita, Horton, *et al.*, 2011; Strazzullo *et al.*, 2009). Legislation is influenced by policy and is often an expression of the policy of government (Sallis *et al.*, 1998).

Considering the benefits of policy-level interventions, which can be seen in tobacco control and salt reduction, the number of premature deaths can be greatly reduced if corrective actions are taken (Asaria *et al.*, 2007; Beaglehole, Bonita, Horton, *et al.*, 2011; Gaziano, 2007).

Schmid *et al*., 1995, added that for a long time, policy and environmental interventions have been considered an important public health approach to health promotion and disease prevention. Such interventions have played a major role in many of public health's successes, such as the enactment of legislation on treating sewage, ensuring food safety, maintaining water quality, and wearing seat belts (Brownson *et al.*, 1995; Sallis *et al.*, 1998). So far, environmental and policy interventions have infrequently been applied to control chronic diseases but have received a growing amount of attention by public health practitioners, NCD prevention and the control research community (Sallis *et al.*, 1998).

1.4 NCDs: South African Context

NCDs remain a significant burden in South Africa (Nojilana *et al.*, 2016; Pillay-van Wyk *et al.*, 2016) and are affecting the quality of life and increasing health-care expenditure at a personal

and country level (Bradshaw, Steyn, Levitt, & Nojilana, 2011). An overall decrease of 0.4% per annum from NCD mortality was observed between 1997-2012 in the NCD mortality rate, resulting from declines in stroke, ischaemic heart disease, oesophageal and lung cancer, asthma and chronic respiratory disease, while increases in mortality were observed for diabetes, renal disease, endocrine and nutritional disorders, and breast and prostate cancers (Nojilana *et al.*, 2016). NCDs add a particular burden to health services, as they are chronic and require frequent visits over a long time (Mayosi *et al.*, 2009)

Poverty and unemployment both contribute greatly to poor health, leading to social and economic inequalities (Kivimaki *et al.*; Narain, Garg, & Frick, 2011; World Health Organization, 2008). In South Africa, mortality from NCDs disproportionately affects poor people living in urban areas (Mayosi *et al.*, 2009) and NCDs cause impoverishment at household level because of high out-of-pocket expenditure on healthcare. They thus exacerbate poverty.

Lack of exercise, harmful alcohol consumption, poor diet and smoking influence a person's risk of developing and dying from NCDs. Because these risk factors can be modified, they have been at the centre of strategies to combat NCDs (Lachat *et al.*, 2013). Schneider (2009), suggested that within the South African context, NCDs and their risk factors are poorly identified and inadequately treated in the healthcare setting, particularly among the poor (Schneider, Bradshaw, Steyn, Norman, & Laubscher, 2009). Untreated hypertension is blamed for high rates of stroke morbidity and mortality (Connor *et al.*, 2004,; Thorogood, Connor, Lewando-Hundt, Tollman, & Ngoma, 2004,). Therefore, there is a need for prevention through well-planned, cost-effective, evidence based interventions across all risk factors and all levels of society.

1.5 South Africa's response to NCDs

South Africa participated at the United Nations High Level Meeting (Sep 2011) and signed a Political Declaration (Spires *et al.*, 2016) that committed governments to address the NCD burden within a specific timeframe (Smith Jr *et al.*, 2012). Subsequently, in 2013, the South

African National Department of Health released a multi-sectoral Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2013-17, (National Department of Health, 2013). The National Strategic Plan (NSP) is based on 'best buys' and existing national policies and strategies have prioritised the goal of reducing NCDs morbidity, mortality and related risk factors. The three major objectives of the NSP include, 1) to prevent NCDs and promote health and wellness at population, community and individual level; 2) to improve control of NCDs through health systems' strengthening and reform; and 3) to monitor NCDs and their main risk factors and conduct innovative research.

The NSP set out goals and targets for South Africa to be achieved by the year 2020. These include:

- reducing the relative premature mortality (under 60 years of age) from NCDs by at least 25% by 2020.
- reducing tobacco use, per capita consumption of alcohol and the prevalence of raised blood pressure by 20% by 2020.
- reducing the mean population intake of salt to <5 grams per day by 2020, and the percentage of people who are obese and/or overweight by 10%.
- increasing the prevalence of physical activity (defined as 150 minutes of moderate-intensity physical activity per week, or equivalent) by 10%.
- screening every woman with sexually transmitted diseases for cervical cancer every five years, otherwise, every woman should have three screenings in a lifetime (and as per policy for females who are HIV/AIDS positive).
- increasing the percentage of people controlled for hypertension, diabetes and asthma by 30% by 2020 at sentinel sites; and increasing the number of people screened and treated for mental disorders by 30% by 2030 using 2010 as a baseline (National Department of Health, 2013).

Such a strategy is crucial, bearing in mind that the prediction is that the burden of NCDs would continue to rise if nothing is done to address this challenge (Abegunde, Mathers, Adam, Ortegon, & Strong, 2007; Mayosi *et al.*, 2009). As Mayosi *et al*. (2012), indicated, in South Africa, exposure to CVD risk is rising, in part because of increases in hypertension prevalence and an ageing population (Mayosi *et al.*, 2012).

Legislative action has been a front-runner in implementing policies aimed at tobacco control (Delobelle, Sanders, Puoane, & Freudenberg, 2016; Puoane *et al.*, 2013; Reddy, Zuma, Shisana, Jonas, & Sewpaul, 2015). These have been demonstrated to have had some impact at a national level in reducing smoking behaviour between 1995 and 2012 (Peer, Bradshaw, Laubscher, & Steyn, 2009; Reddy, James, Sewpaul, Yach, & Resnicow, 2013; Saloojee & Steyn, 2005).

Legislation to reduce trans fatty acids was introduced in 2012, and that of salt in processed food in 2013 (Department of Health, 2013b), including banning junk food advertisements aimed at children (Igumbor *et al.*, 2012). The government of South Africa has also pursued multi-sectoral approaches to NCDs control, bringing together the different ministries to improve buy-in and support for "health in all policies". The establishment of a NCDs Unit, Directorate for chronic diseases, disabilities and geriatrics within the Department of Health was a crucial step toward catalysing multi-sectoral plans, as it may serve as a focal point to advocate the inclusion of aspects of NCDs control in all policies, a step that many countries have not yet taken. Political commitment appears the key in South Africa's ability to address NCDs.

1.6 Problem statement

The burden of NCDs continues to rise in South Africa. In 2012, NCD mortality accounted for 43%, of all deaths (Nojilana *et al.*, 2016). Risk factors such as tobacco use, unhealthy diet, hazardous alcohol intake and physical inactivity have increased, making NCDs a priority in the country (van Zyl, van der Merwe, Walsh, Groenewald, & van Rooyen, 2012). In 2010, 38.9% of deaths were due to NCDs (42.6% of females and 35.4% of males). A sizeable proportion

(14.7%) of those who died were aged <45 years and 21.5% were aged 45 - 59 years, indicating a considerable number of premature deaths. In addition, in the same year, 44% of NCD deaths were due to cardiovascular diseases, 18% to cancers, 10% to chronic respiratory diseases and 7% to diabetes.

The prevalence of risk factors for chronic NCDs reported in 2007 showed that tobacco smoking accounted for 4.0% of the total DALYs, and high BMI and high blood pressure accounted for 2.9% and 2.4% respectively (Burden of Disease report, 2008). It has been widely argued that many of the chronic diseases are preventable through healthy lifestyle programmes. Environmental and policy interventions in the form of population wide interventions may be cost-effective but may be underutilised. SA has responded to the call for action in preventing chronic NCDs by the World Health Organization. Since 1994, a number of health policies relevant to chronic NCDs management have been formulated and adopted by the DOH. A number of national guidelines and publications for the prevention and control of chronic NCDs (including a "Strategic Vision"), have been distributed by public sector services. However, many of these policies focus on specific diseases: the management of hypertension, diabetes, obesity, stroke, a National Cancer Control Programme, and the Integrated Nutrition Programme.

The Tobacco Product Control Act of 1993 is an impressive example of policy implementation with smoking bans, advertising bans, increased tobacco taxes, education and awareness efforts that are considered responsible for the observed decline in the number of deaths due to tobacco related conditions including lung cancer and COPD (Mayosi *et al.*, 2009). Following research into the possibility of regulating salt content of selected processed foods, (Charlton, Steyn, & Levitt, 2005), new legislation to reduce salt was gazetted in 2013 (South Africa Government, 2013). The first phase came into effect in June 2016, and the second phase in 2019, the regulations will reduce the salt content of margarines and butter, bread, breakfast cereal, savoury

snacks, potato crisps, processed meats, sausages, soup and gravy powders, instant noodles and stocks. These policies have not been evaluated to determine if they are effective or not. This thesis is therefore aimed at assessing the impact of salt reduction legislation.

1.7 Research question

What is the scope for population wide interventions in the form of policies to prevent NCDs in different settings and how can population data be used to monitor and evaluate such interventions? What can we learn from the long-standing tobacco control efforts in South Africa and the new salt reduction initiatives?

1.8 Rationale for the study

Evidence has shown that chronic NCDs can be prevented through strategies that target upstream factors and modifiable risk factors. This study reviews the extent to which South Africa is making use of policy and legislation to prevent and control NCDs. This study also explored the challenges and opportunities in the implementation of the National Strategic Plan for the Prevention and Control of NCDs, (NSP) and also the role of population data in the prevention and control of NCDs through tobacco control and salt reduction legislation. Finally, population-based data were used to assess the potential role of policies related to smoking and salt intake in the lower socio-economic urban and rural settings of South Africa.

Challenges facing the evaluation of population wide interventions include: developing the right indicators to reflect appropriate levels (Puska, 2000), using the correct measurement and analytic approaches and also the difficulty of testing the effects of the drivers of the epidemic.

The availability of national mortality and survey data provides an opportunity to explore whether tobacco and salt reduction have contributed to trends in chronic diseases. The Prospective Urban Rural Epidemiological (PURE) study provides population-based data for selected communities

(urban/rural) that allow the assessment of the potential scope for other population-based interventions to reduce NCDs.

1.9 Aim

The overall aim of the thesis is to assess the implementation of policies for reducing risk factors for chronic NCDs in South Africa, and to explore the role of population-based data in supporting environmental and policy approaches to prevent NCDs. The thesis will also examine whether there are differences in urban and rural settings in the implementation of tobacco control and salt reduction regulation as well as the barriers to implement the National Strategic Plan for prevention of NCDs.

1.10 Study Objectives

1. To review the uptake of population wide interventions for prevention and control of NCDs in South Africa.
2. To explore the challenges and successes experienced by health service managers in the implementation of the NSP for NCDs in South Africa.
3. To investigate the impact of tobacco legislation

   3.1. To describe prevalence of smoking in an urban and a rural community.

   3.2. To examine tobacco control policy environment including tobacco policy implementation, smoking intolerance and unacceptability as well as knowledge of health effects of smoking in an urban and a rural community.

   3.3. To examine national trends in prevalence of smoking, and mortality resulting from selected tobacco related NCDs (lung cancer, COPD, stroke, IHD, colon cancer, upper aero-digestive cancer, and cancer of the pharynx, larynx, and oesophagus).

4 To investigate the impact of salt reduction legislation

4.1. To assess the prevalence of dietary intake such as food group, sodium and potassium in urban and rural community

4.2 To review prevalence of hypertension and mortality trends in selected chronic cardiovascular diseases (stroke, IHD, and hypertensive heart disease).

5. To reflect on the role of population-based data in supporting environmental and policy approaches to prevent NCDs.

1.11 Summary of the chapters

This thesis is presented in eight chapters. In Chapter One, the background to the study is described, including a detailed description of the trends in chronic non-communicable diseases and their common behavioural risk factors at global, and local level. Research question, aims, and objectives are also described here. The problem faced by South Africa is highlighted in Chapter One, and a review of the literature is presented. In Chapter Two, evidence-based intervention programmes which have proved effective in the prevention and control of non-communicable diseases, are highlighted. In Chapter Three, conceptual frameworks and an account of the methodology employed during the research process, are given. A description is given of the study design, study setting, target population and sample as well as the sampling method used. In addition, the method of data collection, the instruments used, and the protocol observed during data collection, are described. Matters pertaining to ethics are also included. In Chapter Four, the findings of the assessment of existing policies and the National Strategic Plan to prevent and control NCDs in South Africa, are presented. Challenges and opportunities for the implementation of the NSP in two provinces are investigated. In Chapter Five, the impact of tobacco control policies/legislations are described. The impact of the policies is investigated in an urban and rural settings. The trends in the prevalence of smoking and tobacco related mortality impacts, are shown. In addition, a comparison of the environmental factors associated with NCDs in an urban and rural setting, are reported. These data are used to assess the progress in

tobacco control. In Chapter Six, the findings on the impact of salt reduction legislation on population-level salt intake and health-related outcomes in South Africa, are presented. Findings from national surveys between 1998 and 2016 of mortality data, including an urban and rural comparison study, will be presented. Although salt reduction legislation is new in South Africa, the aim was to assess the progress made since its introduction in 2013.

In Chapter Seven, a summary of the main findings of the thesis and a discussion and recommendations are provided, which also briefly highlight the new contribution from this PhD.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature related to policy approaches to prevent and control NCDs, principally diabetes, cardiovascular disease (CVD), cancer and chronic respiratory disease. It gives an overview of the mortality and morbidity burden of NCDs in the region and in South Africa and highlights the growing importance of prevention and control. It will consider the drivers (social determinants and individual behaviours) and prevention strategies proposed to reduce NCDs, specifically in low- and middle-income countries (LMICs). The evidence for policy interventions and evolution of recommended actions and policies to reduce NCDs, specifically tobacco control policies and salt reduction regulation, which have been selected as case studies for this thesis, will be summarised.

The search was limited. Relevant NCDs policies and strategies, and local print media documents, were identified and assessed to determine what policies have been implemented to address NCDs. The information was obtained using PubMed, Google and Google Scholar. Terms used, tobacco use, tobacco control policies, MCD strategies, NCD policies, salt reduction, population wide interventions.

2.2 Non-communicable disease burden

Efforts to estimate global trends in the burden of disease showed that at the beginning of the 20th century, NCDs contributed to less than 10% of all deaths globally (Murray CJL, 1996). However this has shifted and currently NCDs are the leading causes of preventable disability and mortality throughout the world (World Health Organisation, 2000, 2011a). This has been attributed to an increase in tobacco use, hypertension and unhealthy diet (ibid). Of about 56.4 million deaths in 2015 globally, 39.5 million, (70%) were due to NCDs (World Health Organisation, 2017a). The leading causes of NCD deaths in 2015 were cardiovascular diseases (17.7 million deaths, or 45% of all NCD deaths), cancers (8.8 million, or 22% of all NCD deaths), and respiratory diseases,

including asthma and chronic obstructive pulmonary disease (3.9 million). Diabetes caused another 1.6 million deaths (World Health Organisation, 2017a).

2.2.1 NCDs in low- and middle-income countries (LMICs)

NCDs were often misunderstood as a problem of high-income countries. However, the burden of NCDs is rising disproportionately among the poor and working age in lower income countries (Chimeddamba, Peeters, Walls, & Joyce, 2015). The burden has shifted to developing countries, placing an equal or even greater burden on LMICs (World Health Organisation, 2011a). In 2008, it was estimated that about 80 % of NCD deaths occurred in low- and middle-income countries, an increase of 40 % from that of 1990 (Wordl Health Organisation, 2011). LMICs have a lower capacity to respond and tend to face a double burden of increasing NCD prevalence together with high rates of infectious diseases such as HIV/AIDS, tuberculosis (TB) and malaria.

NCDs result in significant costs to individuals, families, health systems and governments, leading to negative consequences for social and economic prosperity (World Health Organisation, 2014a). However, most low-income and middle-income countries have fragile health systems that are under-resourced and in need of structural and policy reform (Nishtar, 2010). The rapid transition in disease burden to chronic diseases is a huge challenge for these weak systems.

2.2.2 NCDs in South Africa

South Africa is an upper middle-income country with a variety of living conditions spanning wealthy and middle-income suburbs, rich and poor provinces, deprived peri-urban areas, rural farms and under-developed rural areas (Statistics South Africa, 2017). It has a diverse population, currently totalling approximately 56 million people. NCDs are emerging in both rural and urban areas, most prominently among poor people living in urban settings (Mayosi *et al*, 2009). The importance of NCDs in South Africa has been recognized since the late 1990s in

view of the large numbers of stroke (Thorogood *et al.*, 2004,) and hypertension (Steyn, Gaziano, Bradshaw, Laubscher, & Fourie, 2001). The health transition was observed in the cause-of-death profile (Bradshaw, Schneider, Dorrington, Bourne, & Laubscher, 2002), and, more recently, with the increasing numbers of diabetes and kidney diseases (Nojilana *et al.*, 2016).

In 2012, NCDs were the leading overall cause of death in the country, constituting 42% of all deaths (Pillay-van Wyk *et al.*, 2016). The leading NCD cause was cardiovascular disease (19%), followed by respiratory diseases (namely chronic obstructive pulmonary disease, asthma and other respiratory diseases (9%), and cancer (8%). Differences in the rates were observed between provinces and by population group (Nojilana *et al*., 2016). The proportion of deaths that were due to NCDs for Whites and Asians was close to 80%, among Coloureds, it was about 60% and the proportion among Africans was below 40% over the whole period. The same study showed that CVDs ranged from 49% for Asians to 38% for Coloureds.

Several studies from developing countries have shown increased levels of NCD risk factors, particularly high blood pressure in urban compared with rural populations (Anand *et al.*, 2007). Poor people living in urban areas are the most affected by NCDs in South Africa. One of the reasons could be due to out of pocket costs for healthcare for NCDs which create a strain on household budgets and end up forcing families into devastating debt and impoverishment (World Health Organisation, 2011a). For example, a study conducted in Cape Town reported that the burden of NCDs displays socioeconomic disparities. The heaviest burden for poor communities in urban areas is in the poor subdistrict of Khayelitsha which has 856·4 deaths per 100 000 attributable to such diseases compared with rates of 450–500 per 100 000 in the wealthy northern and southern subdistricts of Cape Town (Mayosi *et al.*, 2009). Literature has reported that the burden of this magnitude puts pressure on the health system. Notwithstanding, NCDs are also emerging in rural areas in South Africa (ibid). With that said, South Africa has taken action to formulate legislation, strategies and polices to reduce NCDs. These approaches are reportedly cost effective and feasible to scale-up (World Health Organisation, 2011a).

2.3 Social determinants of NCDs

These are non-medical factors influencing health. Various behavioral, social and environmental factors perpetuate risk factors of non-communicable diseases. These social and behavior factors interact and influence each other in the population, propagating an epidemic of NCDs (Sharma et al., 2017). Some of these factors are explained below.

2.3.1 Upstream factors

Upstream factors are the conditions under which people are born, grow, live, work and age, including the health system (WHO, 2004). Examples of social determinants include, education, income, occupation, family structure, service availability, sanitation, exposure to hazards, social support, and access to resources such as health (Krieger, 2001). These factors are moulded by structural determinants such as economic policies, governance and government policies that are shaped by the society (Discussion Paper, 2013) and which are influenced by the level of income, power and resources at global, national and local levels and policy choices (WHO/AFRO, 2014) It has been established that social determinants contribute to health inequality due to unequal distribution of power, income, goods, and services, across society (WHO/AFRO, 2014). This has been attributed to a combination of poor social policies and programmes (Marmot, Friel, Bell, Houweling, & Taylor, 2008). Furthermore, research has shown that NCDs account for most inequalities in total mortality, both between and within countries (Di Cesare *et al.*, 2013). Hence, NCD inequalities are a major barrier in the reduction of the total burden of NCDs. This important observation compels governments to put more effort into the prevention and control of major NCDs and to improve health systems (Marmot, 2005; World Health Organisation, 2003a). Therefore actions are needed to increase effective equitable NCD prevention programmes by feasible actions that bring aggregate benefits and reduce the overall NCD burden (Di Cesare *et al.*, 2013).

To address these factors effectively requires careful attention to the root causes such as broader policy changes in social, economic, environmental as well as cultural beliefs (WHO/AFRO, 2014). These policies include, equitable education; removal of barriers to secure employment in disadvantaged groups; comprehensive strategies for tobacco and alcohol control and for dietary salt reduction that target low socioeconomic status groups; universal, financially and physically accessible, high-quality primary care for delivery of preventive interventions and for early detection and treatment of NCDs; and universal insurance and other mechanisms to remove financial barriers to healthcare (Di Cesare *et al.*, 2013).

The rapid rise in NCDs is predicted to impede poverty reduction initiatives in low-income countries, particularly by increasing household costs associated with healthcare. People with lower socioeconomic status and who are disadvantaged face severe challenges because they get sicker and die sooner from NCDs than people of higher social positions (Worl Health Organisation, 2017).

2.3.2 Downstream factors

Downstream determinants are factors that are influenced by an individual's behaviour (Sharma *et al.*, 2017). Downstream factors are easily mitigated or prevented by the individual. The rise of NCDs is attributable to the following risk factors, namely smoking, unhealthy diet, physical inactivity and harmful alcohol use. These are modifiable and amenable for primordial prevention (see Fig 2). Metabolic risk factors such as high blood pressure, high blood glucose, high body mass index (BMI) and high waist-hip ratio which require primary prevention (World Health Organisation, 2000). NCDs have a complex causal mechanism characterised by having multiple etiologies and factors (Centers for Disease Control Prevention (CDC), 2015).

2.3.2.1 Harmful use of alcohol and its impact on health

Harmful use of alcohol is associated with a risk of developing NCDs, mental and behavioural disorders, including alcohol dependence, as well as unintentional and intentional injuries,

including those due to road traffic accidents and violence. There is a direct link between high levels of alcohol consumption and the risk of selected cancers (International Agency for Research on Cancer, 2012). At high levels, alcohol consumption is associated with an exponentially increasing risk of liver cirrhosis and pancreatitis (Irving, Samokhvalov, & Rehm, 2009; Rehm *et al.*, 2010). In 2012, it was estimated that 3.3 million deaths, or 5.9% of all deaths worldwide, were attributable to alcohol consumption (World Health Organisation, 2014a). More than half of these deaths resulted from NCDs, primarily cardiovascular diseases and diabetes (33.4%), cancers (12.5%) and liver cirrhosis (16.2%). An estimated 5.1% of the global burden of disease as measured in disability-adjusted life-years (DALYs), is attributed to alcohol consumption (ibid). Implementing very cost-effective population-based policy options such as the use of taxation to regulate demand for alcoholic beverages, restriction of availability of alcoholic beverages, and bans or comprehensive restrictions on alcohol advertising – are key to reducing the harmful use of alcohol and attaining a 25 by 25 target.

2.3.2.2 Insufficient physical activity

Insufficient physical activity is one of the 10 leading risk factors for global mortality, causing roughly 3.2 million deaths each year (Lim *et al.*, 2012). In 2010, physical inactivity caused 69.3 million DALYs – 2.8% of the total – globally (ibid). Adults who are insufficiently physically active have a 20−30% increased risk of all-cause mortality compared to those who do at least 150 minutes of moderate-intensity physical activity per week, or equivalent, as recommended by WHO (World Health Organization, 2010). Regular physical activity reduces the risk of ischaemic heart disease, stroke, diabetes and breast and colon cancer. Additionally, regular physical activity is a key determinant of energy expenditure and is therefore fundamental to energy balance, weight control and prevention of obesity (ibid).

2.3.2.3 Tobacco use and its impact on health

Tobacco use is currently one of the leading causes of preventable deaths in the world. Tobacco use increases the risk of cardiovascular disease, cancer, chronic respiratory disease, diabetes and premature death. In 2012, there were some 1.1 billion smokers worldwide, with over 80% of these smoking daily. Tobacco use accounts for 7% of all women and 12% of all men deaths, globally (World Health Organisation, 2012c, 2013c). It is estimated that about six million people die annually from tobacco use, with over 600 000 deaths due to exposure to second-hand smoke (with 170 000 of these deaths among children) (Oberg, Jaakkola, Woodward, Peruga, & Prüss-Ustün, 2011). Unless strong action continues to be taken by countries, the annual toll is projected to increase to 8 million deaths per year by 2030, or 10% of all deaths projected to occur that year (ibid).

2.3.2.4 Unhealthy diet

Rapid changes in diets and lifestyles that have occurred with industrialization, urbanization, economic development and market globalization, have accelerated over the past decade, hence contributing to a significant impact on the health and nutritional status of populations, particularly in developing countries (Joint WHO/FAO expert consultation, 2002). The above-mentioned changes (urbanisation and globalization), have increased the access to unhealthy diets such as, food that is high in saturated and trans fats, salt, and sugar (especially in sweetened drinks), thus increasing the probability of the occurrence of diet related NCDs in individuals. Literature suggests that, diets low in fruits, vegetables, nuts and seeds and omega-3 fatty acids, including food high in sodium, were the five most important dietary risks associated with NCDs. Consumption of foods high in saturated and trans fats, salt, and sugar is the cause of at least 14 million deaths or 40% of all deaths every year from NCDs globally (World Health Organisation, 2004a). For example, overconsumption of salt is reportedly responsible for approximately 30%

of all cases of hypertension (Joffres, Campbell, B., & Tu, 2007), suggesting that strategies to reduce salt are important in reducing the burden of NCDs.

The determinants of population dietary patterns are complex and include global (food trade and industry), national (food marketing), community (culture and food availability) and individual (income) level factors (Melaku, 2016). Evidence has shown there are cost-effective interventions to address unhealthy diets and should be prioritized (World Health Organisation, 2011a).

2.4 Prevention of NCDs

There has been growing global attention given to the need to address NCDs with much literature highlighting that prevention of NCDs is achievable through simple, and inexpensive interventions (Beaglehole *et al.*, 2007; Epping-Jordan *et al.*, 2005; Wang, Kong, Wu, Bai, & Burton, 2005). Researchers have suggested that public health policy should be directed by evidence (Brownson *et al.*, 1995; Tang & Griffiths, 2009). Cost Effective Analysis (CEA) usefully consolidates evidence about effectiveness as it compares the cost of the intervention with the resulting change in health (Doherty, 2010; Murray *et al.*, 2003; Ortegon, Lim, Chisholm, & Mendis, 2012; Watkins, Olson, Verguet, Nugent, & Jamison, 2016). Several reports and policy evaluations by the WHO experts and academics have shown that a strong evidence base of research informs the policy agenda for NCD prevention and control (Asaria *et al.*, 2007; Bonita *et al.*, 2013; Gaziano, 2007; World Health Organisation, 2011a). Cost-effective interventions to reduce NCDs were identified following several studies. (Adeyi, Smith, & Robles, 2007; Anderson, Chisholm, & Fuhr, 2009; Beaglehole, Bonita, Horton, *et al.*, 2011; Cecchini *et al.*, 2010; Swinburn, 2008; World Health Organisation, 2011a). Some of these studies included modelling techniques to analyse the effect and cost-effectiveness of population health interventions (Asaria *et al.*, 2007; Cecchini *et al.*, 2010; Tasslimi *et al.*, 2008). Several criteria were used to select global or national strategies for the prevention and control of NCDs, including the current and projected burden of disease, cost-effectiveness, and the feasibility of

implementation and political consideration (Chisholm *et al.*, 2012). Studies concluded that, health education, fiscal measures, regulating access and limiting demand through restrictions on advertising, marketing, promotion and price and taxation, were the most cost-effective strategies (Magnusson & Patterson, 2011; World Health Organisation, 2003b, 2011a).

However, implementing these interventions and policies requires feasibility for scale-up in resource-constrained countries as well as fiscal feasibility (Gaziano, Galea, & Reddy, 2007). In a critical review on CEA evidence to address NCDs in LMICs, it was found that few studies had been conducted to determine how much health improvement can be gained per dollar spent (Mulligan, Walker, & Fox-Rushby, 2006).

Subsequently, several modelling studies have been conducted to build new evidence of cost-effective interventions (Asaria *et al.*, 2007; Cecchini *et al.*, 2010; Ortegon *et al.*, 2012). In 2007, three priority cost-effective interventions were identified, including tobacco control, salt reduction, and treatment of people at high risk of cardiovascular disease (Asaria *et al.*, 2007; Lim, Gaziano, & Gakidou, 2007). Cecchini *et al.*, (2007) used a microsimulation model for chronic disease prevention for Brazil, Russia, India, China and South Africa to estimate the impact of policy initiatives at national and sub-national levels. The authors found that the number of cases of NCDs will drop through multiple intervention strategies. For example, one case of ischaemic heart disease (IHD) would prevent 230 cases in (Russia) to (2 400) South Africa over their life-course., one case of breast cancer would prevent 2 000 (in Russia) and 22 700 in South Africans (Cecchini *et al.*, 2010). Several cost-effective population-based policies, including health information about healthy eating and physical activity, fiscal measures to increase the price of unhealthy food or reduce the cost of healthy foods rich in fibre; and regulatory interventions to restrict the marketing of unhealthy foods to children, were identified (Cecchini *et al.*, 2010). Spires *et al* (2016) highlighted the consensus around environmental and policy

interventions in the area of promoting healthy diets and suggested concerted actions in South Africa to affect the positive policies that have been adopted.

In a *Lancet Series* on chronic diseases, a global call was made to reduce NCDs by an additional 2% per year (Strong *et al.*, 2005) through urgent and coordinated political and a stepwise health-system action to reduce the impact of NCDs in order to prevent 36 million deaths over 10 years (Epping-Jordan *et al.*, 2005). The target was based on, among others, the achievements of several developed countries over a few decades during which comprehensive NCD prevention programmes were introduced (Epping-Jordan, Pruitt, Bengoa , & Wagner 2004).

A number of global and regional strategic guidelines for multisectoral policy action on NCDs and their social determinants have been developed (Table 2.1).

Table 2.1: Timeline of global commitments to NCD prevention and control

Strategy	Year adopted
Global Strategy for the Prevention and Control of Non-Communicable Diseases (WHA 53.17)	2000 (WHO, 2000)
WHO Framework Convention on Tobacco Control (FCTC) (WHA 56.1)	2003 (WHO, 2003)
Global Strategy on Diet, Physical Activity and Health (WHA 55/7)	2004 (WHO, 2004)
Prevention and control of non-communicable disease: implementation of global strategy for the Prevention and Control of Noncommunicable Diseases (WHA 61.14)	2008 (WHO, 2008)
Resolution WHA61.14 on 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Non-communicable Disease	2008 (WHO, 2008)
Creation of the Noncommunicable Disease Network	2009
Global Strategy to reduce harmful use of alcohol (WHA 63.13)	2010 (WHO, 2010)
Establishment of Global NCD Alliance	2010
UN High-Level Meeting on Prevention and Control of NCDs and its resulting Political Declaration	2011 (UN, 2012)
WHO Global Status Report	2011
Mortality target – the 25 by 25 goal adopted by the WHA	2012
Global Action Plan for the Prevention and Control of NCDs 2013–2020	2013 (WHO, 2013)

For example, in 2000, the WHO endorsed the global strategy for the prevention and control of NCDs, with particular focus on developing countries. Further initiatives include the Global

Strategy on Diet, Physical Activity and Health (WHO, 2004), the adoption of the FCTC (WHO, 2003), and the global strategy to reduce the harmful use of alcohol (WHO, 2010). To strengthen and accelerate national efforts to address the burden of NCD, the 66th World Health Assembly endorsed the WHO Global Action Plan for the Prevention and Control of NCDs 2013–2020 (resolution WHA66.10). The WHO Global NCD Action Plan 2013–2020 follows on from commitments made by Heads of State and Government in the United Nations Political Declaration on the Prevention and Control of NCDs (resolution A/RES/66/2), thus, recognising the primary role and responsibility of Governments in responding to the challenge of NCDs and the important role of international cooperation to support national efforts. The global action plan offers a paradigm shift by providing guidance on policy options for the Member States, WHO, other UN organisations and intergovernmental organisations, NGOs and the private sector (World Health Organisation, 2013a).

Nine global targets that address the prevention and management of NCDs were introduced by the Global Action Plan for the Prevention and Control of NCDs 2013–2020 (World Health Organisation, 2013b). As part of the agenda, a call was made for the heads of state and governments to develop national responses, by 2025, to reduce premature mortality from NCDs by 25% through prevention and treatment (World Health Assembly, 2013; World Health Organisation, 2012d). The UN General Assembly is planning to convene a third High-level meeting on NCDs in 2018 (Worl Health Organisation, 2017) to review the progress and forge consensus on the road ahead covering the period 2018-2030. In addition, the political declaration called on countries to develop multisectoral national policies and plans on NCDs by the end of 2013. (Murray, 2012). During this time, the WHO stressed the need to adopt whole-of -government and whole- of- society approaches in the NCD response (United Nations General Assembly, 2011).

The strategies mentioned in Table 2.1 identify enablers for successful multisectoral action on NCDs and health more broadly: high-level political commitment, governance mechanisms to facilitate and coordinate multisectoral responses, and robust structures for monitoring, evaluation and accountability. These actions attempt to change the conditions of daily life to promote physical activity and limit the production, advertising and consumption of tobacco, alcohol and unhealthy foods. Examples of legislation and laws include taxes on tobacco, sugar and alcohol products, restrictions on 'junk food' advertising to children, the provision of smoke-free areas and limits on trans-fats and salt reduction.

Through the analysis and comprehensive review of available evidence of 42 LMICs, cost-effective interventions that have high impact have been identified as 'best buys' (World Health Organisation, 2011a). The 'best buys' shown in Table 2.2 are considered to be feasible in saving lives, preventing diseases and avoiding heavy costs (World Health Organization & World Economic Forum, 2011).

Table 2.2: Selected 'best buys' interventions for tackling NCDs

Risk factor/disease	Intervention	Feasibility
Tobacco use	Tax increases Smoke-free indoor workplaces and public places Health information warnings Bans on tobacco advertisements, promotion and sponsorship	Highly feasible
Harmful use of alcohol	Tax increases Restricted access to retail alcohol Bans on alcohol advertising	Highly feasible
Unhealthy diet and physical inactivity	Reduced salt intake Replacement of trans fat with polyunsaturated fat Public awareness through mass media on diet and physical activity	Highly feasible

Source: (World Health Organisation, 2011a)

The 'best buys' include primary prevention and public policies and are affordable. The WHO suggests that countries should prioritise 'best buys'. They rely on taxation, legislation/regulations and information/education. (World Health Organisation, 2011a, 2013b). To achieve sustainable

and effectiveness of these priority interventions, high-level political leadership, reorientation of the health system, international cooperation and monitoring and accountability, are important elements (Beaglehole, Bonita, Horton, *et al.*, 2011; Beaglehole *et al.*, 2007).

Among the five priority interventions worldwide, the reduction of a population's salt intake is listed as second after global tobacco control. A 15% reduction in salt intake was estimated to prevent 8.5 million deaths over ten years worldwide (Asaria *et al.*, 2007; He, Campbell, & MacGregor, 2012).

2.5 Policies to reduce NCDs – Upstream approach

Due to the complexity and interaction of individuals' behaviour with the external socio-economic environment, literature suggests that changing individuals' behaviour is not adequate in itself without addressing the underlying social, economic, environmental and cultural factors collectively in the form of policy approach (Bell & Lutz, 2013). Policy approaches as mentioned in section 1.3, have a positive impact on the population's health (Asaria *et al.*, 2007; Beaglehole, Bonita, Horton, *et al.*, 2011; World Health Organisation, 2011a, 2014a). These are considered important because the costs of implementing these interventions are reportedly relatively low since the extensive strengthening of health-systems is not needed (Asaria *et al.*, 2007; Beaglehole, Bonita, Horton, *et al.*, 2011; Strazzullo *et al.*, 2009).

For policies to be effective, high-level commitment from the government at every level is crucial for the prevention and control of NCDs (Beaglehole, Bonita, Alleyne, *et al.*, 2011). Several high-income countries have achieved major reductions in NCDs (Beaglehole, Bonita, Horton, *et al.*, 2011; Schmidt & Barnhill, 2015; World Health Organisation, 2013b). Prevention and health services that bring about these reductions more or less equally have been suggested by most studies with these achievements (Beaglehole *et al.*, 2007). Subsequently, several evidence-based

interventions for populations and individuals have emerged for the prevention and control of NCD. (Nissinen *et al.*, 2001; World Health Organisation, 2011a).

2.5.1 Policy actions on alcohol use

Cost-effective evidence-based measures to address the harmful use of alcohol include focusing on regulation of affordability, availability, marketing, health warnings, labelling on alcohol drinks, and drink-driving legislation (Casswell & Thamarangsi, 2009; Parry, Patra, & Rehm, 2011; World Health Organization 2011). Potential approaches encompass implementing a full ban on alcohol advertising, policies such as raised alcohol excise taxes, and addressing alcohol accessibility through tighter controls on the days and hours of sale of alcohol (Beaglehole & Bonita, 2009; Casswell & Thamarangsi, 2009; Parry, Burnhams, & London, 2012; Rehm J, Gmel G, Sempos CT, & M., 2003; Rehm, Taylor, & Room, 2006). These strategies can curb the problematic use of alcohol consumption (Beaglehole & Bonita, 2009) and reduce the alcohol-related burden by up to 25% (Rehm *et al.*, 2006). Decreasing the alcohol-related health burden has the potential to be one of the most cost-effective population-based health programmes in developing countries (ibid).

In a review of alcohol policy in South Africa, Parry (2010) observed that there have been considerable changes since 1994, including restrictions on alcohol advertising and counter-advertising, regulation of retail sales, taxation and controls on alcohol packaging. He highlighted the piecemeal approach that has been taken and the challenges of conflicting economic pressures and competing interests. Ferreira-Borges *et al.* (2015) evaluated the alcohol control policies of 46 African countries, including South Africa, and identified considerable scope for strengthening control efforts. A recent study conducted in the City of Tshwane observed extensive public support for 13 specific alcohol control policies, urging policymakers to implement them (Parry *et al.*, 2017).

2.5.2 Policies for reducing insufficient physical activity

Evidence shows that many effective interventions focusing on policy and environment, such as mass media, school settings, workplaces, the community and primary healthcare can be implemented by policy-makers to promote health by increasing physical activity (World Health Organisation, 2004b; World Health Organization, 2009a). Across these above-mentioned categories, multicomponent interventions adapted to local cultural and environmental contexts, have been reported the most successful.

A search of international reviews of interventions to control NCDs revealed that environmental and policy interventions might be among the most cost-effective strategies for promoting population wide improvements in reducing risk factors for NCDs (Spires *et al.*, 2016). Many countries, mostly the higher income countries, have made major reductions in NCD mortality through the implementation of these policies and strategies for reducing the NCD burden (Epping-Jordan *et al.*, 2005; Nissinen *et al.*, 2001). These countries have shown that to control NCDs, responses must be comprehensive, multi-sectoral, and integrate health promotion, prevention and treatment strategies as well as well-functioning health systems (Bonita *et al.*, 2013; Collins *et al.*, 2014). These studies have shown a significant reduction in NCD risk factors and mortality in developed countries.

The physical or built environment plays an important role in facilitating physical activity for large portions of the population, by ensuring that walking, cycling and other forms of non-motorized transport are accessible and safe for all (Kahn EB & Howze EH, 2002). The physical environment also provides sports, recreation and leisure facilities and ensures that there are adequate safe spaces for active living, (Mozaffarian *et al.*, 2014). Health messages on stairs promote physical activity, while the use of stairs decreases when no message is displayed. A recent study was conducted to investigate the use of stairways/moving stairways in shopping malls and examine the extent to which simple warning signs determined whether people took

the stairs. The study showed that individual preferences and/or the lack of effort required in using escalators or elevators may lead people to avoid using stairs as a physical activity (Aksay 2013).

The implementation of national policies and programmes to improve physical activity in several high-income countries, including Canada and Finland, resulted in increased physical activity over the last decade (Heath *et al.*, 2012).In recent years, more low- and middle-income countries have set up initiatives to address physical inactivity.

2.5.3 Policy actions on tobacco use

Tobacco use is a powerful NCD risk factor and smoking cessation is probably the single most effective environmental measure for reducing tobacco use ("Summary of the 2007 European Society of Hypertension (ESH) and European Society of Cardiology (ESC) guidelines for the management of arterial hypertension ", 2007). Reducing tobacco use and deterring uptake is of paramount importance. The tobacco epidemic and control policies are reviewed in more detail in Chapter 2.7.

2.5.4 Nutrition policies to reduce NCDs

The links between diet, nutrition and chronic diseases are well-established (Puska, Pietinen, & Uusitalo, 2002; World Health Organization, 1990). Literature have shown that over the years, many policies and proven nutrition interventions have been implemented throughout the world contributing to some improvements albeit marginal (Delobelle *et al.*, 2016; Moodie *et al.*, 2013; Tuomilehto *et al.*, 2001). The nutrition policy is formulated to provide a basis for making a strong case for nutrition, mobilising resources, advocating for higher-priority interventions, and developing operational strategies (Ministry of Health Ghana, 2013). Promoting healthy nutritional status in a population means addressing the poor dietary practices and inappropriate choices that lead to malnutrition and nutrition-related disorders (ibid). The WHO conducted an extensive comprehensive review of available polices to promote healthy diet and has

recommended reduced salt intake, replacement of trans fat with polyunsaturated fat and public awareness through mass media on diet as the most cost-effective interventions. These interventions are also considered 'best buys'(World Health Organisation, 2011a). These are new innovative strategies to influence nutrition at local, national and global level. Salt reduction will be discussed in more detail in Chapter 2.8 as it is major component of this thesis.

In their overview of South African policy interventions for NCDs related to obesity and physical inactivity, Spires et al (2016) draw attention to the lack of policy coherence and the need for an inter-sectoral approach. The authors highlighted the Health-in-All Policies approach used by local government in South Australia, and the establishment of a National Health Commission as promising strategies.

2.6 Surveillance, monitoring and evaluation

It is recognised that good quality health information is essential for planning and implementing health policy (Bonita *et al.*, 2013; Epping-Jordan *et al.*, 2005). Surveillance data can be used to forecast any health event or NCD and their determinants, and provide the foundation for advocacy, national policy and global action. (Choi *et al.*, 2005). To track and monitor the major risk factors is considered to be one of the three key components of the global strategy for the prevention and control of NCDs, alongside health promotion and improved access to health care (World Health Organisation, 2011a).

2.6.1 Data sources for NCD surveillance

Monitoring of risk factors at population level has been the strength of national NCD surveillance in most countries for several years (Bonita *et al.*, 2013; Epping-Jordan *et al.*, 2005). The capacity to monitor NCD programmes varies between countries and has been judged inadequate in many LMICs (Bonita *et al.*, 2013; World Health Organisation, 2011a), including data shortages

(Alwan *et al.*, 2010). For this reason, governments' top priority in the fight against NCD should be to improve country-level surveillance and monitoring (World Health Organisation, 2012d).

An assessment of risk factors at population level has been the pillar of national NCD surveillance in most countries. Taking a step-wise approach is based on a country's priority on information needs for policy and programme development, implementation and evaluation has been suggested (Epping-Jordan *et al.*, 2004).

2.6.1.1 Population-based data

Routine, accurate and reliable population-based health information systems play a fundamental role in reversing the burden of NCD through informed policy decisions and the evaluation of their effectiveness (Joubert, Rao, Bradshaw, Vos, & Lopez, 2013). Without data, it will be challenging to keep track of achievement, as well as to design, implement and fine-tune the policies and programmes that will be needed (Sankoh, 2017). A primary reason for conducting population size estimations is to understand the scope of the problem and the scale of the response that is required. With this information, programme managers can then assess resource requirements and the capacity needed to plan an appropriate response with sufficient coverage.

2.6.1.2 Death registration, with a reliable cause of death

High-quality and complete registration of deaths by cause through a national registration system is considered the most sustainable mechanism to monitor progress in the prevention of NCD (Beaglehole, Bonita, Horton, *et al.*, 2011). Mortality data can be generated by long-term investment in civil registration (Joubert *et al.*, 2012). Recording all deaths and their cause on country level, is a critical requirement.

According to reports, only about two-thirds of countries worldwide have vital registration systems that capture the total number of deaths reasonably well (Alwan *et al.*, 2010). Accurate reporting of the cause of death on the death certificate is a challenge, even in high-income

countries (Beaglehole *et al.*, 2012; Wang *et al.*, 2007). In these countries, most deaths are not counted, and national initiatives to strengthen vital registration systems and cause-specific mortality, should be a priority (World Health Organisation, 2005).

2.6.1.3 Population-based national surveys, with physical and biochemical measurement

Cross-sectional surveys of population exposure to major risk factors such as tobacco use and high salt intake allow continuous, reliable and timely data to monitor the health status of the population (Byass *et al*., 2004). These are conducted to understand the scope of the problem and its scale of response needed (Krishnan, Gupta, Nongkynrih, & Thakur, 2011). National surveys are useful in the areas of policy and advocacy, programme planning and M&E (Wandai, Aagaard-Hansen, Day, Sartorius, & Hofman, 2017).

The prevalence of risk factors is estimated from surveys of the general population which are generally designed as household surveys and provide robust estimates of relatively common risk factors or behaviours (Beaglehole, Bonita, Horton, *et al.*, 2011).

Several ways of measuring dietary sodium intake have been reported, including dietary and urinary assessment (McLean, 2014). Dietary assessment is labour intensive and often under-estimates intake due to under-reporting and difficulties in quantifying sodium concentration in a variety of recipes, as well as discretionary salt intake. Another disadvantage of dietary intake data is that the success of the recall depends on the memory, cooperation, and communication ability of the subject. Also, a trained interviewer is needed, thus increasing costs for the assessment. However, they have the ability to identify important dietary sources of sodium, which can inform public health interventions to lower sodium intake (Charlton, Steyn, Levitt, Peer, *et al.*, 2008; McLean, 2014).

When looking at 24-hour urinary collection, it is broadly considered to be the ‘Gold Standard’ (World Health Organisation, 2006) and the most accurate method. This method is burdensome

and is limited by under-collection and lack of suitable methodology to identify incomplete samples accurately (Strazzullo *et al.*, 2012). Spot urine (once off urine assessment sampling), is sometimes used and is potentially a convenient and reportedly affordable alternative. Studies suggest that while spot urinary sodium is a poor predictor of 24-hour excretion in individuals, it may in the future provide population estimates adequate for monitoring as part of broader population surveys. However, there are still some questions about the reliability of spot urine collections as a means of monitoring population changes. (McLean, 2014).

2.6.1.4 Policy reviews

Policy indicators require a regular, systematic, and independent assessment to judge whether the policies are in place, implemented, and enforced (World Health Organisation, 2013a). In addition, the WHO has set up a mechanism to monitor country capacity to respond to NCD and conduct periodic assessments of the major components of national capacity in all the Member States (WHO, 2011). Data sources for policy review include vital statistics collected through death certification (demographic and cause of death information), disease surveillance and health surveys (active surveillance) which represent a cross-section of the population under surveillance (Centre for Disease Control (CDC), 2013).

2.7 Tobacco control

Over the past five decades, scientific evidence of harm caused by tobacco use has been well established. Cigarette consumption grew from a few billion per year in 1900 to present values of approximately 5.5 trillion worldwide (Proctor, 2004). Despite declines, in the prevalence, tobacco remains a leading cause of preventable deaths globally (GBD 2015).

The consumption of tobacco products causes cancers of the lung, mouth, throat, larynx, oesophagus, and the pancreas (Centre for Disease Control and Prevention (CDC), 2005). Some studies expand the list of cancers caused by tobacco use to include, bladder, blood (acute myeloid leukaemia), cervix, colon and rectum (colorectal), kidney and ureter larynx, liver oropharynx

(includes parts of the throat, tongue, soft palate, and the tonsils), pancreas, stomach, trachea, and bronchus, (Jha *et al.*, 2013; U.S. Department of Health and Human Services, 2014).

Based on reviews over the previous two decades, evidence has shown that second hand tobacco smoke can be harmful to health (U.S Department of Health, 1964). Other health problems associated with passive smoking have been reported in the literature and include heart diseases, such as IHD and, hypertensive heart, chronic respiratory diseases and as well as stroke (Law, Morris, & Wald, 1997; Parish *et al.*, 1995; Whincup *et al.*, 2004). Children exposed to passive smoke are at higher risk of respiratory infections, asthma, bacterial meningitis and cot death (Surgeon General of the United States, 2006).

A window of opportunity currently exists, particularly in developing regions, to decrease the epidemic of tobacco-related morbidity and mortality, given the long delay between smoking uptake and the development of disease (Asma, Warren, & Henson, 2003; Jha, Chaloupka, Corrao, & Jacob, 2006). Substantial evidence shows that smoking cessation reduces mortality from tobacco-related diseases and improves health (ibid). Within 12-18 months of smoking cessation, most of the increased cardiovascular risk disappears and by 3-5 years, the risk is similar to that of a non-smoker (O'Keefe, Carter, & Lavie, 2009).

Measures proven to be effective in reducing tobacco use include increased tobacco tax, comprehensive legislation prohibiting tobacco advertising and promotion, distribution of information about health risks from smoking, restrictions on smoking in public and workplaces, and increased access to smoking cessation therapies (Asma *et al.*, 2003; Jha *et al.*, 2006; Ross & Chaloupka, 2006). To strengthen the fight against the epidemic of tobacco use and to monitor tobacco control measures, the WHO introduced the Framework Convention on Tobacco Control (FCTC) in 2005 (World Health Organisation, 2003b) to guide and to offer countries with suggested policies and programmes for reducing tobacco use.

2.7.1 Trends in tobacco use

Jha *et al.* (2002) conducted a systematic review of 139 studies on the adult smoking prevalence and found that more than 1.1 billion people smoke tobacco worldwide, with about 80% of smokers living in LMIC (World Health Organisation, 2011a, 2014a). In 2010, about 20% of the population smoked tobacco worldwide, about 800 million men and 200 million women (Eriksen, Mackay, & Ross, 2012). It is estimated that 25% of men and 5% of women smoke tobacco (GBD 2015 Risk Factors Collaborators, 2016).

Oberg *et al.*, (2011) reported that second-hand smoking disproportionately affects women worldwide accounting for 47%, while accounting for 28% in children and 26% in men. Evidence shows that smoking behaviours change over time for a number of reasons, including economic factors, marketing by the tobacco industry, and the implementation of tobacco control programs. Changes in smoking prevalence or intensity may alter the risk of some smoking-related diseases more quickly than others.

Some countries, mostly those with high incomes, have already made major reductions through the implementation of these prevention activities including taxation of tobacco products through regulation (Strong *et al.*, 2006). For example, in 1945, the prevalence of smoking in Australia was 70% for men and 26% for women. In 1964, the prevalence declined to 58% for men and increased to 28% for women. A further decline for men occurred in 1974 accounted for 45% but remained the same for women (28%) (Gray & Hill, 1975; Woolard, Leibbrandt, & De Villiers, 2010). However smoking rates dropped dramatically over the following two decades as many men died prematurely and other gave up smoking in response to te concerns about health that were raised by the scientists at the time (Scollo, Lindorff, Coomber, Megan, & Melanie, 2015).

While the prevalence of smoking has dropped in some high-income countries, it continues to increase in middle- and high-income countries, in particular among young people (23%) and women (17%) (Corrao, Guindon, Cokkinides, & Sharma, 2000; Sharma, 2013; Shibuya *et al.*,

2003). It is considered that the reduction on tobacco use was achieved through tobacco prevention programmes, such as banning of tobacco advertising, taxation and marketing.

2.7.3 Mortality attributable to tobacco use

There are various estimates of the numbers of deaths attributable to tobacco use. According to the WHO, in 2015, over 1.1 billion people smoked tobacco and more than 10% of deaths were attributable to smoking (World Health Organization, 2015c). Furthermore, it is estimated that the prevalence of current smoking is about 25% in men and nearly 80% of these smokers are from LMCs. The WHO (2013) estimated that six million people die every year due to tobacco use and this number is expected to rise to 7 million by 2020, and to 8 million by 2030 globally if no urgent action against tobacco use is taken (World Health Organisation, 2013a). Smoking is reported to considerably increase the risk of death from lung and other cancers, heart disease, stroke, chronic respiratory disease and other conditions (World Health Organisation, 2017b) .

More research that was conducted confirmed that mortality from tobacco-related conditions will double from 3.4 million to 6.8 million between 2002 and 2030 in LMIC if no stronger actions are taken now (Jha & Chaloupka, 2000b). Furthermore, according to Mathers *et al*. (2006), annual tobacco-related deaths are projected to increase by 10% by 2020. Smoking is reported to cause about 71% of all lung cancer deaths, 42% of chronic respiratory disease and nearly 10% of CVD (Messner & Bernhard, 2014). The authors pointed out that the risk of dying from cancer before age 85 is 22.1% for men and 11.9% for women smokers.

A review by Jha *et al*. (2014) reported that out of 1.3 million men deaths in low-income countries, 0.4 million were CVD, COPD 0.2 million and lung cancer 0.18 million (Jha & Peto, 2014). CVD was reported as among the leading cause of death from smoking, particularly among young and middle-aged adults in the US (Erhardt 2009). Unless effective interventions are implemented to curb current smoking rates and if current patterns persist, smoking will continue to kill many people.

Second-hand smoking is estimated to cause 600 000 deaths worldwide annually (World Health Organisation, 2011a, 2014a) and most of these deaths occur among women and children (Ekpu & Brown, 2015). However, the detrimental effects of second-hand smoking were described by (Steenland, 1992) in a 1992 review which estimated that second-hand smoke exposure was responsible for 35 000 to 40 000 deaths per year in the United States in the early 1980s (Taylor, Gumming, Woodward, & Black, 2001). In France, exposure to second-hand smoke has been estimated to cause between 3 000 and 5 000 premature deaths per year. Following this, in 2004, the International Agency for Research on Cancer of the World Health Organization concluded that there was sufficient evidence that second-hand smoke caused cancer in humans (International Agency for Research on Cancer, 2007).

2.7.4 Policy interventions for reduction of tobacco use

There is widespread agreement among tobacco control researchers that the most effective intervention programmes are comprehensive, and include policy interventions, mass media interventions, and more traditional cessation methods (Asaria *et al*., 2007; Gaziano, 2007; World Health Organisation, 2011a). Many scholars consider policy interventions as perhaps the most effective of these interventions. These measures are outlined in the WHO Framework Convention on Tobacco Control (World Health Organisation, 2003b). Because of comprehensive measures, tobacco use has dropped in many high-income countries, at least in men, and mortality is projected to further decline by 9% between 2002 and 2030 (Jha & Chaloupka, 2000b).

In response to the growing tobacco epidemic in 2003, the WHO adopted the comprehensive Framework Convention on Tobacco Control (FCTC) with the aim of reducing the supply and demand of tobacco globally (Awopegba & Cohen, 2013; World Health Organisation, 2003b). The WHO FCTC treaty is supported by evidence-based research conducted in high-income countries (Leischow, Ayo-Yusufm, & Backinger, 2013). The treaty obligates 179 countries who

become signatories to implement a broad array of tobacco control measures (Centers for Disease Control and Prevention, 1994; Gravely *et al.*, 2017; Hopkins *et al.*, 2001; Levy, Chaloupka, & Gitchell, 2004) and came into force in 2005.

The FCTC offers governments, health professionals and stakeholders a treaty containing suggested policies and programmes for reducing tobacco use (Asma *et al.*, 2004). It has 18 articles that include measures on prices and taxes, exposure to tobacco smoke, the content of tobacco products, product disclosure, packaging and labelling, education, communication, public awareness, tobacco advertising, promotion and sponsorship and reducing tobacco dependence (World Health Organisation, 2009b). Furthermore, it includes sales to and by minors and measures to reduce illicit trade. The framework addresses protecting public health policies from the tobacco industry, protecting the environment, liability, international cooperation and reporting and exchange of information.

The priority for immediate action is to achieve a suggested global goal, reducing tobacco use by 30% by 2025. Full implementation of four of the FCTC strategies would avert 5.5 million deaths over ten years in 23 LMICs with a high burden of NCD (Asaria *et al.*, 2007; Beaglehole, Bonita, Alleyne, *et al.*, 2011). Since its adoption in 2003, the FCTC has played a major role in accelerating the adoption and implementation of tobacco control policies around the world since its introduction in 2005 (Alwan *et al.*, 2010; Anderson, Becher, & Winkler, 2016; Gravely *et al.*, 2017; World Health Organisation, 2003b).

In 2008 the WHO introduced the MPOWER (**M**onitor tobacco use**, P**rotect from tobacco smoke, **O**ffer help to quit, **W**arning, **E**nforce bans and **R**aise taxes) package to assist tracking of country-level implementation of the WHO FCTC (World Health Organisation, 2015). Over 90% (119) of the Member countries reported that they have at least one priority area for implementation of the WHO FCTC (Dubray, Schwart, Chaiton, O'Connor, & Cohen, 2015). Many parties

mentioned the implementation of specific articles of the Convention as being their priorities. The most frequently reported priority articles were: Article 14 (Demand reduction measures concerning tobacco dependence and cessation), Article 8 (Protection from exposure to tobacco smoke), Article 11 (Packaging and labelling of tobacco products), Article 6 (Price and tax measures to reduce the demand for tobacco), and Article 15 (Illicit trade in tobacco products).

Policy approaches have a degree of generalisability, and it is believed that the experience gained in the developed countries over many years can be of great value in planning and implementing NCD prevention and control activities in developing countries (Countrywide Integrated Noncommunicable (CINDI), 2000; Nissinen *et al.*, 2001; Puska, 2002a). The general principles for community-based prevention programmes have been demonstrated to be the same, regardless of the degree of development of the country (Nissinen *et al.*, 2001). Therefore, these interventions can be applied in developing countries.

2.7.4.1 Increase (excise) taxes and price of tobacco products

Taxation aims to reduce consumption and initiation as well as to increase government revenue (Brown, Tzoulaki, Candeias, & Elliott, 2009; Ekpu & Brown, 2015; Van Walbeek, 2005). With this policy, specific taxes are added as a fixed amount to the price of cigarettes to allow flexibility and allow the government to raise the tax with less risk to the industry. There is a high level of agreement among tobacco control economists that tobacco excise tax increases are an extremely effective and cost-saving way of combating tobacco use (Cecchini *et al.*, 2010; Chaloupka & Grossman, 1996; The World Bank, 1999; World Health Organisation, 2011a).

Data from the Unites States (USA) based survey, National Health Interview Survey (NHIS) in the USA, from 1976 to 1980, 1983, 1985, and 1987 to 1993, a pooled analysis of different dataset was conducted. The NHIS was administered to a nationally representative multistage probability sample of the non-institutionalized civilian population aged greater than or equal to 18 years. Smoking histories were obtained for these years in supplements to the NHIS; the overall response

rate for these supplements was approximately 80%. Information on race/ethnicity, income, smoking status, age, and other demographic factors were obtained from the core of the NHIS questionnaire. Using data reported by the Tobacco Institute (Tobacco Institute, 1998), the average price of a pack of cigarettes for each state, adjusted for inflation, was merged into the NHIS data by year and state of residence. The 14 cross-sections of the NHIS have 367,106 respondents; of these, 355,246 respondents had complete demographic and price data (approximately 24,000 respondents per year).

A probit (limited dependent variable) model was used with the full sample (n=355,246) to estimate the change in the probability of smoking (one for current smokers and zero for all other respondents) for a change in the inflation-adjusted price (1982-1984 dollars). An ordinary least squares model, restricted to current smokers (n=112,657), with the self-reported number of cigarettes smoked per day as the dependent variable, was used to estimate the relation between inflation-adjusted price and quantity of cigarettes consumed. For all models, the effect of price is expressed as price elasticities.

For all respondents, the models estimated a prevalence price elasticity of -0.15 and a consumption price elasticity of -0.10, yielding a total price elasticity estimate of -0.25. Therefore, a 50% price increase could cause a 12.5% reduction in the total U.S. cigarette consumption (i.e., 50% X -0.25=-12.5%), or approximately 60 billion fewer cigarettes smoked per year. In the age-specific model, younger smokers were more likely than older smokers to quit smoking.

Van Walbeek (2005) has conducted several research studies on excise tax increases which have been used as international lessons. Price elasticity of demand for cigarettes in South Africa is around -0.6. Thus a 10% increase in cigarette price will reduce consumption by 6%. The poor and the youth have typically shown to be more responsive than the rich and the old.

2.7.4.2 Protect people from tobacco smoke (smoking restrictions in public and workplaces)

Evidence from the USA and Canada suggests that smoke-free air policies are associated with a significant reduction in cigarette consumption (Jha & Chaloupka, 2000a; Mackenzie, Bartecchi, & Schrier, 1994). A study was conducted in the district of Columbia in the USA with the aim of assessing the impact of tobacco control, specifically in the area of tobacco restrictions, to protect people from smoking. The study found that the average adult smoking rate decreased significantly from 2011 to 2013 (21.3% to 19.3%, ($P = .016$ and smoke-free air regulations ($\beta = -.057$, $P = .008$) were significant (Mader, Lapin, Cameron, Carr, & Morley, 2016). It has been estimated that smoke-free interventions have the potential to reduce smoking rates by 5–15% in developed countries (Woolery, Asma, & Sharp, 2000). Research suggest that smoke-free policies reduce the opportunities for addiction in individuals at early stages of dependence, particularly among the youth (Chaloupka & Warner, 2000; International Agency for Research on Cancer, 2009).

There is considerable literature on the impact of restricting smoking in workplaces (Fichtenberg & Glantz, 2002). A systematic review of the comparison of employees in unrestricted and totally smoke-free workplaces (the USA, Australia, Canada and Germany), found that totally smoke-free workplaces are associated with reductions in prevalence of smoking of 3.8% (95% CI: 2.8% to 4.7%) and 3.1% (95% CI: 2.4% to 3.8%) with fewer cigarettes smoked per day per continuing smoker. A combination of the effects of reduced prevalence and lower consumption per continuing smoker yields a mean reduction of 1.3 cigarettes per day per employee, which corresponds to a relative reduction of 29%. The researchers suggest that if all workplaces became smoke-free, consumption per capita in the entire population would drop by 4.5% in the United States and 7.6% in the United Kingdom (Fichtenberg & Glantz, 2002).

2.7.4.3 Warning about the dangers of tobacco (Mass media campaign)

Mass media campaigns consisting of the dissemination of information through television, radio, print media and billboards, informing smokers and motivating them to quit, are effective in keeping with tobacco control on both the social and political agendas, and reinforcing community action (Ekpu & Brown, 2015). Campaigns are designed either directly, to change individual's behaviour, or to catalyse other forces of social change which may lead to change in the social norm in smoking (Bala *et al*., 2013). A study was conducted in Australia between 1995 and 2006 (Wakefield, Durkin, Spittal, Siahpush, Scollo, Simpson, Chapman , *et al.*, 2008) with the aim of assessing the impact of several tobacco control policies and televised antismoking advertising on adult smoking prevalence (Wakefield, Durkin, Spittal, Siahpush, Scollo, Simpson, Chapman , *et al.*, 2008). The smoking prevalence was measured each month from 1995 through 2006, using a population-based survey and a time-series analysis which assessed the effect on smoking prevalence of televised antismoking advertising, cigarette costliness, monthly sales of nicotine replacement therapy and smoke-free restaurant laws (Wakefield, Durkin, Spittal, Siahpush, Scollo, Simpson, Chapman, *et al.*, 2008). The study found that exposure to tobacco control media campaigns significantly reduced smoking prevalence. They found a 0.3-percentage-point reduction in smoking prevalence by exposing the population to televised antismoking ads at an average of almost four times per month (Wakefield, Durkin, Spittal, Siahpush, Scollo, Simpson, Chapman , *et al.*, 2008).

2.7.4.4 Enforce bans on tobacco advertising

An international review reported that comprehensive bans on advertising and promotion and sponsorship, can potentially reduce the demand for tobacco use by around 6.3% (Saffer, 2000). A study conducted by the Organization for Economic Development and Development (OECD) from 1970 to 1992 examined data on tobacco consumption from 22-member countries. The study found that comprehensive advertising bans can reduce tobacco consumption by 5.4%, but also

found that a limited set of advertising bans will have little or no effect. Advertisement bans must be sufficiently inclusive to reduce the average product of the non-banned media. The factors supported in the literature are that, the effectiveness of a smoking ban depends on the comprehensiveness of legislation, level of enforcement, public support and degree of prior legislation in place (Wilson *et al.*, 2012).

2.7.4.5 Offer quitting and cessation

The greatest tobacco-related improvement in population health has been the results of efforts to increase tobacco taxation, develop clean indoor air policies, introduce comprehensive bans on advertising and educate the public through campaigns (Asma *et al.*, 2004). However, if someone stops smoking, these changes gradually decrease as the damage to the body is repaired. People who quit smoking can actually reverse some of the lung damage and improve their life expectancy (Pearson, Bachireddy, Shyamprasad, Goldfine, & Brownstein, 2010).

Literature suggests that telephone quit lines conveniently provide smokers with advice and support through the quitting process. Mass media publicity may encourage participation and target specific smokers. Quit lines may be integrated into a health care system or operated as a separate program by government (Levy *et al.*, 2004).

Quitting smoking has almost immediate as well as long-term health benefits for individuals (International Agency for Research on Cancer, 2007; U.S Department of Health and Human Services, 2004; U.S. Department of Health and Human Services, 2010). Doll *et al*, (2004), conducted a prospective study that continued from 1951 to 2001 to compare the hazards of cigarette smoking in men who formed their habits at different periods, and the extent of the reduction in risk when cigarette smoking is stopped at different ages. The study found that cessation at age 60, 50, 40, or 30 years gained respectively, about 3, 6, 9, or 10 years of life expectancy (Doll *et al*, 2004). Similar findings were reported for men who stopped smoking at ages 60, 50, 40 and 30, the cumulative risks of lung cancer by age 75 were, 10%, 6%, 3% and

2% respectively (Peto & Lopez, 2000). Another study in the USA examined data from a cohort of 216,917 adults in the U.S. National Health Interview Survey (NHIS) between 1997 and 2010 to investigate the effects of cessation at various ages on current mortality. The study found that adults 25 to 34, 35 to 44, or 45 to 54 years of age gained about 10, 9, and 6 years of life, respectively, as compared with those who continued to smoke (Jha *et al.*, 2013).

In a systematic review of non-pharmacologic interventions for NCDs, Flottrop *et al* (2008), identified several smoking cessation interventions that have been evaluated and reported that telephone quit lines conveniently provide smokers with advice and support throughout the quitting process (Flottorp, Farah, Thürmer, Johansen, & Fretheim, 2008). However, quit lines may be integrated into a healthcare system or operated as a separate program by government (Levy *et al.*, 2004). However, the cost-effectiveness of these interventions needs further evaluation (Flottorp *et al.*, 2008).

2.7.5 Monitoring tobacco use and tobacco control policies

Monitoring tobacco use and exposure to tobacco smoke are essential to track the progress of tobacco control programmes as well as assist policymakers in designing stronger and more targeted tobacco control (World Health Organisation, 2017b). It is important to note that effective monitoring of tobacco use is an ongoing process. Current and relevant information on tobacco use is needed to measure the impact of public health policies for future projections (Alwan *et al.*, 2010; Swart & Panday, 2003; World Health Organisation, 2017b). The information gathered can be used to guide research initiatives, intervention programs, and policy decisions. With less meaningful data, it is very difficult to evaluate the policy of any sort.

The importance of valid and reliable evidence from population-based policies cannot be more over-emphasised. Population-based data are, representative and are periodically repeated to enable policymakers to monitor the results of their interventions and to appropriately tailor anti-tobacco activities towards future needs (World Health Organisation, 2012a). Tobacco use can be

measured regarding the prevalence and the amount consumed (Saloojee & Steyn, 2005). Surveillance and the monitoring of smoking have been key in tracking the overall trend in smoking prevalence and showing the effectiveness of the legislation, education and taxation on tobacco products (Swart & Panday, 2003). Tools for monitoring tobacco control policies include WHO FCTC and the recently added MPOWER (World Health Organisation, 2014a, 2017b).

2.8 Salt/sodium reduction

Salt is an essential electrolyte to life in human beings and is used universally in cooking, seasoning, and preserving manufactured food stuffs. High salt intake is linked to increased blood pressure (BP) which is a major risk factor for NCD (Graudal, Hubeck-Graudal, & Jurgens, 2011; He, Li, & Macgregor, 2013; Mozaffarian *et al.*, 2014). Increased BP has also been linked to increased risks of stroke, stomach cancer, diabetes, and asthma and other adverse health outcomes.(He & MacGregor, 2009; Polonia & Martins, 2009).

Strong and consistent evidence from the literature has shown that a diet high in salt/sodium is harmful to health and that reducing its intake is among the most cost-effective possible means to decrease NCD (Appel, Frohlich, & Hall, 2011; Campbell, Legowski, & Legetic, 2011; Scientific Advisory Committee on Nutrition, 2003; World Health Organization, 2007). The WHO recommends less than 5 g salt per day for adults aged 16 years and older (World Health Organization, 2012). These guideline thresholds are based largely on clinical trials reporting a reduction in BP through low salt intake. Intake of salt of more than 5 g/day is estimated to cause 1.65 million cardiovascular related deaths each year globally, representing around one in every 10 deaths from cardiovascular causes (Mozaffarian *et al.*, 2014).

At the 66th World Health Assembly, it was agreed on a voluntary global NCD target of 30% relative reduction in a mean population intake of salt, with the aim of achieving a target of less than 5 grams per day (approximately 2 g sodium) by 2025 (Webster, Trieu, Dunford, & Hawkes, 2014; World Health Organisation, 2013a; World Health Organisation Regional Office for

Europe, 2008). Some countries have committed to even lower levels in the longer term (Cappuccio *et al.*, 2011).

2.8.1 Health consequences of high salt consumption

Compelling evidence suggests that high salt/sodium diet is a major factor for increasing population BP, which is known as a major risk for cardiovascular diseases (Aburto *et al.*, 2013; Cappuccio, Kalaitzidis, Duneclift, & Eastwood, 2000; Elliott *et al.*, 2007; He *et al.*, 2013; He & MacGregor, 2009; Mozaffarian *et al.*, 2014; Sacks *et al.*, 2001; Strazzullo *et al.*, 2009; Tasslimi *et al.*, 2008). Several epidemiologic, evolutionary, and clinical studies have confirmed that a high salt intake is an important factor in elevating BP in humans. A survey conducted in Newfoundland, Canada, showed that the prevalence of salt intake in the centre of the island was between 6.7 and 7.3g/d, while salt intake in the coastal community was between 8.4 and 8.8g/d. The prevalence of hypertension inland was 15% while it was 27% in the coastal community (Ha, 2014). The first double-blind controlled study of moderate salt restriction was performed in the early 1980's by MacGregor *et al* (2010). They recruited nineteen unselected patients with mild to moderate essential hypertension, whose average supine BP after two months' observation and no treatment was 156/98mmHg (MacGregor *et al.*, 1982). Patients were advised to reduce dietary salt intake. After two weeks of sodium restriction, patients were entered into an 8-week double-blind randomised crossover study of 'Slow Sodium' (Ciba, 10mmol of sodium per tablet) versus slow sodium placebo (Watt *et al.*, 1983). The mean BP was 7.1mmHg (6.1%) lower in the fourth week of slow sodium placebo than that in the fourth week of slow sodium Ciba ($p<0.001$). Urinary sodium excretion in the fourth week of slow sodium Ciba was 162±9mmol/24 hours and in the fourth week of slow sodium placebo was 86±9mmol/24 hours ($p<0.001$). Following this study, many observational and epidemiological interventions conducted globally link the association between high salt intake and hypertension (Ha, 2014). The negative effects of salt

were also reported to be responsible for 1.7 million deaths from cardiovascular diseases worldwide in 2010 (Mozaffarian *et al.*, 2014).

A randomised community based intervention trial in villages in north-eastern Japan, which tested the effects of dietary counselling for one year, reduced mean salt intake by 2.3 g/day (920 mg of sodium) as measured by 24-hour urinary sodium, and was associated with a decrease of 3.1 mm Hg in systolic blood pressure. (Takahashi, Sasaki, Okubo, Hayashi, & Tsugane, 2006).

Observational studies and randomized controlled trials document a consistent effect of sodium consumption on BP (Intersalt Cooperative Research Group, 1988; Law *et al.*, 1997). For example, during the 1980s, a large international study on salt and BP (INTERSALT) was set up using a standardized method for measuring BP and 24-hour urinary sodium. The INTERSALT study included over 10 000 men and women aged 20–59 years from 52 population sample in 32 countries, with data collection carried out during 1985–1987 (Intersalt Cooperative Research Group, 1988). The purpose was to relate sodium intake to BP with a wide range of salt intake from 0.5 to 25 g/day. However, among the 52 communities recruited into the study, only four had a low salt intake (that is, 3 g/day or less) and the majority lay between six and 12 g/day. None had the high salt intake as originally envisaged. Nevertheless, the study demonstrated a significant positive relationship between salt intake and BP. The population with higher salt consumption had higher average BPs, also a highly significant positive relationship between salt intake and an increase in BP with age.

Nevertheless, Salt Institute criticised the methodology used by the INTERSALT, putting forward that in the analysis of 48 of the 52 centres, no significant association was noted between sodium intake and BP (Ha, 2014; He & MacGregor, 2009). However, the investigators from INTERSALT re-analysed their data and showed that the highly significant within-population association between salt intake and BP across all 52 Centres was unchanged when the four low-salt populations were excluded, and that the association between salt intake and the rise in BP

with age persisted across 48 centres. (Elliott *et al.*, 2007; Ha, 2014; He & MacGregor, 2009; Intersalt Cooperative Research Group, 1988). Furthermore, the INTERSALT and other studies have shown that communities with a higher salt intake have a higher mean population BP (He *et al.*, 2012; Intersalt Cooperative Research Group, 1988). Several studies have supported the association between high salt intake and hypertension, for example, the EPIC-Norfolk study (the Norfolk Cohort of the European Prospective Investigation into Cancer) (Khaw *et al.*, 2004) and the INTERMAP study (International study of macro and micro-nutrients and BP) (Zhou *et al.*, 2003) have given further support for the important role of salt in determining BP levels in a population.

There is much evidence that raised BP is a major cause of CVD and accounts for 60% of all strokes and 50% of all heart disease. (Aburto *et al.*, 2013; Strazzullo *et al.*, 2009; World Health Organization, 2007). However, the risk of CVD increases throughout the range of BP starting from a SBP of 115 mmHg (He, Markandu, & MacGregor, 2001; Singh *et al.*, 2000) which is exceeded by about 80% of the adult population. Experimental studies have shown that a high salt diet may have a direct effect on stroke, independent of its effect on BP (Kupari, Koskinen, & Virolainen, 1994; Nagata, Takatsuka, Shimizu, & Shimizu, 2004; Perry & Beevers, 1992). Perry and Beevers (1992) performed an ecological analysis of the relationship between urinary sodium excretion (data from INTERSALT study) and stroke mortality in Western Europe. They found a positive correlation between 24-hour urinary sodium excretion and stroke mortality and this relationship was reported to be much stronger than that found when urinary sodium was plotted against BP.

For many years, it has been known that there is a relationship between chronic high salt intake and increased risk of gastric cancer (Wang *et al.*, 2007). Stomach cancer is the most common cancer in the world. However, men are at a greater risk of stomach cancer than women. Stomach

cancer is most common in the over 55s with less than 8% of cases being diagnosed before this age (Cancer Research UK, 2009).

Several studies have shown that salt intake relates to the amount of protein or albumin excretion (du Cailar, Ribstein, & Mimran, 2002; Verhave *et al.*, 2004), which is an important risk factor for the development of kidney disease and CVD (He & MacGregor, 2009; Verhave *et al.*, 2004). Kidneys have no capacity to remove more than 4–5g of salt per day, therefore, the remaining salt that is not able to be excreted gives rise to undesirable ailments in the body. A high salt diet also increases the risk of kidney stones through the same mechanism at a greater risk of stomach cancer. (Cancer Research UK, 2009; He & MacGregor, 2009).

A recent meta-analysis of seven prospective studies by D'Elia et al. (2012), demonstrated a relationship between increasing salt intake and risk of gastric cancer. (D'Elia, Rossi, Ippolito, Cappuccio, & Strazzullo, 2012). About 270 000 individuals were followed up over 6–15 years and those with high salt intake had a 68% higher risk of developing gastric cancer than those with low intake. Similarly, a 2007 meta-analysis of cohort studies found that for every gram of salt intake per day, the risk of developing stomach increased (D'Elia *et al.*, 2012).

He & MacGregor, (2009) reported the findings from an ecological analysis and the study exhibited a direct association between salt intake and deaths from stomach cancer among 39 populations in 24 countries (Joossens *et al.*, 1996). The incidence of gastric cancer in Japan is reported to be four times higher than that in the UK (Naylor *et al.*, 2006). Furthermore, observational studies among Japanese who migrated to the USA and Brazil based on the geographic differences, the trend in cancer incidence with time, and the change in incidence patterns, suggest that gastric cancer is closely associated with dietary factors, such as the intake of salt and salted food (Tsugane, 2005). Each year, stomach cancer causes about 800 000 deaths worldwide. Furthermore, Wang, Terry, and Yan (2009), express their concern that stomach

cancer has a poor prognosis with the 5-year survival rate being just 15%. Salt intake was first reported as a possible risk factor for stomach cancer in 1959 (Wang *et al.*, 2009).

2.8.2 Inconsistencies in evidence

There have been inconsistencies reported with some of the findings from different studies disputing the association between high salt intake and high blood pressure. For example, some randomised controlled studies have demonstrated no relationship between sodium consumption and CVD (Aburto *et al.*, 2013; Taylor, Ashton, Moxham, Hooper, & Ebrahim, 2011). However, He *et al*., (2011) and He and Macgregor (2012) suggested that the above-mentioned study had methodological flaws. For example, measurement error in assessing daily salt intake, not controlling for confounding factors, and reverse causality salt intake, is the result, rather than the cause of a participant's illness. In addition, a meta-analysis conducted by the Cochrane Hypertension Group confirmed these findings as the review found that the study was subject to methodological flaws and urges great caution when interpreting their results (He *et al.*, 2013).Therefore, the authors suggest that the results from these studies should not be used to reverse recommendations for population wide salt reduction (He *et al.*, 2012).

It is important to note that, several meta-analyses of salt reduction trials and several population-based intervention studies have been performed (Alam & Johnson, 1999; Cutler, Follmann, & Allener, 1997; Graudal, Galloe, & Garred, 1998; Hooper, Bartlett, Davey Smith, & Ebrahim, 2002; Law *et al.*, 1997; Midgley, A.G., C.M., & A.G., 1996). Most of these studies have failed to achieve a reduction in BP for the reason that there was no change in the salt intake in such studies. Strazzullo et al, (2009) performed a meta-analysis of prospective cohort studies and reported that excessive salt intake increases the incidence of cardiovascular diseases (Strazzullo *et al.*, 2009). Furthermore, in two meta-analyses (He & MacGregor, 2009), it was claimed that salt reduction had very little effect on BP in individuals with a normal BP and a reduction in population salt intake was not warranted. However, it is reported that these studies were found

to be flawed because some of them used a small sample size and included trials of very short duration, with many comparing the effects of acute salt loading to abrupt and severe salt restriction for only a few days. Such acute changes in salt intake are known to increase sympathetic activity, plasma renin activity and angiotensin II (MacGregor, Markandu, Sagnella, Singer, & Cappuccio, 1989), which would counteract the effects on BP. Therefore, it is inappropriate to include the acute salt restriction trials in a meta-analysis that attempts to apply them to public health recommendations for a modest longer-term reduction in salt intake (He & MacGregor, 2013). Some of the reasons given for this included, certain studies focused on subgroups of individuals who may be more sensitive to salt, e.g., the elderly and black race groups, and those people with established hypertension or chronic kidney diseases, increasing the likelihood, of observing an association. Another reason could be that it has been known that other lifestyle factors such as eating fruit and vegetables, doing physical activity and cutting back on excessive alcohol consumption, are more important for BP than salt (Campbell *et al.*, 2011; Drüeke; He, Jenner, & Macgregor, 2010; Strazzullo *et al.*, 2009). (Campbell *et al.*, 2011; He *et al.*, 2010).

Some researchers (Mente, M.J., & Rangarajan, 2014) have raised concern that salt reduction increases the risk of cardiovascular deaths. A prospective population study, involving 3681 participants without cardiovascular disease was conducted to assess whether 24-hour urinary sodium excretion predicts blood pressure and health outcomes. (1985-2004). Of the 3681 participants without CVD, 2096 were normotensive at baseline and 1499 had BP and sodium excretion measured at baseline and last follow-up (2005-2008). The study found that systolic blood pressure, but not diastolic pressure, changes over time, and is aligned with a change in sodium excretion. The authors concluded that this association did not translate into a higher risk of hypertension or CVD complications. Lower sodium excretion was associated with higher CVD mortality (Stolarz-Skzypek *et al.*, 2011).

Alderman *et al* (1995) and Cohen *et al* (2006) conducted research which assessed the relationship between salt intake and the risk of cardiovascular diseases. They found that the relationship between salt intake and CVDs was J-shaped and that salt intake of 5-6g/day was characterised by the lowest risk of CVDs (Alderman, Madhavan, Cohen, Sealey, & Laragh, 1995; Cohen, Haitpern, Fang, & Alderman, 2006).

These results have created debate as some researchers have expressed concern that reduced sodium might lead to adverse effects on health (Aburto *et al.*, 2013; Alderman, 2010; World Health Organisation, 2012b).

2.8.3 Salt intake in different countries

Salt intake depends on age, gender and ethnicity, and this probably explains the lack of consensus regarding defined amounts of salt indicative of restriction or excessive intake (Brown *et al.*, 2009; He & MacGregor, 2009). There are variations in the amount of salt intake among countries. Gaziano 2013 & Brown (2009), reported that the current salt intake in many countries ranges from 4–17 g per day which is well above the WHO recommendation of less than 5 g per day. For example, the average salt intake worldwide is estimated to be approximately 9.87 g (5.45–13.77) per day according to public information (Mozaffarian *et al.*, 2014), and between 5 g and 15 g/day (Webster, Dunford, Hawkes, & Nea, 2011). These data were confirmed recently in a large survey showing that salt intake exceeds the WHO recommendations in 181 of 187 countries around the world (Mozaffarian *et al.*, 2014; Powles, Fahimi, & Micha, 2013). Depending on the local traditions and eating habits, salt intake may be as high as more than 20 g per day. Furthermore, salt intake in children older than five years is reported to be more than 6 g/d and increases with age (Brown *et al.*, 2009; He *et al.*, 2010). Another study in the USA reported the average salt intake in the United States to be approximately 9 g per day. Also, a small US population of about 5% consumes around 3.75 g or less per day (Sakuyama *et al.*, 2016).

In Japan, the estimated salt intake has remained at about 10–15 g per day for decades. In Canada, a daily salt intake of 3.75 g salt per day is recommended; however, an intake of less than 3 g per day has been unattainable (Gaziano & Pagidipati, 2013).

Studies have reported that most adult populations worldwide have an average daily salt intake higher than 6 g and also many Eastern Europe and Asian countries are higher than 12 g (Strazzullo *et al.*, 2009). Intake levels of consumption appear lower in Africa. However, there is uncertainty about the estimates because of a shortage of data (World Health Organisation, 2014a). In addition, sodium/salt intake is believed to be higher in urban than in rural populations (Oyebode, Oti, Chen, & Lilford, 2016). However, salt consumption has increased in rural areas during modern times (Brown *et al.*, 2009). In 2000, it was estimated that salt intake in Latin America and the Caribbean exceeded 9 g/day. This amount is reported to be higher than the amount which their ancestors consumed (He *et al.*, 2012).

Sources of salt in the diet vary among countries. In developed countries 75% of salt comes from processed food, whereas in developing countries, 70% comes from salt added during cooking or at the table (Alwan & Maclean, 2009) or through the use of sauces, such as soy sauce (Brown *et al.*, 2009).

To reduce population salt intake, policy development and implementation need to target the main source of dietary sodium in the population. Thus, the food industry needs to implement policies on the amount of salt added to food in developed and developing countries, and a public health campaign to encourage consumers to use less salt coupled with widespread salt substitutes that are low in sodium and high in potassium (He *et al.*, 2012).

2.8.4 Approaches to reducing the use of salt

Salt reduction policies have been found to be very cost-effective for the prevention and control of NCD. (World Health Organisation, 2011a). Policymaking related to dietary factors is complex but crucial in reducing the burden of diseases (Appel *et al.*, 2011).

2.8.4.1 Communication/awareness

These included educational and awareness campaigns, efforts to motivate consumers, and requests to the food industry to support these activities by marketing lower-sodium alternative products and voluntarily lowering the sodium content of its products. Communication strategy is used to **c**reate and evaluate public awareness campaigns to educate consumers about salt and its health effects. These approaches have shown limited results in reducing sodium intake, and the reasoning given in the literature could be that the nature of the sensory preference for salt has possibly resulted in lower-sodium products tasting less acceptable than "regular" products for many consumers. Individuals' personal dietary choices and population-level improvements in nutrition require public education and the support of healthful environments in settings where food is available (Public Health Agency of Canada and the World Health Organisation, 2008). A non-randomised control trial study was conducted in China in 2008. This study aimed to assess the impact of health education on a general population of about 111000 workplace employees. The intervention included education and promotion on reducing salt intake for six years (Chen, Wu, & Gu, 2008). The study found a significant net reduction of 3.9g/day. The reduction of salt intake from the intervention group was from 16 to 10.6 g/d and the control group from 16 to 15.5 g/d from 1986 to follow-up in 1995 (Chen *et al.*, 2008). This is a huge improvement on health education interventions.

A study in Ireland conducted a campaign on a billboard and aired radio advertisements to raise awareness about the level of salt in foods and provide tips on how to reduce salt intake. The study was conducted before and after intervention for six weeks (Safefood, 2006). The study

found that among adults who reported to have seen the billboard campaign, there was an increase in the proportion who reported that they have changed their salt behaviour from 22% in 2003 (Safefood, 2004) to 37% in 2006 (Safefood, 2006). In addition, among those who heard the radio advertisement about salt reduction, there was an increase in the proportion who have changed their behaviour from 21% in 2003 (Safefood, 2004) to 25% in 2005 (Safefood, 2006).

2.8.4.2 Nutrition labelling- refers to the disclosure of nutrients on a food product. Labelling is more important for sodium reduction efforts because sodium content in a specific food can be shown on a nutrition facts panel or other display on the label. There are two forms of food labelling to identify low-salt products. These include the use of labelling to highlight the salt content of foods and the use of symbols, logos, or text to identify low-salt products (World Health Organization, 2013b).

2.8.4.3 Reformulation – voluntary collaboration with the food industry

This strategy seeks to encourage the food industry to voluntarily reformulate products so that they are low in sodium (Charlton, Webtser, & Kowal, 2014; Webster *et al.*, 2011). Food reformulation initiatives have so far aimed at reducing salt, trans-fatty acids, saturated fatty acids, sugars and total energy. In some countries, engagement occurs through national associations, while in others, direct contact with large and progressive food manufacturers and/or restaurant chains, has worked.

Engagement with the private sector on reformulation is led by the Non-Government Organisation (NGO) which also assists with managing institutional conflicts of interest in certain countries. Often, reformulation to decrease salt content focuses on a step-by-step reduction. The first salt reduction programmes were implemented in the 1970s. Such initiatives have resulted in a significant decrease in salt intake, and the estimated economic and public health impact is substantial (Bibbins-Domingo *et al.*, 2010; van Raaij, 2008).

Since the 1970s, Finland has aimed at reducing the population's salt intake (Karppanen & Mervaala, 2006) through collaboration with the food industry to develop food products with reduced salt and by raising awareness among consumers. The Finnish NGO sector negotiated with food industry and also collaborated with Finland government and food industry to raise awareness "promoting heart health (WHO European Region, 2015). Over 30 years, the average population salt intake has reduced by a third (6 g per person per day). Systolic blood pressure fell by over 10 mm Hg, while mortality from stroke and coronary heart disease decreased 75-80%, with an increase of five to six years in life expectancy (Karppanen & Mervaala, 2006). Similarly, in Japan, a government campaign to reduce salt intake saw a fall from 13.5 g/day to 12.1 g/day (from 5400 mg to 4840 mg sodium) in a decade. This was associated with a reduction in stroke mortality (Sasaki, 1979).

Food reformulation is required throughout the industry to help curb the epidemic of CVD. Non-industry stakeholders, such as academia and public health agencies, must also be involved in this change.

The reductions achieved in Finland (Karppanen & Mervaala, 2006) and more recently in the UK (He & MacGregor, 2009) and France (WHO Forum and Technical Meeting, 2006), were, in part, a result of forging successful collaborative partnerships with the food industry. This strategy is also being used in Canada in an effort to reduce sodium (Campbell, 2008). In the UK, voluntary action by the food industry in response to specific timelines and targets for sodium reduction in specific foods set by the Food Standards Agency, has resulted in a 30% sodium reduction in foods without impacting taste, and further reductions are planned (He & MacGregor, 2009).

2.8.4.4 Reformulation - Regulation **-** includes appropriate fiscal policies and regulation to ensure food manufacturers and retailers produce healthier foods or make healthy products available and affordable. Strategies adopted to date by countries include, mandatory reduction

of sodium content of sodium content in South Africa, Argentina, Greece and Bulgaria (Trieu, 2015), and voluntary reformulation in United Kingdom, Brazil, Chile, Canada, Australia etc (Trieu, 2015). Regulation has several advantages. For example, regulation allows the government to state its policy goals and set standards and targets clearly and provides a level playing field. Government policies and strategies should create environments that enable populations to consume adequate quantities of safe and nutritious foods that make up a healthy diet, including low salt. Salt reduction is a societal and individual responsibility, demanding a population-based, multi-sectoral, and culturally relevant approach.

Actions by the food industry in response to the call to action by Heads of State and Government in 2011, should include committing to reducing salt in products over time as well as promoting the benefits of eating reduced salt foods through consumer awareness and education activities (World Health Organization, 2015b). Thereby consumers can adapt to the less salty taste and not switch to alternative products. The promotion of the benefits of eating reduced salt foods through consumer awareness and education activities, are also introduced. An assessment of the impact of tax on salty snacks with a salt content of >1g/100g a day in Hungary, was conducted. The research revealed a decline in sales and consumption by 26% and the salt content of many foods has been decreased by up to 85% (Kloss, Meyer, Graeve, & Vetter, 2015).

Currently, only two countries (South Africa and Argentina), have mandatory targets for a range of food products, and two others (Bulgaria and Greece), have mandatory targets for four products. Five countries (Paraguay, Belgium, Hungary, Netherlands and Portugal), have mandatory targets for bread only (Webster et al., 2014). While implementing effective legislation takes time and resources and is often actively opposed by industry, even pending legislation has been shown to expedite action by industry to reformulate products ahead of regulations coming into force.

2.9 Lessons from the literature

Literature has shown that NCDs contribute to about 70% of deaths globally, nearly 80% of these occur in LMICs. Smoking, hazardous alcohol use, unhealthy diet, physical inactivity and socioeconomic conditions, influence individuals' risk of developing and dying from NCDs. Several population wide policies have shown or have reported to have made improvement in reducing exposure to and ultimately the burden of NCDs. However, morbidity and mortality due to NCDs are still high, suggesting that not enough emphasis is placed on NCD prevention in many countries. There have been reports of implementation gaps, in particular with tobacco control and a very slow pace for salt reduction policies. This calls for the need to re-assess the implemented policies to identify weaknesses. Policy approaches for prevention of NCDs are cost-effective and can be applied in any country with few modifications. However, strict regulation is needed for countries to achieve moderate reduction of NCD risk factors. In addition, monitoring of these policies should be a priority, thus improving data availability is important.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The study uses both qualitative and quantitative approaches. It also makes use of an analytical framework to assist the synthesis and interpretation of the evidence-based literature and to guide the integration of information from different data sources. The thesis explores issues around policy implementation and the role of population-based data in the evaluation of tobacco control and salt reduction legislation.

This study consists of six components (in the form of activities) to achieve four main objectives of this thesis. The first section of the thesis involves a desk review of documents about the use of population wide policy interventions with proven cost-effectiveness and political and financial feasibility to prevent and control NCDs in South Africa. This is followed by a policy analysis that uses semi-structured interviews with NCD policymakers and managers in two provinces (the Eastern Cape and Western Cape) to assess the challenges in implementing the NSP for the Prevention and Control of NCDs. The third component is based on secondary analysis of PURE data to assess the prevalence of tobacco use and salt intake in an urban and a rural setting. The forth component involves data collected through face-to-face interviews regarding environmental factors and behaviours related to tobacco control policies and an observational audit in these two settings. Component five is a descriptive epidemiological investigation to assess the impact of tobacco and salt intake legislation in South Africa, including urban and rural differences, through secondary analysis of national survey data. The last component was the review of trends in mortality from tobacco-related and high salt consumption related conditions. The conceptual framework used in the thesis is outlined, followed by the methodology of each component including study design, study setting, sampling methods and sample size, data collection, data management, data analysis, validity and reliability, and ethical considerations as appropriate.

Component, Methods used and data sources and objectives

The urban and rural impact of national policies was assessed using data collected in selected communities. Both qualitative and quantitative methodologies were used and analysed using three complimentary conceptual frameworks.

Table 3.1: Data sources and methodology used and objectives.

Component and data sources	**Activity**	**Objectives**
Component 1 Literature and policy documents	Desk review of population wide intervention in South Africa	Objective 1
Component 2 Primary data on semi-structured interview of policymakers	Exploring challenges and successes of implementation of the NSP	Objective 2
Component 3 Primary data analysis from PURE	Determining prevalence of smoking and salt intake in urban and rural settings in South Africa	Objective 3.1 Objective 4.1
Component 4 Primary data using EPOCH instrument	Assessment of tobacco control policy environment in urban and rural communities	Objective 3.2
Component 5 Secondary data from eight surveys and burden of disease dataset	Evaluation of tobacco control and salt reduction legislation for South Africa	Objective 3.3 Assess prevalence of tobacco smoking Objective 4.2 Assess prevalence of hypertension
Component 6 Secondary data from Statistics SA and burden of disease dataset	Calculation of mortality trends for tobacco related and high salt intake	Objective 3.3 Assess mortality related to tobacco use Objective 4.2 assess morality related to high salt diet

This thesis has attempted to integrate and triangulate data from multiple sources of data to minimize bias, to validate, strengthen and to correlate findings. Data from surveys provided the prevalence of smoking and hypertension. Data from statistics South Africa provided trends in NCD mortality. The use of these data made it possible to look at the trends in mortality and trends in prevalence in order to evaluate the effectiveness of tobacco control and salt reduction policies. On the other hand, data on comments from the key informants provided information on complexity of policy formulation and implementation. Triangulation and integration of findings provide an insight for future policy development and implementation. Thus, triangulation enabled the collection of valid and reliable data from various sources for completeness of this study.

3.2 Conceptual Framework for the thesis

This thesis makes use of three complementary frameworks namely: Innovative care for chronic conditions (ICCC), the Schematic Framework for promoting healthy lifestyles and preventing NCDs, and the WHO-Stepwise framework for health promotion, prevention and monitoring progress and evaluating the impact of NCD policies.

3.2.1 Innovative care for chronic conditions (ICCC)

The Innovative Care for chronic conditions (ICCC) model (Figure 3.1) developed by the WHO(World Health Organization, 2002) is a comprehensive approach to address chronic diseases. The approach to the prevention of chronic NCDs is conceptualized within a framework that identifies determinants as ‘upstream’ factors. These include globalisation, unplanned urbanization, poverty, legislation and social exclusion.

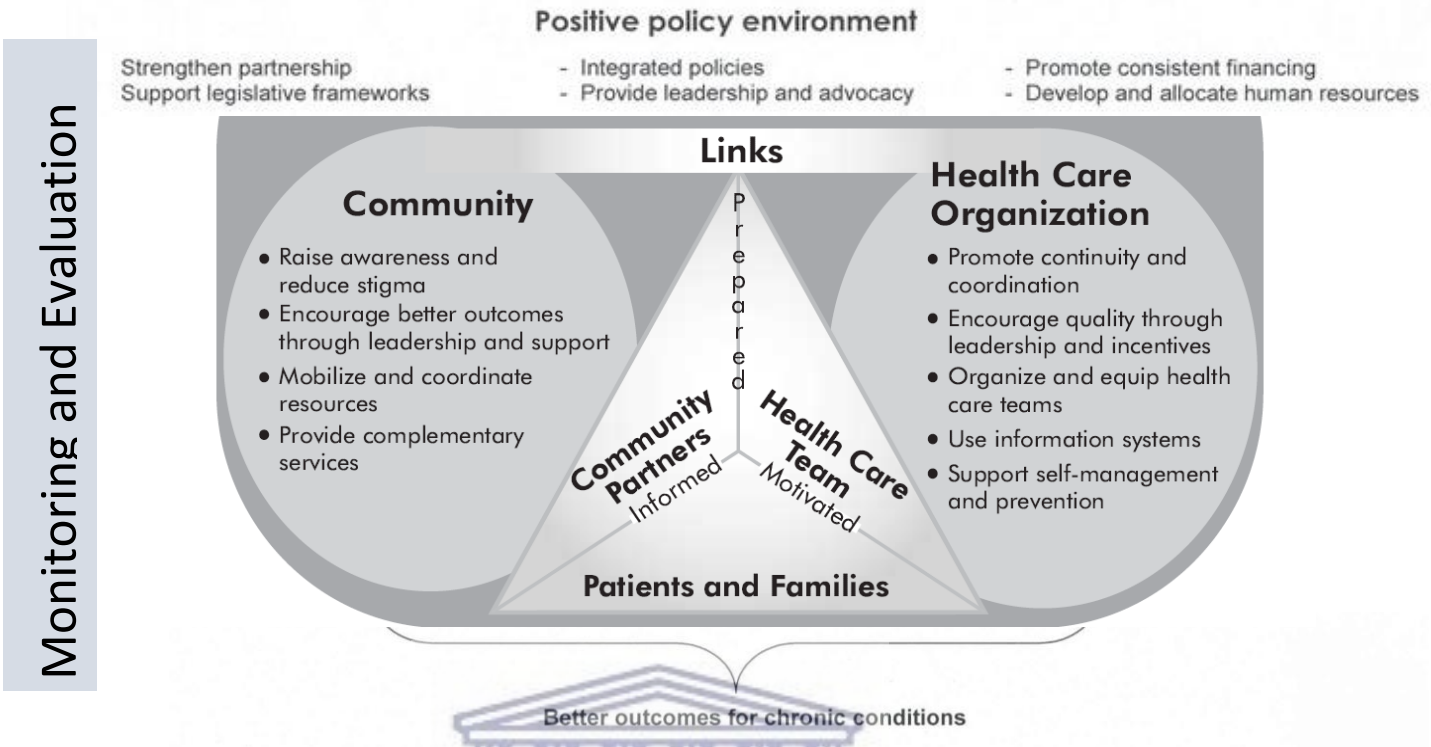


Figure 3.1 Innovative care for chronic conditions including monitoring and evaluation

Source: Adapted from Epping-Jordan et al, 2004

As outlined by Epping-Jordan *et al,* (2004), the new model addresses the deficits of the current system in managing chronic conditions, where healthcare systems are based on acute and infectious conditions. This model was specifically designed to suit low and middle-income countries where chronic conditions mainly present at the primary health care level and need to be handled in these settings. ICCC is patient-centred and comprises three components which include *macro* (policy), *meso* (health care organisation and community) and *micro* (patients and family) levels (Epping-Jordan *et al.*, 2004; Strong *et al.*, 2006; World Health Organisation, 2002).

This thesis focuses on policy (macro level) interventions that can be implemented to reduce premature mortality from NCDs. Policies for prevention and control of NCDs need to address the unhealthy behaviours of people including tobacco use, unhealthy diet, physical inactivity and

harmful use of alcohol (Mendis, 2010). These factors are influenced by economic growth, globalisation and urbanisation (World Health Assembly, 2008). Health education and the counselling efforts of health professionals to improve health literacy as well as an enabling policy environment, are fundamental for sustaining healthy behaviour. This requires involvement of all sectors and not just the health sector alone.

Examples of policy activities are legislation, policy integration, partnerships, financing and allocation of human resources. Highly engaged critical action is needed to assemble evidence based research to pressurise industries to promote healthy environments and healthy behaviours (Epping-Jordan *et al.*, 2004; World Health Organisation, 2002). Monitoring and evaluation were not included in the original framework. This component has been added by this researcher under the assumption that although policies are formulated and implemented, it is critical that they undergo rigorous evaluation to provide concrete evidence of their effects to inform and support future policies (Fong *et al.*, 2006).

3.2.2 Schematic Framework for promoting healthy lifestyles and preventing NCDs

For monitoring and evaluation, it is important to have a logic framework. The framework in Figure 3.2 outlines the links between risk factors and NCDs and the approaches to health promotion at different stages, based on a comprehensive primary healthcare model (Bradshaw, Steyn, & Pascal-Kengne, 2011). The population for any disease can be divided into four groups a) healthy population, b) population with risk factors, c) population with symptoms and d) population with disease or disorder (Last, 2000). Each of these four population groups needs to be targeted with specific interventions to comprehensively address the needs of the whole population. In brief, primordial prevention is needed to ensure a healthy population, primary prevention is needed to prevent and delay complications, and secondary prevention is needed to ensure curative and rehabilitative care of the population with disease. Primordial prevention aspires to establish and maintain conditions that minimize hazards to health. It consists of actions

and measures that inhibit the emergence and establishment of environmental, economic, social and behavioural conditions and cultural patterns of living known to increase the risk of disease. These should focus on the supply, availability, manufacturing, processing, marketing, and advertising of food to ensure availability and affordability of healthy food, limiting salt content of manufactured food and staples such as bread, and a smoke free environment. The emphasis is to improve the health and quality of healthcare among the poor.

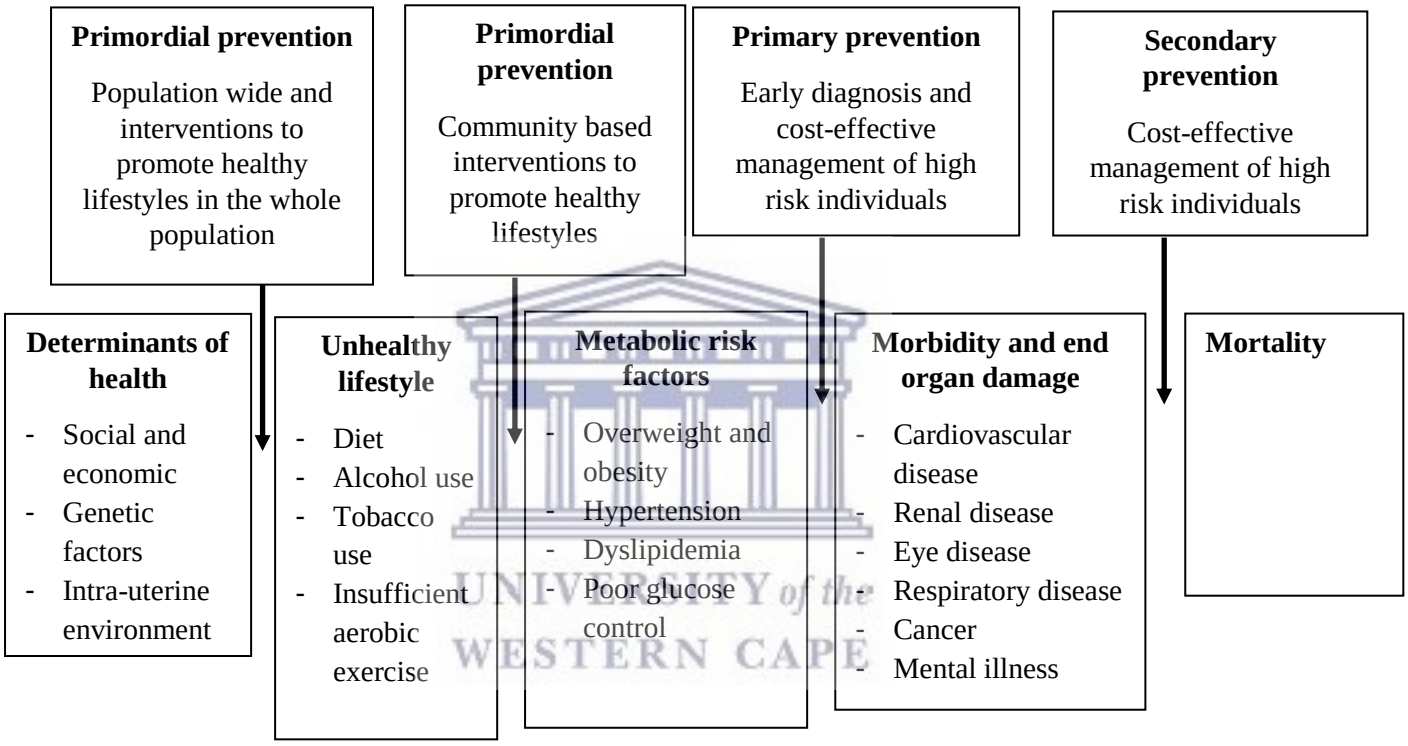


Figure 3.2: Schematic Framework for promoting healthy lifestyles and preventing NCDs

Source: Bradshaw et al, 2011.

3.2.3 Success factors for WHO-Stepwise framework for preventing chronic diseases

The WHO-Stepwise framework was developed to offer LMIC countries a flexible and practical approach to assist ministries of health in developing evidence-based plans while balancing diverse needs and priorities (Epping-Jordan *et al.*, 2005). The framework acknowledges that the political, economic and socio-cultural context influences health policy processes and outcomes (Brewer & Leon de, 1999.; Sachs, 2001) and provides understanding of the important stages of

the health policy process such as a needs analysis, policy formulation and implementation. Epping-Jordan et al, (2005) report on the experiences of several countries in applying the stepwise framework to develop national plans. Furthermore, they have identified six factors associated with successful implementation of plans: -

1. A high-level political mandate to develop a national policy framework.
2. A committed group of advocates who are often involved with estimating need, advocating for action, and developing the national policy and plan.
3. International collaboration providing political and technical support.
4. Wide consultation in the process of drafting, consulting, reviewing, and re-drafting the policy until endorsement is achieved.
5. Development and implementation of a consistent and compelling communication strategy for all stages of the process.
6. Clarity of vision for a small set of outcome-oriented objectives.

3.2.4 The links and relationship of the frameworks

The ICCC framework identifies policies within a multidimensional response for chronic diseases. It utilises a comprehensive approach that simultaneously seeks to effect change at three levels: (1) at the macro level there is emphasis of positive policy environment, (in this thesis, tobacco control and salt reduction) (2) at the meso level the emphasis is on the role of the community and health care organization (in this thesis, the importance of integration and coordination of services and resources), and (3) at the micro level community where patient and family are involved (in this thesis, individual health related behaviours and impacts). The second model of a health promotion approach offers a logical framework and thereby outlines an important element for monitoring and evaluation to compliment the ICCC model. The framework is used in the evaluation of tobacco control and salt reduction.

The six success factors identified by Epping-Jordan *et al* (2005) for the development and implementation of a national plan for NCDs are used as an analytical framework for the assessment of the implementation of the NSP. It provides a way to organise and interpret data collected in the first two components of the thesis and identify gaps in the policy formulation process that might undermine the implementation of the plan.

3.2.5 Theory of Policy analysis

In addition to the frameworks mentioned above, two public policy models were used to guide policy analysis of this study: the policy triangle framework for policy analysis (Walt & Gilson, 1994) and Kingdon's multiple streams theory (Kingdon, 1984).

Walt and Gilson's policy analysis triangle framework incorporates context, actors, process and content concepts in analyzing policies. The framework allows the analysis of the contextual factors such as social, economic, political that can be influenced by the policy process. The framework presents a simplified approach to a complex set of interrelationships (Walt & Gilson, 1994).

Walt *et al.* (2008) suggests that Kingdon's multiple streams theory is considered one of the most influential theories of the public policy process. The theory argues that a "policy window" opens only when three independent streams namely, the problem, the policy and the politics streams, meet, propelling governments to act. The *problems stream* contains the broad problems facing societies. The *policy stream* refers to the set of policy alternatives that researchers and other stakeholders propose how to address problems. The *politics stream* consists of political transitions, national mood, elections, or pressure from interest groups (Kingdon, 1984).

3.3 Data collection and analysis methods

Method for each component is described giving appropriate detail according to study design.

3.3.1 Component one: Desk review of population wide intervention in South Africa

To achieve objective one, namely to review the uptake of population-wide interventions for prevention and control of NCDs, a desk review of literature was conducted. A literature search was undertaken to identify published and unpublished articles and reports. Relevant NCDs policies and strategies, and local print media documents, were identified and assessed to determine what policies have been implemented to address NCDs. The material was also used to assess the development and implementation process of the NSP and describe what is currently being done in South Africa to address the NCD challenge. The information was obtained using PubMed, Google and Google Scholar. The search terms included were: strategy for NCDs prevention, policies to prevent NCDs, non-communicable disease prevention, chronic disease, strategies to prevent NCDs, NCDs policies, NCDs control, and developing countries. Documents published from January 1990–2016 were included in the search to ensure that broad coverage of strategies and policies could be attained.

3.3.2 Component two: Exploring challenges and successes of implementation of the NSP

To provide an understanding of the implementation of NCDs Strategic Plan in South Africa, a qualitative study of two provinces was conducted to achieve objective two.

3.3.2.1 Study design

This cross-sectional qualitative study in two provinces forms part of a multi-method study to provide an understanding of the implementation of NCDs policy in South Africa. Semi-structured interviews with key-informants were conducted to explore the experiences and

challenges faced by the policymakers and NCDs managers in implementation of the NSP. The study was implemented at two levels of governance, i.e. provincial and municipal/district level.

3.3.2.2 Study setting

The Western Cape and Eastern Cape provinces were conveniently selected to represent their diversity regarding socio-economic and living conditions, access to healthcare as well as healthcare infrastructure. The Eastern Cape is one of the country's poorest provinces regarding average deprivation, with unemployment levels of 30% (Statistics South Africa, 2012). In 1994, the Eastern Cape Province came into being by incorporating the former Xhosa-speaking homelands of the Transkei and Ciskei, together with what was previously part of the Cape Province. Home to 6.7 million people, the Eastern Cape comprises a relatively young population and has a below average life expectancy rate (53.7 male, 59.3 females) (Statistics South Africa, 2013). The province has two metropolitan municipalities and six district municipalities with 37 local municipalities (Statistics South Africa, 2012). Healthcare has been affected by chronic staff shortages, weak primary care and a culture of ill-discipline and poor work ethic (HST, 2013). The province is facing many practical and policy challenges, such as the effective diagnosis and treatment of patients and adequately trained health workers (Buso *et al.*, 2012).

The Western Cape Province, in the most southern part of the country, is the second richest province in the country, accommodating 5.8 million people (Stats SA, 2013). About two-thirds of the population live in the metropolitan area of Cape Town. Although the province is affected by wealth inequalities, it has an unemployment rate of 22%, which is lower than the national average of 25% (Stats SA Q Labour FS, 2013). The review by the National Department of Health (HST, 2013) found the Western Cape Department of Health (WCDOH) to be well-functioning with capacity in planning, infrastructure, good practice and management. The WCDOH uses robust methods to plan and manage health service delivery based on a well-developed and well-

communicated strategic vision and direction and has a bigger private sector associated with a relatively high proportion of the population covered by medical aid (25.2%).

3.3.2.2.1 Governance

The term governance is not a synonym for government and should not be used interchangeably. South Africa has nine provinces which are governed by the three mentioned spheres (Fig. 3.3) based on the principle of cooperation and inter-governmental systems. National government deals with lawmaking, executive authority and judicial authority. The province as the second sphere is responsible for the different needs of the province through the laws passed by the National Assembly. At the local sphere, cities and smaller regions, known as municipalities, are governed by local government (South African Noncommunicable Disease Alliance, 2015).

The responsibility for certain functions is allocated to a specific sphere, but many other functions are shared among the three spheres which cooperate with each other to maximise output and prevent duplication of activities rendered to the communities (Naidoo, 2005). The Constitution of South Africa mandates each of the spheres as distinctive, interrelated and interdependent with a legislative and executive authority of its own and has made healthcare a responsibility of all three spheres (Scott *et al.*, 2014).

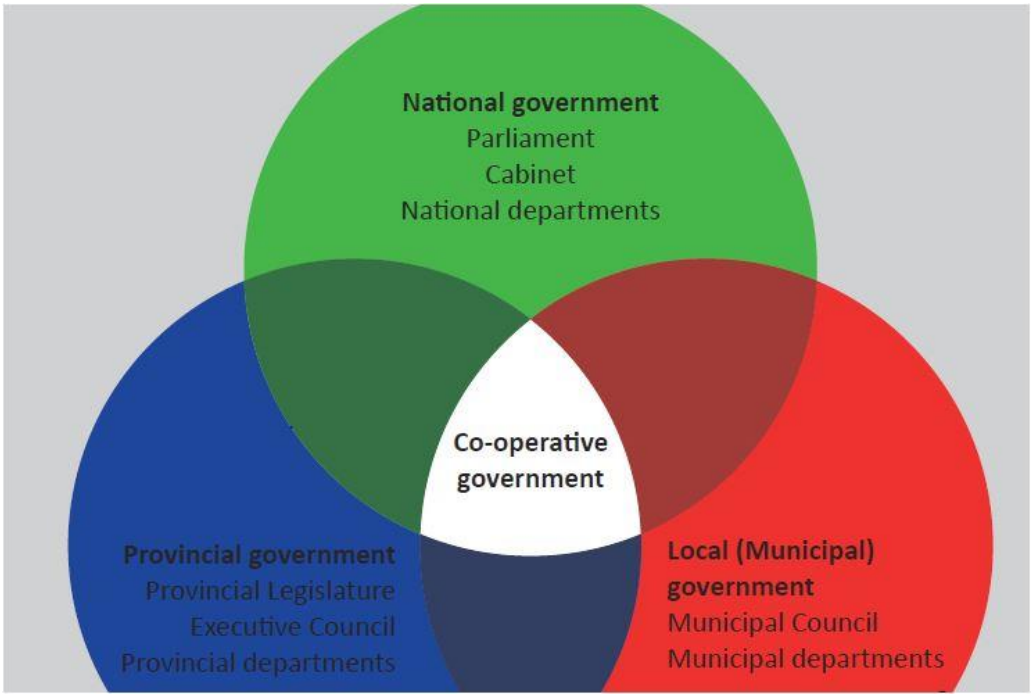


Figure 3.3: Three spheres of government

Source: Western Cape Provincial Government, 1996

In the health sector, the NDoH is responsible for setting policies, while provinces and districts are responsible for implementation. Legislative authority remains with national and provincial government, while the administration of the selected functions is assigned to local government (Metropolitan Municipalities and District Municipalities). In an ideal setting, the actions at all levels would synergistically contribute to placing NCD prevention and control on the agenda and implement a coordinated programme. The various spheres of government need to co-operate with each other to maximise output and prevent duplication, and coordinate the activities rendered to the community. It is important to assess how the three spheres of government have managed their functional roles and responsibilities (Lupafya, Matanje, Maseko, & Chimbali, 2016). Therefore, it is important to understand how this will play out or affect the process of implementing the NSP.

3.3.2.3 Sampling of key informants

Key informants (KI) were purposefully selected based on their role in NCDs in the provincial Department of Health and Local Government. These were senior management and professionals

responsible for running NCDs activities, and who work as policymakers and/or policy implementers in their respective provinces/districts. The respondents were primarily selected from two levels of governance, i.e. provincial and municipal/district. This was done to obtain relevant information and allow informational adequacy and appropriateness of data. The participants' (NCD managers) experience varied between four and 20 plus years; three participants were from the Eastern Cape province, one from the municipality in the Eastern Cape, while in the Western Cape, two participants came from the province, and one from the district level.

Interviews were conducted between August and October 2013 and May 2016. An interview schedule was developed for face-to-face interviews conducted by the researcher. Questions were aimed at provoking interviewees to share their views on the implementation of NCD policies and the new national strategy for prevention and control of NCDs 2013–2017, which also explored successes and barriers, or challenges faced by the managers during this process. The questions included, 'What are the priorities of the province?' 'How does the province implement NCDs policies which are developed at the national level?' 'Do you implement them as they are, or do you modify them?'

Policy documents were requested from officials during the interview. All participants provided informed consent before participating. Interviews were conducted in English and pre-tested in a local setting. Each interview took about 50–60 min and was audio recorded with permission.

3.3.2.4 Data Management and Analysis

Qualitative data were transcribed, cleaned and saved in Word format. Identification codes were assigned to all individuals' records including audiotapes, transcripts and demographic information. Data were stored on a password-protected hard drive and copies of data were backed up with password protection. Transcribed data were then transferred into Atlas ti for analysis. Content analysis was done.

A policy analysis was undertaken using the six success factors identified for the WHO Stepwise framework to organise and interpret the data. The augmenting of the available literature and policy documents were integrated with the information gathered from the desk review, interview notes as well as the information from the key informants.

3.3.3 Component three: Determining prevalence of smoking and high salt intake in urban and rural settings in South Africa

This component addresses objective 3.1. (To describe prevalence of smoking in an urban and a rural community) and objective 4.1. (To assess the prevalence of dietary intake for high sodium and potassium in urban and rural community).

3.3.3.1 Study design

Descriptive cross-sectional, primary analysis of data collected in two communities (1) Langa (urban) and 2) Mount Frere (rural) which forms part of a multi-country cohort study, Prospective Urban Rural Epidemiology (PURE), started in 2009, was undertaken. The current study assessed the prevalence of tobacco smoking and measure salt.

PURE is a large, longitudinal population which recruited approximately 140,000 individuals residing in more than 600 urban and rural communities in 17 high to low income countries of varying incomes and sociocultural settings (Teo, Chow, Vaz, Rangarajan, & Yusuf, 2009). These include three high-income countries (HICs): Canada, Sweden, United Arab Emirates; (7 UMICs) Argentina, Brazil, Chile, Poland, Turkey, Malaysia, South Africa; (3 LMICs) China, Colombia, Iran; and (4 LICs) Bangladesh, India, Pakistan, Zimbabwe. The overall aim of PURE was to examine the relationship between societal influences on lifestyle behaviours, cardiovascular risk factors, and incidence and mortality of chronic diseases. PURE South Africa has three legs these include, North West province (Southern region and Bophirima region), Eastern Cape province (Mount Frere) and Western Cape province (Cape Town Langa). Langa and Mount Frere were selected as an urban and rural pair of communities for inclusion for the current study.

3.3.3.2 Study setting and population

Langa township, located in the Cape Town metropolitan district in the Western Cape Province, is urban and is also mainly inhabited by isiXhosa-speaking black South Africans. Mount Frere is located in Alfred Nzo district in the Eastern Cape, which is largely rural and mainly inhabited by isiXhosa-speaking black South Africans. The study targeted 2026 apparent healthy individuals aged 35-70 years old residing from the two communities.

3.3.3.3. Sampling procedure for the PURE study

The two communities were purposefully selected by the PURE investigating team because they had established research interactions with these communities, making long-term follow-up of individuals feasible. In the urban community, individuals were recruited to join the cohort using a multistage sampling approach. First, households were grouped into three development areas that mirrored the SES of the residents. Then a street map obtained from the City of Cape Town was used to randomly select streets in each of the three areas. Once a street was selected, a systematic sample of every second house was approached for possible inclusion in the study.

In the rural community, streets and households are informal, irregular and unnamed and houses are unnumbered, making it impossible to follow the same sampling approach. Therefore, a cluster sampling of houses in selected villages under the clan heads in Mount Frere was undertaken.

Households were selected if at least one member of the household is between the ages of 35 and 70 years and the household members intend to continue living in their current home for a further 4 years. All individuals (men and women) within these households between 35 and 70 years providing written informed consent were enrolled. Participants were recruited during 2009 to 2010. All participants who were between the ages of 35 and 70 years were eligible to participate (Teo et al., 2009) in spite of having been diagnosed with chronic conditions such as diabetes, hypertension and others with no exclusions.

3.3.3.4 Data collection and data collection tool

Baseline interviews were conducted in English using standardised and validated PURE questionnaires by trained field workers. The questionnaires were used to capture information about demographic, socioeconomic factors, health status and history, lifestyle factors and were completed during home visits. Dietary information was obtained by PURE using country-specific quantified food frequency questionnaire (QFFQs). For the South African sites, the questionnaire was validated by the University of the North West Site (Prospective Urban Rural Epidemiology (PURE) study investigators, 2017). A more detailed description of dietary data collection and questionnaire validation are found elsewhere (Prospective Urban Rural Epidemiology (PURE) study investigators, 2017). Participants were shown food models (pictures, real foods, other models) to make it easier for them to estimate the amount of food consumed. Then, assumptions about the relative frequencies of intakes and portion sizes of the foods was made to convert the food eaten into nutrients. Household quantities of food consumed were converted into grams by using conversion food tables (Wolmarans P, 2010). Repeat visits at different times of the day were undertaken to reduce the level of non-response.

For salt intake: Discretionary salt was collected separately as part of FFQ. The subjects were asked “Do you add salt to your food after it has been cooked?”

The frequency of consumption (always, sometimes, never) was asked. Quantitative intake of amount of salt added was collected through a food frequency questionnaire. The dietary intake was then inputted into Food Finder, a computer programme that produces nutrient analysis. The results obtained in grams of salt were converted to grams of sodium.

3.3.3.5 Data analysis

For the purpose of this objective (Determining prevalence of high salt intake in urban and rural settings in South Africa), data collected at baseline was obtained by the student from 2026 participants in the PURE database (Cape Town and Mount Frere). Descriptive statistics for

tobacco use which include frequency, percentage, mean and standard deviations (if normal distribution) and median and confidence intervals was used primarily to summarise data on education, income and employment and tobacco use. Tobacco use was categorised into three groups as current, former and never used. The data were analysed using Stata 14 and Excel 16, separately for rural and urban study participants. The $\chi 2$ test was applied to test for differences between the rural and urban populations for nominal data and the t-test for continuous variables. In all analyses, statistical significance was set at $p < 0.05$.

To convert the frequency and portion size of foods from the QFFQ into nutrients, the foods were coded, and the food portion size converted to gram by a trained nutritionist and analysed by a statistician with experience with nutritional intake data. The daily intake of sodium and potassium were calculated for each food item using the South Africa Medical Research Council Food database (SAFOOD), then summed to get the total nutrient consumed by the participant. Since nutrition data are generally not symmetrical or normally distributed, the median and interquartile range were used to describe the sodium and potassium intakes (by age and sex where applicable). Quintile regression analysis was conducted to investigate whether there was a statistically significant difference between urban and rural participants as well as by age and sex. Stata 14 and Excel 16 were used. Similarly, for salt, data were analysed using STATA and Excel spreadsheets with reference to SAFOODS database to generate estimates of salt intake of individuals. The results obtained in grams of salt were converted to grams of sodium. Quantile of the intake was calculated.

Total sodium intake is the sum of the salt consumption obtained from the FFQ and the measurements of discretionary salt.

3.3.4 Component four: Assessment of tobacco control policy environment in the communities

For the objective 3.2, to examine the policy environment including tobacco policy implementation, smoking intolerance and unacceptability as well as knowledge of health effects of smoking in an urban and a rural community.

3.3.4.1 Study design

An observational audit of the policy environment was undertaken by trained researchers and a cross-sectional survey of community perceptions was conducted in an urban and a rural community.

3.3.4.2 Study population

Participants for this study were selected as part of the from two communities of Black South Africans-Mount Frere, a rural community located in the Eastern Cape Province and Langa, an urban settlement close to Cape Town in the Western Cape Province as mentioned in section 3.3.3.2.

3.3.4.3 Sampling procedure and sample size

A random sub- sample of individuals was drawn from the larger PURE study (as described above) by the PURE investigating team. A sub-sample consist of 68 participants (34 urban and 34 rural) was identified to obtain information on community profile and community attitudes and acceptance of tobacco control policies implementated in these settings. The sub-sample was considered sufficient to reliably characterise measures at the community level as well as to broaden the study and understanding of social phenomena in our research.

3.3.4.4 Data collection instrument

The EPOCH instrument was developed by the international PURE investigation team following a systematic review of existing instruments and community level measures that influence cardiovascular risk factors (CVRFs) and this review has been described separately (Chow *et al.*, 2009). The EPOCH instrument could be used to simultaneously collect data on a range of environmental characteristics potentially associated with cardiovascular risk factors (by means of either structured observations) as well as perceptions of the environment (through interviews with community residents) (Raudenbush & Sampson, 1999). Four major domains were identified: the tobacco environment, the physical activity environment, the food (including alcohol) environment, and the social and economic environment. The instrument was developed in two parts, EPOCH instrument 1 (an assessment of the physical environment) is an objective environmental audit tool and EPOCH instrument 2, (residents' perceptions of their community) an interviewer-administered questionnaire that captures perceptions about the community from PURE subjects living in the community (Chow et al., 2010).

The Epoch instrument was tested in 25 rural and urban communities in Brazil, Canada, China, Colombia and India. Face to face training of the researchers (fieldworkers) was conducted in Cape Town, which involved a session where all observers and the trainer visited at least one community together to do an assessment.

The benefit of using the EPOCH tool include the ability to use simultaneously to collect data on a range of environmental characteristics potentially associated with NCD risk factors and which combined objective measures and perceptions of the environment.

3.3.4.5 Reliability of EPOCH questionnaire

EPOCH instruments have been validated and shown to be feasible and, for many variables, direct community observation had high inter-observer reliability (Chow *et al.*, 2010). Reliability for

each measurement have been tested and high reliabilities were achieved for community-level measures (Corsi *et al.*, 2012).

3.3.4.6 Data collection

The data were collected by a trained researcher by using EPOCH questionnaire on environmental change, societal influences on lifestyle and risk factors for NCDs. The EPOCH consists of two parts (namely EPOCH 1 and EPOCH2) measures a range of environmental characteristics potentially associated with cardiovascular risk factors and perceptions of the environment ability to influence behaviours. In EPOCH 1, Five elements were used analysed. The first, '*Community characteristics'*, is a checklist of essential infrastructure and services in the community. The second, a '*Community observation walk',* takes place in a commercial or central shopping district that people use for everyday purchases. The researcher walked according to a planned route covering 1 kilometre, beginning from a pre-specified central location designated as the 'start point' (e.g. a central, busy traffic intersection, central train or bus station, post office, supermarket, shopping mall, school or another central area where people frequently visit). On the walk, the researcher counts the different types of tobacco advertisements and shops. The walk takes about one hour. The third section is '*Assessment of a tobacco retail outlet',* and the fourth is an *'Assessment of a grocery store'*. These assessments aimed to capture price, access to and availability of tobacco products, and presence of in-store tobacco advertising. The closest tobacco store, grocery store and local restaurant to the 'start point' of the community observation walk were selected for the detailed assessments. If none existed, these were not done.

The EPOCH 2 is a structured interview covering two domains relevant to cardiovascular risk factors: 1) the community tobacco environment and 2) the community social environment. The community tobacco environment was represented by 2 scales derived from 5 questions with Likert-type responses and 5 scales based on yes/no responses to between 3 and 8 questions. Our goal was to assess the compliance with tobacco legislation inside stores in urban and rural of the

study settings and to describe awareness of tobacco legislation in our setting as well to describe youth access to cigarettes in the community. Subjects were asked about the current restrictions on smoking in their communities and their preferences for smoking in public places. Respondents were also asked whether they had seen advertisements both for and against smoking in media, to give their opinion of the social acceptability of smoking, and about their knowledge of the health effects of smoking. EPOCH 2 also assessed residents' smoking tolerance, awareness of tobacco legislation and health effects of smoking, and disapproval of smoking among children and youth (Corsi et al., 2012, Teo et al., 2009).

3.3.4.7 Data analysis

Comparative analysis was done by the student using excel version 10. Chi square analysis to compare community environmental factors and behaviours related to smoking as well as awareness on tobacco control policies (Eastern Cape) and urban (Western Cape) communities. A comparison between age, sex and education was made.

3.3.5 Component five: Evaluation of tobacco control and salt reduction legislations for SA

Objective 3.3 and 4.2 included the assessment of the trends in the prevalence of tobacco use and hypertension as outcomes of the tobacco control efforts and salt reduction regulation**.** To achieve this objective, estimates from eight national surveys including, the South African Demographic and Health Survey 1998, 2003 and 2016 (SADHS), National Income Dynamics Study (NIDS) 2008, 2010, 2012 and 2014, South African Nutritional and Health National Survey 2012 (SANHANES) were consolidated.

3.3.5.1 Study design

Secondary analysis of cross-sectional national surveys with prevalence of the use of tobacco and hypertension, a condition related to high salt consumption.

3.3.5.2 Data sources

Eight national surveys including, the South African Demographic and Health Survey 1998, 2003 and 2016 (SADHS), National Income Dynamics Study (NIDS) 2008, 2010, 2012 and 2014, South African Nutritional and Health National Survey 2012 (SANHANES) were used to calculate prevalence of tobacco use and hypertension.

3.3.5.3 South African Demographic and Health Survey (SADHS)

The population-based SADHS conducted in 1998, 2003 and 2016 collected data, including an adult health segment for those above 15 years of age, from a nationally representative, multistage cluster sample of households. All the SADHS in past years were conducted similarly. The interviews and clinical measurements were performed by trained, standardised fieldworkers (Department of Health, Medical Research Council, & OrcMacro, 1998; National Department of Health, Medical Research Council, & OrcMacro, 2007, 2016). Multi-stage stratified sample was employed to select a representative sample.

Data collection on tobacco use

Tobacco use data were collected by asking the respondents if they "ever used tobacco products". Questions on tobacco use from the WHO -Stepwise surveillance programme questionnaire were included in the 2003 SADHS and were similar to the SADHS questionnaire used in 1998, and 2016 though with greater emphasis on current and daily smoking habits. Descriptive statistics were calculated using the weights based on the sample design and the response rate. The reported variance estimates were calculated using the Taylor series method were used to estimate confidence intervals. Those who smoked tobacco products, irrespective of the quantity, were classified as 'smoke daily or occasionally'. 'Users of smokeless tobacco or snuffers' described adults who used snuff or chewing tobacco, irrespective of whether they smoked tobacco products.

Data collection for hypertension

The adult health questionnaire (AHQ) for SADHS was designed to include blood pressure measurements. Respondents' treatment was recorded on viewing their prescribed medication containers. Blood pressure was measured using an Omron Automatic Digital BP Monitor (model M2, Omron Healthcare, Bannockburn, IL, USA) by trained nurses. Omron is internationally validated as a standard quality BP monitor and is recommended for monitoring and self-monitoring BP (Bonilla et al., 2002; Wan et al., 2010). The prevalence of hypertension was calculated by using both cut-off points currently under consideration (Guidelines Subcommittee, 1999). The prevalence of hypertension according to the WHO/ISH (BP. 140/90 mmHg) allows for understanding that is comparable to other rates reported in the literature.

Limitations of SADHS data

Measurement errors include the prevalence based on self-reporting and the possibility of recall bias in the case of tobacco use.

3.3.5.4 The National Income Dynamics Study

The analysis of the aforementioned NCD risk factors (tobacco use and hypertension) is based on data from the four waves of the National Income Dynamics Study (NiDS) panel survey, (Southern Africa Labour and Development Research Unit, 2009, 2014, 2016a, 2016b) carried out by the Southern Africa Labour and Development Research Unit (SALDRU) in the School of Economics at the University of Cape Town. The NIDS panel survey includes questions about tobacco use and measurement of blood pressure. Various documents detailing the survey methodology (Leibbrandt, Woolard, & De Villiers, 2009, weighting {Wittenberg, 2009 #1658; Southern Africa Labour and Development Research Unit (SALDRU), 2013) and user manuals (Brown, Daniels, De Villiers, Leibbrandt, & Woolard, 2012; De Villiers, Brown, Woolard, Daniels, & Leibbrandt, 2013)were found on the NIDS website (www.nids.co.za) and on the data distributor's website (http://www.datafirst.uct.ac.za/).

The study began in 2008 with a nationally representative sample of over 28 000 individuals in approximately 7 300 households throughout the country. Four hundred primary sampling units (PSUs) were sampled from the selected 3000 PSUs sampled from the master sample that Stats SA used for its Labour Force Survey and General Household Surveys between 2004–2007 and used 53 districts councils as the explicit strata. The survey has been repeated with these same household members every two years and examines the livelihoods of individuals and households over time.

Data collection on tobacco use

Data on smoking status were collected based on whether the respondent smokes (current), ever smoked regularly, and an average number of cigarettes smoked per day (both to current and past smokers). Questions about tobacco use "Have you ever been smoking daily? with possible responses being 'Yes', 'No', 'Refused' or 'Don't know'. Unspecified responses as well as the 'refused' and 'don't know' responses in the NIDS were treated as missing data when estimating the prevalence. Respondents are classified as: 'past smokers', 'present smokers', or 'never smoked'.

Classification and statistical analyses of data for smoking

Data on tobacco use were analysed for adults aged ≥18 years. Weighted data were analysed using STATA version 12 (Stata Corporation, USA). Estimates and 95% confidence intervals (CIs) were reported with odds ratios (ORs) as measures and direction of the association. Chi-square and t-tests were used for categorical and continuous random variables, respectively. A p-value of <0.05 indicated statistical significance. Logistic regression analyses were conducted on the sub-sample of current tobacco smokers to determine the factors associated with having tried to stop smoking in the preceding 12 months in this group. The variables found to be significant in the univariate models were used in the multivariate model.

Data collection on hypertension

NIDS study variables include self-reported hypertension, systolic and diastolic BP, smoking, BMI and alcohol use. Systolic and diastolic BP were measured twice, however, this was found to be challenging. The measurement for the two sets of systolic and diastolic readings was eliminated from the analysis according to the following rules:

1. If systolic BP <40 mmHg or >240 mmHg and diastolic <30 mmHg or ≥140 mmHg
2. A set of readings for systolic and diastolic BP was retained if systolic BP ≥80 mmHg and also at least 15 mmHg larger than the diastolic BP.
3. If the second systolic or diastolic BP differed by more than 5 mmHg, the first BP reading was excluded.

Classification and statistical analyses of data for hypertension

A final measurement for systolic and diastolic BP was calculated from the average of the two measurements, or the single measurement if only one reading met the criteria. Measured systolic and diastolic BP readings were used to define BP levels as normal, prehypertension or raised BP. In addition, survey respondents were defined as having hypertension if they had raised BP or were on medication for hypertension. Self-reported hypertension, systolic and diastolic BP, raised BP and hypertension were not included. All data were analysed in relation to the population's demographics, and geographic and time variations.

Limitations of NIDS

The question on smoking status was phrased somewhat differently from the questions used by other surveys. The status of current smokers was obtained from a single question that had complex categories while other surveys have a sequence of questions to identify the categories.

3.3.5.5 The South African National Health and Nutrition Examination Survey, 2012 (SANHANES-1)

In addition to the data from the SADHS and NIDS, data from SANHANES-1, which was carried out by Human Science Research Council in 2012, was also used to describe the prevalence of smoking and hypertension for 2012 of South Africans aged ≥15 years. This was done through an interviewer-administered questionnaire and BP measurements.

Sampling in SANHANES-1

The detailed sampling method is described in the main report. (Shisana *et al.*, 2013) Persons in all nine provinces aged ≥15 years were sampled, using a multistage disproportionate, stratified cluster sampling approach to select 10 000 households from a random sample of 500 census enumerator areas. All such adults in the household were interviewed. Respondents were considered to be current tobacco smokers if they reported that they currently smoked tobacco daily or occasionally.

Data collection on tobacco use

Respondents were asked if they ever smoked tobacco ('never', 'past smoker' 'fewer than daily smoker' and 'daily smoker'). The last three categories were combined into a single category 'ever smoked'. Similarly, current users of other tobacco products were defined as those who reported the use of other tobacco products on a daily or less than daily basis. Reference to non-smokers in the text includes ex-smokers. For completeness, Table 3.2 summarises the dimensions of tobacco use included in the national surveys.

Table 3.2: Characteristics of tobacco use from the three surveys

	SADHS	NIDS	SANHANES
Smoking	Ever used tobacco products	Current smoker	Ever smoked tobacco
	Perceptions of smoking on health	Past regular smoker	Age of initiation of smoking
	Exposure to environmental tobacco smoke	Age of initiation of smoking	Number of cigarettes smoked per day
		Number of cigarettes smoked per day	Exposure to environmental tobacco smoke
			Cessation of smoking
			Advice to quit smoking

Source: Wandai et al., 2017

Classification and statistical analyses of data for smoking

Data on tobacco use were analysed for adults aged ≥18 years. Weighted data were analysed using STATA version 12 (Stata Corporation, USA). Estimates and 95% confidence intervals (CIs) were reported with odds ratios (ORs) as measures and direction of the association. Chi-square and t-tests were used for categorical and continuous random variables, respectively. A p-value of <0.05 indicated statistical significance. Logistic regression analyses were conducted on the sub-sample of current tobacco smokers to determine the factors associated with having tried to stop smoking in the preceding 12 months in this group. The variables found to be significant in the univariate models were used in the multivariate model.

Data collection on hypertension

Blood pressure was measured using an Omron M2 (model M2, Omron Healthcare, Bannockburn, IL, USA). Measurements were taken by the staff at the health facility, after at least 5–10 minutes of rest. The correct cuff size was selected to ensure accurate measurements. An adult-standard-size cuff (16 × 30 cm) for an individual with an upper-arm circumference of 27–34 cm, a 'small adult' cuff (12 × 22 cm) for an individual with an upper-arm circumference of 22–26 cm, and a 'large adult' cuff (16 × 36 cm) for individuals with an arm girth of 35–44 cm. If the second measurement was substantially different from the first, the doctor took a third measurement. The lower of the last two measurements was recorded as the clinic BP.

For manual BP measurements, Systolic BP was recorded upon the first appearance of faint repetitive clear tapping sounds gradually increasing in intensity and lasting for at least two consecutive beats. Diastolic BP was recorded at the point at which all sounds disappeared completely. The latter (phase v) correlates better with direct measurement and commonly used in clinical trials of antihypertensive therapies and is more reproducible when assessed by different observers. The following categories for BP measurements were used.

Table 3.3: Blood pressure classification

Normal	Prehypertension	Raised BP	Hypertension
SBP <120 mmHg and DBP <80 mmHg	SBP 120–139 mmHg or DBP 80–89 mmHg	SBP ≥140 mmHg or DBP ≥90 mmHg	Raised BP or self-reported medication use for hypertension

SBP= systolic blood pressure; DBP= diastolic blood pressure

Classification and statistical analyses of hypertension

Descriptive statistical analyses were conducted. Both Stata and SPSS software commands were used to obtain the estimates of prevalence or proportions of responses and cross tabulations. Weighted analysis (benchmarked to the 2012 midyear population estimates provided by Stats SA for age, race group, and province) was conducted. Analyses of weighted data were conducted using STATA 11 software considering the complex multi-level sampling design and adjusting for non-response.

Data analysis was carried out independently by at least two biostatisticians to verify results. Tables and figures in the results section of the report present weighted percentages and unweighted counts.

Data were double-entered and verified using Census Survey Processing (CS Pro) software version 5.0 (US Census Bureau) and converted to the Statistical Package for the Social Sciences (SPSS) for further exploration. Sampling weights were computed to account for unequal sampling probabilities and benchmarking to 2012 mid-year population estimates.

Limitations of SANHANES-1

Self-reported morbidity measures, collected by questionnaire instruments, are known to have inherent validity and reliability limitations due, largely, to recall bias. A limitation on blood pressure measurement is that the number of participants in white and Indian population groups proved to be too small for reliable analysis and these are therefore not considered further in this analysis on hypertension.

3.3.5.6 Survey response rates

Table 3.4: Sample size and response rates from the eight surveys

Survey name	Year	Sampling procedure	Overall response rate (%)
South African Demographic and Health Survey (SADHS)	1998	Multi-stage stratified sample	89.7
SADHS	2003	Multi-stage stratified sample	70.5
National Income Dynamics Survey (NIDS)	2008	Stratified two-stage cluster sample design	63.3
NIDS	2010	Stratified two-stage cluster sample design	52.8
South African National Health and Nutrition Examination Survey (SANHANES)	2012	Multi-stage sampling disproportionate, stratified cluster sampling approach	71.5
NIDS	2012	Stratified two-stage cluster sample design	57.1
NIDS	2014	Stratified two-stage cluster sample design	58.2
SADHS	2016	Multi-stage stratified sample	N/A

3.3.6 Component six: Calculation of mortality trends for tobacco related and high salt intake

To further achieve objective five and six, a descriptive study to assess the trends in mortality from conditions related to the use of tobacco and high salt intake in the South African population, was undertaken making use of estimates from the 2nd National Burden of Disease Study (Msemburi *et al.*, 2016).

3.3.6.1 Data sources

Statistics South Africa reports the cause of death statistics from death notifications on an annual basis (Statistics South Africa (Stats SA), 2015). Although this provides a nationally representative dataset, the data are incomplete, with about 10% of deaths missing and are known to contain errors in the cause of deaths (Joubert *et al.*, 2013; Pillay-van Wyk, Bradshaw, Groenewald, & R., 2011). In particular, HIV is under-recorded, and there is a high proportion of ill-defined causes (about 12%) (ibid). Trends in the data, particularly cause-specific mortality rates, should adjust for the data deficiencies. The Burden of Disease Research Unit has obtained unit record data annually from Stats SA for the period 1997-2013 and developed a consolidated database (personal communication – Ms Ria Laubscher). These data were used to estimate the cause of death mortality trends for the 2nd South African National Burden of Disease Study (SA NBD) for the period 1997-2012 (Pillay-van Wyk, 2016). For the 2nd SA NBD study, data integrity was assessed using data cleaning processes and validity checks. Full details have been documented in the technical report by the SA NBD team (Pillay van Wyk *et al.*, 2014). Data cleaning included checks of the age and sex and underlying cause of death coded to ICD-10 (World Health Organisation, 2008). Deaths of unknown ages were distributed proportionately by age and sex across all causes. Deaths misclassified according to ill-defined signs and symptoms and other 'garbage codes' were proportionally redistributed to specified causes within each age and gender category. The ICD-codes were aggregated according to the updated National Burden of Disease (NBD) list, which is a condensed list of conditions containing the most prevalent diseases across SA, including those of public health importance (Pillay-van Wyk et al., 2014).

3.3.6.2 Analysis and classification of data

Age-standardised mortality rates for selected causes were calculated using the WHO World Population as the standard (Ahmed et al., 2010) and mid-year population estimates for South

Africa (Dorrington, 2013). Trends in the age-standardised rates for the period 1997-2012 were reviewed for males, females and persons.

3.3.6 3 Limitations of the SA NBD mortality estimates

The technical approach of the SA NBD methodology is complex, both in concept and in application. Each burden of disease study contains uncertainty as a result of possible imprecision in epidemiological data (e.g., deaths, incidence, prevalence, severity), in the parameter values used, or due to methodological controversy (Polinder, Haagsma, Stein, & Havelaar, 2012). No bounds of uncertainty have been calculated.

3.4 Reliability

The use of multiple methods and various procedures for collecting data and analysis and the use of a framework, ensured the reliability of the study. Structured validated questionnaires were used during face-to-face interviews with the selected communities. Quality of data collection is maintained through the use of standardised protocols and centralized training. Information is collated from similar sources for both settings where possible. The QFFQ has good validity and reproducibility in relation to the reference method and can be used to rank data based on their macro- and micronutrient intake (Dehghan *et al.*, 2012; Wentzel-Viljoen, Laubscher, & Kruger, 2011).

3.5 Generalisability

Findings from this study may not be generalised beyond this setting. However, the lessons learned here can be applied elsewhere with some adjustments.

3.6 Ethical considerations

Ethics approval for the study was obtained from the Senate Research Office (SRC) of the University of the Western Cape Ethics Committees for the primary data collection and secondary analyses that were undertaken. The study was explained to participants in their local language (isiXhosa). Participants were made to understand that their participation was voluntary and that

they could withdraw at any time. Permissions was obtained from the Provincial Department of Health, Eastern Cape, and the Western Cape Provincial Government to collect primary data. Informed consent was obtained from all participants before conducting the interviews. Completed questionnaires were secured in a locked cabinet of the study coordinator. Permission to conduct the study was requested and granted from the International Steering Committee of the PURE study and the local Principal Investigator (Prof Thandi Puoane). The proposed analytical study is in line with the objective presented to study participants when they were recruited at baseline.

CHAPTER 4: NCD POLICIES IN SOUTH AFRICA

4.1 Introduction

In this chapter, the aim is to review what has been done to address NCDs in South Africa and the two provinces, to review the implementation process of the NSP, and explore the challenges and successes experienced by NCD managers in implementing the NCD NSP 2013–2017.

In this chapter, the findings of the assessment of existing policies and the National Strategic Plan for the Prevention and Control of Non-Communicable Diseases (NSP) to prevent and control NCDs in South Africa, are presented. This situational analysis is aimed at assessing the existing national policies in South Africa on reducing risk factors for NCDs. We examined how well these policies match the WHO recommendations. Furthermore, challenges, successes, and the implementation process of the NSP were explored, using a study in two provinces of South Africa. In addition, since South Africa has three spheres of government (national, provincial and local/district), the coordination and integration of services and outreach activities between the three spheres were assessed in relation to the implementation of the NSP.

4.1.1 National Strategic Plan

South Africa participated in the UN High-level Meeting in 2011 and was a signatory to a Political Declaration (Beaglehole, Bonita, Alleyne, *et al.*, 2011; Spires *et al.*, 2016) that committed governments to address the NCD burden according to a specific timeline (Smith Jr *et al.*, 2012). Subsequently, in 2013, the South African National Department of Health (NDoH) released a multi-sectoral Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2013–17, (NSP) (National Department of Health, 2013). The NSP is based on 'best buys', and has prioritised the goal of reducing NCD morbidity, mortality and related risk factors. The strategy has time-bound targets and indicators to reduce relative premature mortality (dying below the age of 60 years) from NCDs to be achieved by 2020 (National Department of Health, 2013) using 2010 as a baseline (National Department of Health, 2013). Such a strategy is crucial,

bearing in mind that estimates had predicted that the burden of NCDs would continue to rise if nothing were done to address this challenge (Abegunde *et al.*, 2007; Mayosi *et al.*, 2009). With this plan, South Africa has developed a comprehensive set of actions to prevent and treat NCDs, with an emphasis on a whole of government policy response which was launched in 2013. (National Department of Health, 2013). This is explained in detail later.

The results of this research are reported in two parts. Firstly, the findings from the reviewed documents and secondly are reported followed by the findings from the KI interviews.

4.2 South Africa's National response to NCDs

A review of government publications at a national and provincial level, press releases from the government news agency, NDoH annual reports, national department and provincial websites, and SA Health Reviews, indicates that the national government had recognised the importance of NCDs long before the NSP was launched. Since the early 1990s, the government of South African has shown commitment and has been reorienting policies to address prevention and control of NCDs. Several positive policies have been developed at national level to target NCDs and their risk factors. A directorate within the NDoH was established for Chronic Diseases Management and Disability Services, in 1996. Through this directorate, South Africa has made progress in formulating and implementing several health policies relevant to chronic disease prevention. Table 4.1 provides a summary of selected legislation, policies and regulations related to tobacco, food and more generally, the prevention and control of NCDs and their risk factors. The bulk of these regulations were related to tobacco control. In addition, these policies and regulations address norms and standards for primary health care (PHC) (Bradshaw, Steyn, Levitt, *et al.*, 2011; Mayosi *et al.*, 2012; Puoane *et al.*, 2013).

Table 4.1: Selected policies and regulation for prevention and control of NCDs in South Africa

Policy	Details	Year
Tobacco Control Act (Act 83 of 1993) was amended in 1999 and 2007	Prohibit smoking in public places, warnings on packaging, tobacco sales to minors under the age of 16 and regulated some aspects of advertising tobacco products and sponsorship	1993
Universal screening for cervical cancer screening	Three cervical cytology tests, at ages 30, 40 and 50 years	2000
Alcohol; The Liquor Act (Act 59 of 2003)	Legal drinking age from 18 to 21 years, and banning advertising and sales near schools and public places	2003
Mental Health Care Act No 17 of 2002	To provide for the care, treatment and rehabilitation of persons who are mentally ill	2005
Regulation relating to trans-fat in foodstuffs (ACT NO. 54 OF 1972) (No. R. 127 of 2011)	The sale, manufacturing and importation of any processed foods that exceed 2g of *trans*-fat per 100g of partially hydrogenated fats and oils, are prohibited.	2011
National Cancer Control Programme (Act No. 61 of 2006- Regulations related to Cancer Registration No. R.380)	New cases of cancer to be notified (Act No. 61 of 2006- Regulations related to Cancer Registration No. R.380). The regulations make provision for the establishment of a population-based cancer registry.	2011
Food labelling and advertising regulations (ACT NO. 54 OF 1972) (R146)	All labels and advertising of food products in South Africa must be compliant.	2012
Salt reduction regulation Act 1972(Act 54 of 1972) No. R. 214 (2013) R989 Amendment (2016)	Reduction of Sodium content in certain foodstuffs (Act 1972)	2013

Source: Adapted from National NCDs Strategic Plan 2013-17

There have also been significant changes in the public health services. Since 1994, the South African government has endeavoured to deliver an improved PHC system based on the newly introduced health district system (Moosa, Derese, & Peersman, 2017). However, services remain fragmented, accompanied by staff shortages, resulting in poor health outcomes (Moosa *et al.*, 2017; National Department of Health, 2011). Subsequently, the NDoH is in the process of overhauling the health system based on a re-engineering of PHC, making a shift towards prevention (Moosa *et al.*, 2017). The NDoH has adopted PHC re-engineering as a means to

strengthen the effectiveness of the current health system weakened by poor infrastructure and human resource limitations (Department of Health, 2013a).

Integration of NCD prevention and control of NCD risk factors for health services, requires the linking of acute and chronic care (Atun *et al.*, 2013; Levitt, Steyn, Dav, & Bradshaw, 2011; Rabkin, Kruk, & El-Sadr, 2012). In an effort to provide care for chronic conditions, South Africa has implemented a comprehensive clinical practice guideline that aims to equip nurses and other clinicians with the tools to diagnose and manage common adult conditions at primary level known as Practical Approach to Care Kit (PACK) (Cornick *et al.*, 2018; Fairall *et al.*, 2015), previously known as Primary Care 101(Mash *et al.*, 2012).

PACK KIT has been under developing processes for the past 14 years. The tool that is evidence-based to strengthen primary care in under sourced areas has been, tested, expanded, refined and implemented by the Knowledge Translation Unit (KTU) of the University Cape Town Lung Institute. PACK covers all significant and common presentations of adults in primary care in South Africa and has four components: policy compliant and evidence-informed guidelines; onsite, team and case-based training; non-physician prescribing and a cascade system for jurisdiction-wide scaling up. (Fairall et al., 2005).

The PACK Adult guideline covers 40 common symptoms and 20 chronic conditions seen among adults attending primary care clinics in South Africa (Mash et al., 2012) and is an expansion of PALSA PLUS to include NCD (hypertension, diabetes, cardiovascular disease), mental health, end-of-life care and women's health (antenatal care, contraception). A concise tool, it uses symptom-based algorithms as its entry point and a standardised checklist format to assist health workers to ‘Assess, Advise and Treat’ patients' chronic conditions. The guideline prompts users at appropriate opportunities to consider diagnosis of a priority condition, speeding initiation of routine care for that condition with criteria and paths for referral where appropriate.

Following PACK Adult's successful pilot in four districts during 2012, and the political profile it received, PACK Adult is being implemented in the 11 pilot districts identified for health system strengthening as part of plans to introduce National Health Insurance in South Africa over the next 15 years (National Department of Health, 2011).

4.3 Findings from the interviews (qualitative data)

There were seven key informants all together. Three were from the Western Cape including one from the district, and four were from the Eastern Cape, one from the municipality, with work experience ranging from four years to 20 years.

NCD prevention and management activities at provincial and local level

The interviews with the seven NCD programme managers in the two provinces revealed that provincial departments have various well-established NCDs activities and programmes (Table 4.2). Each province has its priority conditions. The Eastern Cape follows the national priority list (National Department of Health, 2014), while the Western Cape has identified its own conditions according to the burden experienced in the province. The activities extend from prevention to the management and control of NCDs and appear to differ in magnitude. The scope of the initiatives was limited, especially in the Eastern Cape, suggesting that the NSP presents a unique opportunity to strengthen the prevention and control of NCDs. Managers view the implementation of policies and programmes and training as part of their continuing responsibility.

Table 4.2: Comparison of NCDs-related activities and implementation of the NSP in the Eastern Cape and Western Cape

Activity	Eastern Cape	Western Cape
Priority conditions	Hypertension Diabetes Mental health Substance abuse Eye care	Hypertension Diabetes Epilepsy Asthma and COPD Care of Elderly and Rehabilitation
Staffing	Each priority condition has a manager. There are three sub-directorates in the provincial department. Single staff member in Municipality	Two NCDs managers One staff member from the District
Use of mass media for communication and to create awareness	Occasionally use local radio and newspapers for specific campaign	Use of local TV channel and local radio for dissemination of information
Employee wellness programme for staff to improve health	Not in place	Currently being implemented
Implementation of the NSP	No implementation plan for NSP or NCDs control	Provincial plans for NCDs control already implemented. Further development of NCDs control plan in progress
Provincial management support	Lack of leadership and support from provincial administration	Demonstrates active support from the provincial management
Intersectoral collaboration and partnership with NGOs	Not yet established. The need for intersectoral collaboration is acknowledged but very little relationship with academics or NGOs exists. Also there is minimal engagement with other departments.	The committee has been established, however, activities are limited due to funding constraints.
Service delivery	Integration of NCDs in primary healthcare is in process.	Services involve NPOs and NGOs to complement services. Public participation is also encouraged
Technical support from the national department	Recognition that it is crucial for them to garner support from the top management in the province and the national department	Not felt to be that important as they have received guidance from academics in the province

Experience in addressing NCDs

(1) Awareness of the impact of NCDs

In both provinces, the participants demonstrated clear recognition of the effects of NCDs and the need for specific attention required to reduce these conditions. They indicated that the management of NCDs had been prioritised as listed in Table 4.2. However, because of limited

resources, both provinces have found it necessary to prioritise selected activities. Although NCDs were considered a major problem, they do not get the attention they deserve because of competing priorities, including other diseases as well as social needs. One respondent responded:

Yes non-communicable disease[s] *is a priority but* [an]*other priority is HIV/AIDS and TB* (4). Another example was:, *There are many factors that are out of our hands and those are upstream* (top-bottom) *and downstream factors* (bottom-top) *– you have got to work in collaboration with other departments to see that is in place. I mean we have poor communities and Department of Health can't provide work, can't provide housing, can't provide water – but we work in collaboration, to say look this is the burden, how can you – how can you address it*? (1).

The Western Cape has already considered the comprehensive management of NCDs through the introduction of a disease reduction project (Naledi & Household, 2009). This project aimed to provide a framework for a multi-sectoral strategy to address the most common causes of morbidity and mortality in the province. Because of the high burden of NCDs in the Western Cape, one of its components was to reduce these through addressing upstream factors. As explained by KI: *Western Cape is quite ahead with the national strategic plan but obviously there is still a lot of work to be done… we do have our own strategies and policies in the province... We have a strategic objective (for province) which is around healthy lifestyle, and we are addressing salt intake policy …and how we can influence that type of policy* (1).

More technical support could be used to ease the implementation process as mentioned by a respondent: *In the strategy, the first objective, …establish your functioning structure for planning and monitoring interventions to reduce NCDs, mmh it's not easy – but we are doing it in smaller scale* (3).

(2) Community-based activities in the provinces

Both provinces demonstrated their commitment to promoting awareness of NCD risk factors through health education and the promotion of healthy behaviour by involving community-outreach activities as well as intersectoral actions. This was illustrated by the respondents: *On awareness days, we highlight the key messages around healthy lifestyle about the major five conditions, but we do commemorate other health days too* (1). When asked about what kind of activities they perform during these days, this is what was said: *It would be a range of activities, whether they choose to walk, those type of things, there will be messages and all types of screening, and obvious once they are screened and there is a need for referral they will refer the patient* (1). Another informant said: *…We bring services to the people; we check blood pressure, diabetes*… (4). However, there are concerns about participation and the challenge of engaging some stakeholders in the community, as reflected by this response: *Yes, we actually do it but the attendance of the youth is very low* (3).

Community-based activities provide opportunities at every stage of prevention for promoting healthy behaviour and the provinces are utilising these. The activities will be implemented in the form of intersectoral collaboration with other institutions and integrated with other services simultaneously as elaborated by KI: *We are going to be implementing* [a] *wellness programme in collaboration with* [the] *private sector where people can be screened at specific times for free for* [sic] *hypertension, diabetes, cholesterol, body mass and thus given lifestyle modification advice* (2). This was complemented with: *Say it's a diabetes day, we pull all the resources; could be staff from facility, NGOs or whoever they collaborate with – they will either have it in the mall, local community hall, with TV and radio* (1).

In the Eastern Cape, community sports activities are sometimes organised which they call 'golden games' so that everyone in the community can participate. They consider that these serve a wider purpose: *We have golden games for social development* (4). The Western Cape is

conducting workplace interventions to improve the health status of its employees: I*ntervention to address workers in their workplace about lifestyle and …how to access assistance when they are stressed* (1) Examples of school interventions were also mentioned: *We have these 2–6 like afternoon programmes where kids play sports, provide* [them] *with healthy food by* [the] *social department, and it's like sport and cultural intervention around chronic diseases* (2).

Implementation by municipalities was stated to be challenging: *…There is no one supporting me, …sometimes I call community health workers to help because there is not enough NGOs in this area* (3). Furthermore, in this municipality, NCDs are not considered a priority: *…NGOs go door to door checking people with HIV and TB only… no one is helping people with chronic diseases …outside the clinic* (7).

This manager acknowledged that there is a little help from the nine community health workers for people who had suffered from stroke. However, it was pointed out that these community health workers were not only assigned to NCDs, they have to attend to everybody in the community regardless of their illnesses. *…yes, community health worker*[s] *are facing all types of diseases… There is also a sense that there is lack of update knowledge with NCDs compared with HIV and TB… There is this feeling of lack of knowledge and up-to-date knowledge, whereas I think HIV and to a lesser extent, TB* have/[s] *very good updates, new policies, new protocol, and training …NCDs you don't get that… it has been dormant for years... only now* (7).

In a district in the Western Cape, the conditions were different and strategies were in place to address NCDs. It was noted that *…We recognise the importance in terms of implementation, however, it is difficult, it's not just dependent on us, also the partnership with the patients. We advise around*[on] *lifestyle modification, smoking, alcohol… when we have chronic disease workshops for the district we always bring in something, our last focus was on smoking* (7).

(3) Service integration

The management of NCDs is directed at associated conditions such as hypertension, diabetes, etc. In the PHC, identifying and addressing modifiable risk factors, treatment, and follow-up, screening for common NCDs, and, when necessary, referring patients using a standard protocol, are the key aspects of clinical NCD management. When asked how NCD services are provided, this was the response: *We have a focus on diagnosing the patient, and we have a focus on the bigger population groups* (7).

The goal in all provinces and municipalities/districts is to deliver comprehensive and integrated PHC services at district level. The focus now is to move away from a vertical approach towards integration of services. Everyone seen in primary care should be assessed for common risk factors such as smoking, alcohol use, obesity, blood pressure, blood sugar and counselled on lifestyle modification, as has been reported. Currently, this goal has not been realised, with many clinics still focusing attention on a specific condition, e.g., hypertension and offering a specific service on a particular day.

The NCD department in the Western Cape finds it workable within the DoH to integrate NCD management. According to one manager: *Integration within the department (of health) it is not difficult for example with HIV/AIDS. We try to offer an integrated service, so everybody must know a little of everything, but we ask for example,* [the] *NCDs champion within* [the] *facility who will target the training and intervention* (2, WC PM). In the Eastern Cape, management of NCDs still falls under each separate condition: *Each programme has its own management guideline policies, e.g. hypertension, diabetes, etc. but it's only done under one manager at the province* (6).

(4) Governance

Often the national policies are complex and challenging to implement, and it is left to the provinces to translate these into tangible programme activities. This was supported by the KI

who suggested that implementation would require modifications to be able to implement in different settings: *We are getting policies from national …We can't see ourselves 100% implementing them as they are* (1, WC MP). In the words of another manager: *We take policies from national and adapt them* (4).

Some district/municipalities engage in partnership with local government to render municipal services. In the current study, the district and municipality were working together: ...*In our area, we have one authority, so we do everything together which is wonderful... we partner with them around campaigns, they work around poverty, orphan, and vulnerable children. They will partner around specific projects so municipality will help us with campaigns or special days or access to certain things* (7).

(5) Intersectoral activities

Despite there being a national agenda to establish an intersectoral coordination structure, there have been delays. By the end of 2014, no progress had been made at national level. However, intersectoral actions were recognised by both provinces as being important. Furthermore, the Western Cape has developed an intersectoral structure to address NCDs in the premier's office which is tasked with bringing sectors together to address pressing issues. On the other hand, the Eastern Cape found it challenging to engage with the provincial prevention and management about developing a multi-sectoral structure in the province, although an ad hoc collaboration with other departments was reported. The difficulty of intersectoral actions was identified:

The first objective in the strategy is to establish your functioning structure for planning and monitoring intersectoral interventions …integration with other department[s] *is not easy* (4). Another KI: *It is difficult, it is very difficult, I think some of the difficulties are that departments are expected to use their own resources to be able to achieve this* (3). The difficulty may be because departments have their own priorities; therefore, it should be the responsibility of the provincial government to prioritise intersectoral functioning despite challenges.

Currently, both provinces have been able to arrange ad hoc activities with other sectors/departments. According to one KI: *We have functional integration with other department*[s] *such as education, social development departments and* [the] *liquor board* (2). Another KI reported: *We are doing it (*inter-departmental*) in* [a] *smaller scale with other departments* (3).

In the case of the Western Cape, participants reported that intersectoral collaboration has evolved in the past few years and emphasised leadership as a critical factor. They considered that there had been a change influenced by the change in political leadership as illustrated: *To be honest, I think considering where we were before this… we used to have* [a] *similar structure where the different heads of department sit together and work together before DA* [Democratic Alliance] *came*. When asked why they have stopped now, the response was: *Well you know it is political, it was driven by a different political party* (2).

In order to have maximum impact on health we need to work together to provide best evidence and most appropriate interventions: *Co-operation is very important,* and some sectors have presented opportunities to address NCDs in the Western Cape: *We are working with the department of education, cultural affairs and sports* (2).

The Western Cape established a Provincial Reference Group (senior managers, coordinating clinicians, clinicians, and experts) to develop their provincial policy framework and implementation strategy to guide the prevention and management of NCDs. This was prompted by the high number of people with chronic diseases visiting health facilities.

Barriers to interventions

(1) Capacity to prevent and manage NCDs

Capacity of personnel was highlighted by several participants as one of the key challenges. In the words of one of the KIs: *It's a challenge… we cannot compare ourselves with the first world, I mean they have all these things (resources), and we have got the idea, but for us to put together is such a lot of challenge, there are basic needs to be met and basic staff*" (1). This too was echoed: *There are many challenges, some people can't always implement the plan, but they do try* (3). Distance from health facilities to the training centre has been cited as one of the challenges people from districts face: *…Even now, the training is offered in Cape Town, and I mean our staff are way off in the most rural...* (1). However, they do have some solutions to this problem: *…We try to design things locally, based on our own gaps* (4).

(2) Communication and support from national and provincial management

Lack of communication from the NDoH was cited as a challenge during implementation. According to one KI: *We thought that the National Department will come down (to the province) and call all other departments to explain (this objective) so that all departments understand what they are supposed to do, that's why it's not easy* (4). In some instances, the respondents felt that policies were being dumped on them without a clear action plan for how to achieve their goals, as one explained: *Even these policies that are coming from the national* [Government] *they just throw them… they are supposed to follow* [up] *the policies* [with] *at least the first workshop with the provincial managers so that we can see if we can cascade it down to local level* (4).

When asked if they had heard about the NSP for NCDs, the response from one KI was simply, *No*. Similarly, another participant from another district responded: *I don't know about that I knew they were talking about it, I know about the smoking and obvious the alcohol* (7).

Every successful programme depends on strong administrative support. Lack of support from the Provincial Department and the Head of Department (HoD) was also mentioned. As alluded

to by an informant, one explanation could be related to lack of interest: *I have been trying to get an appointment, but till today I didn't have a chance. ...Last time when I had an appointment I was told that there was a new HoD that was coming in and there was no chance for me to do it* (4).

4.4 Discussion

This study was found that South Africa has made steady progress in the fight against the burden of NCDs. A timely and coordinated response was observed, with NCDs policies being developed since the early 1990s. Several supportive tobacco policies have continuously been implemented since 1993 (Table 4.1). While tobacco control policies have shown some effectiveness (Delobelle *et al.*, 2016), the fully implementation of most of these policies has been slow as per WHO FCTC (Khosa, 2003). Since SA has ratified with WHO FCTC, policies enacted are not fully in accordance with the requirement of the FCTC, for example the use of graphic images or the warning messages should cover more than ½ of the cigarette pack but it's not the case in SA. Also, the taxing level of SA is only 52% while the required level is above 75%.etc.(Gravely *et al.*, 2017; Hussain, English, & Ramanandraible, 2016)The commitment to combat NCDs was further demonstrated by the high level of leadership commitment and the adoption of the multi-sectoral NSP. The development of the NSP was done collaboratively within the DoH through various consultations with other relevant health stakeholders and academics and other sectors to ensure common understanding and feedback. The plan is comprehensive, based on 'best buys' and existing national policies and strategies, and is aligned with the WHO plan. South Africa has identified that a multi-sectoral approach is a cornerstone of NCD prevention.

The policy development process of the NCDs' strategic plan in South Africa provides the road map for addressing NCDs and was initiated by the NDoH. This plan was developed in response to local evidence, showing the rising burden of NCDs and also the push from the global society for a commitment such as the UN political declaration on NCDs. Although the key informant at

provincial level (provincial NCD mangers/policy makers) were involved during the NSP formulation and gave their input, the implementers such as district managers did not participate at formulation level. This appeared to have contributed to the implementation challenges. Stakeholder participation in the process was reported as insufficient as some key implementers (at district level) were left out of the process. Crucial to the successful development of the NSP were: stakeholder participation and extensive consultation, strong political will from the government and use of international guidelines. These factors, which have been reported in other studies (Epping-Jordan *et al.*, 2005; Etiaba *et al.*, 2015), are essential in the development of NCD policies, because they may improve the adoption and implementation of policies (Alwan *et al.*, 2010; Beaglehole, Bonita, Horton, *et al.*, 2011). The strong political will demonstrated during the development of the NSP could have been because of the international commitments which South Africa signed, such as the Political Declaration of 2011, and local evidence of an emerging problem similar to what has been observed in other countries (Bhandari, Angdembe, Dhimal, Neupane, & Bhusal, 2014; Buso *et al.*, 2012; Rani, Nusrat, & Hawken, 2012).

Preventive strategies such as the NSP are crucial to comprehensively reducing NCDs and their risk factors in the country. The belief is that such approaches may deliver the greatest cost-effective benefit in reducing risks at a population level. However, the plan fails to clearly spell out specific activities/direction in ensuring effective implementation. There was neither an implementation plan nor budget accompanying the Plan from the NDoH or the provinces. However, this study, found that the process of developing NSP lacks these crucial components, contributing to challenges faced by the implementers (District managers). Furthermore, mechanisms to monitor the achievements of the strategic plan, were not defined.

A Strategic Plan for HIV, AIDS and STI also reported challenges for successful implementation such as poor coordination, time delay or slow implementation (Nglazi *et al.*, 2012; Uyei, Coetzee, Macinko, & Guttmacher, 2011) and poor integration (Naidoo *et al.*, 2017).

Variations on the implementation of the NSP between the two provinces have been observed. For example, the Eastern Cape seems to be slow to adapt. The managers in the Eastern Cape pointed out the implementation challenges of leadership and management and resistance from the implementers (District managers). In contrast, the Western Cape had made progress with the implementation of the NSP because Western Cape has many more such resources (research institutes, universities etc) than Eastern Cape. This included the establishment of the intersectoral committee, which was achieved mainly through the ongoing collaboration with universities, NGOs and numerous experts and research institutes operating at national and local level. Various opportunities to assist with efficient implementation included the use of NGOs in service delivery, were observed in the Western Cape. These organisations play an important role in delivering healthcare services in the province.

The success factors for implementation of NCDs policies identified in the WHO Stepwise Framework for Preventing Chronic Diseases, were used to assess the implementation process of the NSP in South Africa and the two provinces. The differences are summarised in Table 4.3, against the national experience. The process of developing the NSP was well-aligned to the Success Factors of the framework. However, there are gaps regarding the communication strategy with the need for more effective dissemination of a clear vision related to a small set of outcomes. In contrast, the experience at provincial level was not aligned with the success factors, which will likely hamper the implementation process of the NSP. In addition, the NSP is clearly lacking defined activities and a roadmap for implementation. Khosa (2003) noted that the discrepancies between policy and implementation in South Africa were caused mainly by unrealistic policies and a lack of managerial expertise.

The ICCC framework emphasises an integrated and coordinated positive policy environment across all levels (macro, meso and micro). A positive environment can promote health through legislation and regulation, advocacy and solid leadership. However, this study has revealed the

challenges at the meso and micro levels which indicates that the NSP is not well coordinated with the community, healthcare organisations and individuals.

Another opportunity that was mentioned by the participants in both provinces was the flexibility of tailor-made policies to suit a province's environment and assist with policy implementation. The Western Cape serves as an example for other provinces. Furthermore, strong collaboration with NGOs, NPOs, and community-based agencies, provides opportunities for exploring new and innovative ways of delivering services in the Western Cape. Currently, the Western Cape has many policies and programmes such as employee wellness, in place.

While there has been some progress at a provincial level, very little has happened at the municipality/district level. There is no clear intervention in place. This study found that robust health programmes and policies were often absent at municipal/district level. The complexity and weaknesses in the intergovernmental structures of the three spheres, which create an intricate co-operative governance system, were observed and, thus, suggest constraints to implementing an adequate response to chronic diseases. Similar findings were reported by Samb *et al*. (2010) who identified aspects of governance such as weakness in governance processes as constraints to implementation. Participants at this level admitted having not seen the strategic plan and were operating according to out-dated treatment guidelines. This could be attributed to a disjuncture in activities between the levels.

The actual implementation of the NSP at municipality/district level has been shown to be challenging and local municipalities are losing the responsibility and accountability regarding NSP implementation. Similar findings were also reported in another study conducted in Colombia, suggesting that limited involvement of key actors was a barrier to the efficient implementation of policies (Mosquera *et al.*, 2014). One of the reasons could be that less attention had been given at lower level, while the health managers at local/district level had the responsibility for implementing policies (Scott *et al.*, 2014). Furthermore, cooperative

governance requires structures and processes for coordination and collaboration among the three spheres.

These findings suggest that implementation of policies is complex and therefore needs full support from the NDoH through coordination and proper communication. Furthermore, Bonita *et, al*, (2013) suggested that effective interventions require full support from the highest level of government and local government in their implementation. In this study, it was highlighted that many countries experience more or less similar challenges when implementing policies (areas that need more action). For example, Moosa et al., (2017) evaluated the PHC outreach teams and found that they struggled with leadership challenges, similar to the findings in this study. When looking at governance, Bosu (2012) suggested that weak governance hindered the implementation process (Bosu, 2012; Moosa *et al.*, 2017). Furthermore, goodwill and commitment of actors were some of the enablers for effective implementation (Mosquera *et al.*, 2014).

There has been evidence on the use of a multisectoral approach (MSA) in improving population-level health outcomes. However, there is limited research on the application and success of a multisectoral approach for the control of other risk factors (i.e., harmful use of alcohol, physical inactivity, and unhealthy diets) in developing countries (Juma, Mohamed, Wisdom, Kyobutungi, & Oti, 2016).

4.5 Study limitations

This study has several limitations. A possible explanation is the timing of the interviews which could have been conducted too soon after the launch of the NSP. Interviews in Cape Town were (provincial) conducted in August 2013, in Eastern Cape provincial and district Oct 2013, one district in Cape Town March 2016. A more extended period may have given the NCDs managers enough time to develop an implementation plan. An intervention to lower salt consumption in the general population ought to result in a substantial reduction in the prevalence of hypertension

(Asaria *et al.*, 2007; Cook *et al.*, 2007). For example, Cook *et al*. (2007) suggest this could start to show effects after 18 months (TOHP I) and after 36-48 months (TOHP II). A limited number of interviews was conducted, and it was not possible to secure interviews with national programme directors. Several meetings could not happen due to the nature of work of the targeted individuals. They would be called and tasked by the minister randomly and this made it difficult. However, such interviews could have enhanced the understanding of the problems and provided an additional perspective regarding the policy development and implementation processes. On the other hand, the use of a combination of the desk review, field notes, and semi-structured individual interviews, enhanced the validity of this research. Strategies to ensure rigour were developed and adopted based on the work of (Lincoln & Guba, 1985). This included the training of the researcher and hands-on practice in interviewing skills and data analysis. In addition, a pilot study was done to assure adequacy of data collection and recruitment

Table 4.3: Developmental process for the South African National Strategic Plan as per Epping-Jordan et al. (2005)

	Success factors of the WHO Stepwise Framework for implementation	Success factors for NSP	Eastern Cape	Western Cape
1.	High level political mandate to develop a national strategic plan	The national Minister of Health has taken the lead to mobilise multi-sectoral response to NCDs, signalling a high level political mandate. In addition to participation in global meetings, he supported the NDoH's two-day national NCDs Summit on the 12-13 September 2011 in Gauteng. Policymakers, academics and representatives from multiple sectors including media, marketing and advertising, nongovernmental organizations and consumer organizations, met to develop the Strategic Plan for the Prevention and Control NCDs 2013-2017. (National Department of Health, 2013).	Low political will to get involved due to poor communication from the provincial NCD managers No official plan	Strong ongoing leadership from the province with an inclusive approach. The plan has been drafted.
2.	Intersectoral action is important at all stages of policy formulation and implementation to tackle major determinants of NCDs. Committed group of advocates who assess the needs, advocate for action and assist with development of national policy and planning.	A situation analysis was conducted to gather data on NCDs profile in South Africa and propose solutions on how to reduce incidence and prevalence through comprehensive and intersectoral interventions. A 'whole of government' approach with areas for action beyond health sector. The framework for intersectoral collaboration has been developed. Advocates and civil society, NGOs, PLWNCDs were involved in preparing the summit, but depth of involvement has been limited by capacity eg, Soul City, Heart and Stroke Foundation, Salt Watch, National Council Against smoking etc. (National Department of Health, 2013).	Formal intersectoral committee not established yet. However there are limited activities that have been implemented with other departments in the province.	Intersectoral Committee has been established. Service delivery in collaboration with NGOs
3.	International collaboration providing political and technical support	Collaboration with WHO and other technical experts. The Minister of Health has been involved in several national and international initiatives to reduce the risks of NCDs. The Minister launched the Southern African Development Community (SADC) Healthy Lifestyles Day in February 2010, to create a platform for SADC Ministers of Health to show their commitment to address NCDs. In 2010 the Minister co-hosted	The Lilly NCDs Partnership Donald Woods Foundation (DWF) in the Eastern Cape combines diabetes diagnosis and referral with an existing program of home-based care	Drawn in the local and national advocacy and civil societies to support preventive activities

		the Diabetes Leadership Forum Africa. The Minister of Health also represented South Africa at a Ministerial Conference on Healthy Lifestyles and Non-Communicable Disease Control in Moscow in April 2011.	for people with HIV/AIDS and TB	
4.	Wide consultation in the process of drafting, and reviewing the policy until endorsement is achieved	Wide consultation in the process of drafting the NSP, including reviewing and re-drafting the policy until endorsement was achieved (National Department of Health, 2013)	Exclusion of the district managers during the NSP production was noted. Lack of clarity of their involvement	Exclusion of the district managers during the NSP production was noted. Mangers draw activity plan and send to districts to be implemented.
5.	Development and implementation of a consistent and compelling communication strategy for all stages of the process	Strong communication in the development but lack of implementation plan and limited communication	Lack of clarity and communication from province to district/municipality level. National communication does not seem to have penetrated widely.	National communication does not seem to have penetrated widely to districts.
6.	Clarity of vision on a small set of outcome-oriented objectives	The plan fails to clearly spell out specific activities/ direction to ensure effective implementation and budget (National Department of Health, 2013)(Strat Plan 2013). It makes use of generic statements (e.g. Creative awareness of dangers of high salt diet), these terms are not informative and clear action needs to be outlined in the policies to mobilise stakeholders for effective actions (Geneau *et al.*, 2010).	No clear objectives and operational outcomes	Developed a strategic plan for the province with activities and outcomes

Despite the continuing academic activities in policy development surrounding NCDs, interest in international studies/research, specifically in low-income countries, has been sparse, thus no studies in this area have been published. An available review of countries' responses to the NCDs burden conducted by the Global Survey, suggests that low- and middle-income countries have developed strategies, regulations, and interventions to address NCDs and its risk factors (World Health Organisation, 2015). Although responses to policy have been reported in Mozambique (Lupafya *et al.*, 2016), Ghana (Bosu, 2012) and Zambia (Mukanu, Zulu, Mweemba, & Mutale, 2017), their methodology does not describe how these were implemented, and successes and challenges were mostly related to human and financial resources and clinical management (Lupafya *et al.*, 2016).

4.6 Conclusions and recommendations

In this chapter, the intention was to review NCDs policies and strategies in South Africa and assess the experiences encountered in implementing the NSP that was launched in 2013. Findings indicate that South Africa has adopted policies to fight NCDs since the 1990s. However, implementation of the new NSP has many gaps, with slow or no progress. Some of the reasons for the limited implementation are: fragmentation and lack of coordination between the province and district/municipality, poor communication, lack of technical support and coordination from the NDoH. A clear communication strategy targeting different actors as suggested by Hercot et al. (2011), needs to be put in place to ensure effective implementation (Hercot, Meessen, Ridde, & Gilson, 2011).

Ensuring multi-sectoral commitment remains a challenge, especially in the Eastern Cape. This appears to relate to the nature of the three spheres of the government with insufficient cooperation and engagement across the spheres. A PHC response to NCDs is often unstructured and inadequate. The interrelationship among the three spheres needs attention if service delivery is to be improved. There is a need to improve the use of communication

channels to accelerate the implementation of policies in Eastern Cape. Furthermore, clear governance structures and accountability arrangements, underpinned by a cooperative commitment to work, regarding roles and responsibilities, needs to be established to ensure the success of policy implementation.

Barriers to implementation should be strategically addressed; this can be done through involving all the stakeholders including NDoH, policymakers/NCDs managers in the province and district managers throughout the development and implementation processes to ensure their support and effective implementation of policies at all levels. The creation of a task team from the NDoH to oversee the implementation process and feedback in the initial stages at provincial level, may be useful. Interactive follow-up workshops for managers to discuss challenges could be used as feedback and guidance for effective implementation of the strategy. Health education and awareness in promoting health literacy among the population could ensure the public can protect and promote their own health. This will assist in strengthening health promotion and prevention and eventually reduce the incidence of NCDs and their risk factors in the provinces.

The benefit of developing a focussed action plan (with outcome-oriented objectives), was recommended by Epping-Jordan et al. (2005). An implementation plan led by skilled and experienced people, is needed. Provincial implementation plans must ensure adequate financial provision for the implementation of the NSP, human resources, and training. Increased collaboration with sectors other than health is needed to improve implementation efforts. Considerable efforts are required to ensure strong multi-sectoral support and action, especially at a provincial level. Full implementation of the plan requires more political commitment and resources. Clear and prioritised actions are needed at a national and provincial level to arrest the NCD epidemic; such actions need to be documented in policy documents to ease the implementation process.

CHAPTER 5: TOBACCO CONTROL POLICY IN SOUTH AFRICA

5.1 Introduction

In the previous chapter, a situational analysis was done and interviews with NCDs managers and policymakers in two provinces conducted. The study sought to assess national policies to reduce the NCD burden in South Africa and assess whether there are differences between urban and rural areas, considering Eastern Cape to be a more rural province than the Western Cape. This chapter reports the findings related to tobacco control policy (objective 3). Although there is evidence pointing to the effectiveness of tobacco control policies in reducing smoking prevalence in many high and some middle income countries (Levy, Ellis, Mays, & Huang, 2013), there is limited data on the effectiveness of such policies in South Africa. In this chapter, findings on the evaluation of the impact of tobacco control policies/legislation in national and specific urban and rural settings are reported. The aim was to understand what contribution the control policy has made towards reducing the prevalence of smoking, whether any impact can be observed in tobacco related mortality, and whether the control policies have impacted in both urban and rural settings. The findings of this study may be used to make practical recommendations about potential approaches to counter the tobacco epidemic, including policy implementation, and monitoring and surveillance aspects, in line with the WHO FCTC Guidelines (World Health Organisation, 2003b).

The Schematic Framework for promoting healthy lifestyles and preventing NCDs (Figure 3.2) was employed in this chapter. The framework is used to highlight that data are needed at different steps in the chain of disease prevention. The chapter will consider the community environment, prevalence and mortality impact related to smoking. The framework presents three approaches, primordial, primary and secondary prevention focus to improve health, highlighting aspects that need to be evaluated.

Tobacco control policies and legislation were selected as a case staudy for thesis because of their long existence (more than 20 years) in South Africa as well as their commitment to WHO FCTC. In addition, tobacco control policies/legislation were selected because of their proven health effects in reducing smoking prevalence and smoking-related mortality, low implementation costs , and political and financial feasibility in the context of low- and middle-income countries (Asaria *et al.*, 2007; Beaglehole *et al.*, 2007; Bonita *et al.*, 2013; Tasslimi *et al.*, 2008).

The South African government has recognized the need to monitor tobacco use and tobacco control policy in the country hence, in 2013, South Africa joined the international community to intensify the fight against the NCD burden by setting a target to reduce tobacco prevalence by 30% by 2020 (Department of Health, 2013b).

5.2 Overview of tobacco control legislation in South Africa

The history of tobacco control in South Africa dates back to the mid-1960s as shown in Table 5.1. Similar to the experience globally, the initial period from the 1960s to early 1990s was characterised by procrastination by the government (Asare, 2009; Malan & Leaver, 2003).

Table 5.1: History of tobacco control activities in South Africa (1965 to 2013)

Year	Tobacco control activity
1965	No smoking in cinemas and theatres (Fire hazards not health)
1976	National Council Against Smoking (NCAS) established
1988	South Africa Airways prohibits smoking on flights
1989	Edenvale Town Council bans smoking in all municipal buildings
1990	South Africa introduces comprehensive tobacco control policies to address the growing epidemic of tobacco use in the country
1992	Landmark legislation, Tobacco Products Control Act, was passed in Parliament. Taxes make up 30 percent of tobacco product prices.
1993	The then Minister of Health, Rina Venter, introduces the Tobacco Products Control Act of 1993, mandating that health warnings be added to cigarette packs and advertising material, and prohibiting smoking on public transport.

1995	Health warnings introduced on packs, with Quit Line number, and on radio, TV and billboards. Tar and nicotine levels limited and printed on packages. Johannesburg and Cape Town introduce partial bans – separate areas in the same room/building
1997	Government raises taxes on tobacco products to 50 percent of cigarette retail prices.
1999	An amendment to the Tobacco Products Control Act bans tobacco advertising, the sale of tobacco to minors and increases regulations around smoking in public places, including the workplace. Regulations on Smoking in Public Places. Point of Sale and Advertising published.
2001	The law banning public smoking comes into effect. Smokers may now only smoke outside and in cordoned off indoor areas.
2004	Excise tax on tobacco products are raised to 52 percent of retail prices.
2005	South Africa ratifies the WHO's Framework Convention on Tobacco Control (FCTC), which gives governments a framework for quickly passing and implementing evidence-based tobacco control laws.
2008	Amendment Act published in Government Gazette Act 23 of 2007 (National matters. smoking and product regulation).
2009	Provincial amendments published: Act 63 of 2008 (advertising, picture health warnings, point of sale, importing) Amendment Act 23 of 2007 and 63 of 2008 come into force on 21 August 2008. Work on regulations commences.
2010	Regulations to limit the display of tobacco products at the point of sale are gazetted. As of 2013, this has yet to be signed into law.
2012	Draft regulations that would ban smoking in public places and certain outdoor public places, such as beaches and outdoor eating areas, are gazetted, but have not been passed into law.
2013	South Africa signs an international treaty to clamp down on the illegal trade in cigarettes.

Source: (Stassen W, 2013)

South Africa initiated its tobacco control effort when local authorities banned tobacco use in cinemas in the 1960s as seen on the Table above. Following the dissemination of scientific evidence on health and the economic costs of tobacco use in South Africa (Yach & Townsend, 1988), a ban on smoking on domestic flights was implemented. During the 1980s, tobacco control lobbyists and the anti-tobacco group had little success in bringing about change through the parliamentary system (Asare, 2009; Blanke & Silva, 2004). The lack of success was cited as due to the unhealthily close relationship between the then governing political party and the tobacco industry (van Walbeek, 2002).

In 1991, the Tobacco Action Group (lobbyists) including the Cancer Association of South Africa (CANSA) and the Heart Foundation of Southern Africa (HFSA), was formed (Swart & Reddy, 1998). They lobbied successfully using media advocacy to raise public awareness, however it was recognized that there was a need for a strong coalition to support the drive for legislation. Therefore, the coalition was broadened to involve churches, trade unions and health groups (Swart & Reddy, 1998), which led to a strong collaboration between the Department of Health, the Tobacco Action Group (TAG), the Medical Research Council and non-governmental organisations.

The introduction of the South African tobacco control policy can be largely attributed to strong and consistent lobbying. Over a period of more than 25 years, health related medical societies such as the National Council against Smoking (NCASA), TAG, NCAS, CANSA and the HFSA have lobbied the government to impose an effective tobacco control policy in South Africa (Swart & Reddy, 1998). Tobacco control policies are those "targeted at tobacco users or potential users directly and applied to populations, groups, areas, jurisdictions or institutions with the aim of changing the social, physical, economic or legislative environments to make them less conducive to smoking" (Thomas *et al.*, 2008). They include rules about use, provide messages aimed at providing information and changing attitudes and beliefs, and programmes to deliver interventions that can facilitate appropriate behaviour change (Chaloupka & Grossman, 1996).

Over a period of more than 25 years, health related societies such as the National Council against Smoking (NCASA), TAG, NCAS, CANSA and the HFSA have lobbied the government to impose an effective tobacco control policy in South Africa (Swart & Reddy, 1998). The tobacco control lobbyists were few in numbers, however, they were highly effective and generated substantial media attention as has been reported (Salooje, 1993; Swart & Reddy, 1998; van Walbeek, 2002). The government was also called on to introduce effective

countermeasures and discredit the tobacco industry's claims about the economic importance of their industry. In 1994, the first democratic elections were held in South Africa, and the African National Congress became the leading part in the Government of National Unity. Subsequently, the government's attitude towards smoking changed.

In 1993, the first Tobacco Products Control Act (Government of South Africa, 1993) was approved and implemented in 1995, to give the tobacco industry more time to comply (Asaria *et al.*, 2007). The Act regulated smoking in public places, prohibited tobacco sales to minors under 16 years old, and regulated certain aspects of advertising of tobacco products such as labelling. The Bill was found to be inadequate and had several shortcomings, such as radio advertising that was still allowed (Salooje, 1993). Also, smoking in public places was not banned completely; the definition of a public place was not specified, and no enforcement mechanism was built into the act (Swart & Reddy, 1998; van Walbeek, 2002).

The tobacco industry resisted the controls. They criticised legislation on the basis that the measures would have negative economic effects, claiming that the banning of smoking in public places amounted to unnecessary job losses and criminalization of individuals (van Niekerk, Van der Waldt, & Jonker, 2001; van Walbeek, 2001). It became apparent that tobacco industry did not comply with the regulations of the Tobacco Control Act and violated the recommended size of health warnings by putting advertisements on billboards in such a manner the health warnings could hardly be seen (Ucko, 2015). Tobacco industry continued to use aggressive marketing by sponsoring cultural and sporting events. Furthermore, cigarettes were freely distributed in shopping malls, concerts and carnivals (Swartz, 2001).

Subsequently, substantive amendments to tobacco control activities shown in Table 5.2. were introduced. These aimed to strengthen the restriction on advertising and sales, smoking in public places and health warnings (Malan & Leaver, 2003). This was further supported by increasing taxes on cigarette which was introduced by the government in 1994 at the budget

speech. Since 2000, the tax on cigarettes has also gradually increased to 52%. Studies have shown that tobacco taxation have significant effect on tobacco consumption (Van Walbeek, 2003). In South Africa, this has resulted in the decrease in smoking prevalence from 34% in 1995 to 21.4% in 2003(Ayo-Yusuf, 2005).

Table 5.2: Changes in tobacco regulation over two decades

Regulation	Description
Tobacco Products Control Act 83 of 1993	Health hazard warnings and contents on advertisement and package Restrictions on vending machines Prohibition of sales to people below age 16 years Power for local authorities to regulate smoking in public places Penalties/fines
Regulations, 1994	Specifications on: Health warning and labelling requirements on packages
Tobacco Products Control Amendment Act 12 of, 1999	An amendment to the 1993 legislation, Tobacco Products Control Amendment Bill, was passed. Prohibit smoking in public places except designated areas Stricter regulation on tobacco advertisement and sponsorship Bans on free distribution of tobacco Maximum content levels in cigarette Penalties/fines for violation
Regulations, 2000	Specification on: Smoking in public places. Tar and nicotine levels. Advertisements and sponsorship. Point of sale
Tobacco Products Control Amendment Act 23 of 2007	Amend definitions Bans smoking in selected outdoor areas Product regulation of imported and exported tobacco products Removal of misleading terms (i.e. "light" and "mild") from advertisements and packages Standards for manufacturing and export of tobacco products Increase in penalties/fines
Tobacco Products Control Amendment Act 63 of 2008	Increase age of sale from 16 to 18 years. Bans on one to one advertisement Bans on tobacco sales at health education establishments Bans on tobacco -like toys Tighter bans on free distribution Tighter standards on packaging and labelling with pictorial health warning Illegal for adults to smoke in a car if there is a child under 12 years old inside the car
Act No 429 Regulation 2011	Reduced ignition Propensity (RIP) cigarette Draft regulation on the display of tobacco products at wholesale and retail points

South Africa emerged as a global leader in terms of introducing tobacco control legislation (Bradshaw, Steyn, Levitt, *et al.*, 2011; Reddy *et al.*, 2013). Furthermore, it played a key role in the drafting of the WHO FCTC (Bradshaw, Steyn, Levitt, *et al.*, 2011; Mayosi *et al.*, 2009)

which advocates for a comprehensive approach to tobacco control in signatory countries. This indicates strong government leadership with regards to tobacco control, which has been acknowledged by the international community (van Walbeek, 2002).

The WHO set up the MPOWER indicators to systematically track the implementation of the FCTC by signatory countries (World Health Organisation, 2003b; World Health Organization, 2009b).

All six MPOWER tobacco control measures (protect people from tobacco smoke, offer help to quit tobacco use, warn about dangers of tobacco, enforce bans on tobacco advertising, promotion and sponsorship and raise taxes on tobacco) have been reported to have the potential to reduce premature smoking-related mortality (Dubray *et al.*, 2015; Hussain *et al.*, 2016; World Health Organisation, 2017b). The findings suggest that progress in South Africa is slow. It showed that South Africa fell short and scored 39% on complying with the requirements of the FCTC (Hussain *et al.*, 2016). This is lower than the average for the African region (43%) and 53% of the remaining WHO regions (Hussain *et al.*, 2016). South Africa has been successful with the tobacco taxation (Van Walbeek, 2003), however, even in this area South Africa falls short according to WHO FCTC implementation requirement. For example, the tax rate should be 75% of the retail price, but for South Africa it is only 39.9%. This is below the global average of 66% (Hussain *et al.*, 2016). Furthermore, warning images and pictures on cigarette packets should cover more than 30% of the front and back of the pack, however South Africa has less than the required amount. South Africa advertising law does not cover all media, for example there is an opportunity for the tobacco industry to exploit advertisements through magazines. A ban on indoor smoking has been partially implemented. South Africa needs to fully implement all aspects of FCTC to achieve the 2020 goal.

In 2013 South Africa set out a target to reduce the prevalence of smoking by 20% by 2020 through the numerous tobacco controls at its disposal (National Department of Health, 2013).

Monitoring tobacco use, and tobacco control policies is needed for better planning and implementation of necessary public health interventions. This can be achieved through routine surveillance combined with other research.

5.3. The prevalence of smoking among urban and rural participants

This section (5.3) describes findings from PURE cohort on prevalence of tobacco use in urban and rural communities of the study setting. The PURE study recruited 2026 individuals, and all were included in this research analysis. Results are presented as the number and its corresponding percentage (Table 5.3) of selected socio-demographic characteristics of the study participants according to the area of residents. Participants were predominantly females, who accounted for 72.8% (overall, data not shown). About 75.3% of females lived in the rural which is significantly higher than 70.3% of females in urban areas. The median age of the participants was 49.5 in the urban and 50.0 in the rural setting. More than two third individuals in urban area had reached secondary education 69.8% while in rural area only 48.4%. This was significantly higher in the urban setting ($p<0.001$). Household income significantly varied between urban and rural areas. The data indicate that urban residents earned higher income than rural residents. Most of the low-income earned <R1000 (33.3%) and R1000-1999 (38.0%) from participants reside in rural areas and high-income earners (>R2000) reside in urban areas 34.2% compared to 13.5% in rural areas (Table 5.3). Likewise, unemployment is higher in both communities, 80.6% for urban and 71.9% for rural residents respectively. This is very high compared with the national figures 25.2% of the same year as reported by statistics South Africa (Statistics South Africa, 2016). This may be caused by poverty, low levels of education as well as the possibility that PURE cohort underrepresent the working people from the communities. Urban participants were more likely to be single at 49.9% compared with 42.8% rural residents who were more likely to be married or 23.0% who were separated. This seems to suggest that people in rural areas tend to get and stay married for cultural reasons, while in

urban area many choose to remain single. These differences are significant (p<0.001). The missing data was not included in the analysis. There was no statistically significant difference between smoking status in both settings (19.7% urban; 16.6% rural include males and females). This is so surprising since the rural residents are less educated and have lower income. The ratio of males to females 3:1.

Table 5.3: Socio-demographic characteristics of the participants (PURE)

Characteristics	Urban N= 1026		Rural N=1000*		p- value
	N	%	N	%	
Sex					
Female	721	70.3	753	75.3	p=0.011
Male	305	29.8	247	24.7	
Age (yrs)					
Median		49.5		50.0	
Education					
Primary	233	22.7	480	48.0	p<0.0000
Secondary	716	69.8	484	48.4	
Higher	72	7.0	30	3.0	
Unkonwn	5	0.5	6	0.6	
Marital status					
Never married	512	49.9	304	30.4	p<0.0000
Married	328	32.0	428	42.8	
Common-law/live-in-partner	41	4.0	38	3.8	
Widow(er)	81	7.9	177	17.7	
Separated/divorced	64	6.2	53	5.3	
Employment[bc]					
Employed	636	27.2	653	18.3	p<0.000
Unemployed	237	72.9	146	81.73	
Income					
<R1000	169	16.5	333	33.3	p<0.000
R1000-R1999	305	29.7	380	38.0	
R2000+	351	34.2	135	13.5	
Missing	201	19.6	152	15.2	
Smoking status*					
Ex-smoker	39	4.2	47	4.9	p=0.178
Currently smoker	182	19.7	156	16.6	
Never smoker	701	76.0	748	78.5	

b 153 urban and 201 rural participants have missing employment status

*104 urban and 49 rural participants have missing smoking status

c Ecxcluding pensioners

* 70 cases had missing information

In Figure 5.1, the prevalence of smoking in urban and rural settings is shown using population-based data (PURE). The prevalence of smoking was higher among rural males (39%) and accounted for 36% for urban males. However, this was not statistically significant (p= 0. 463) 1ndicating there are no differences between the two areas. Among urban females, the prevalence was higher at 13% and accounted for 9% in rural females, which differs from the SADHS that has shown that the prevalence of smoking is higher in urban areas for both sexes.

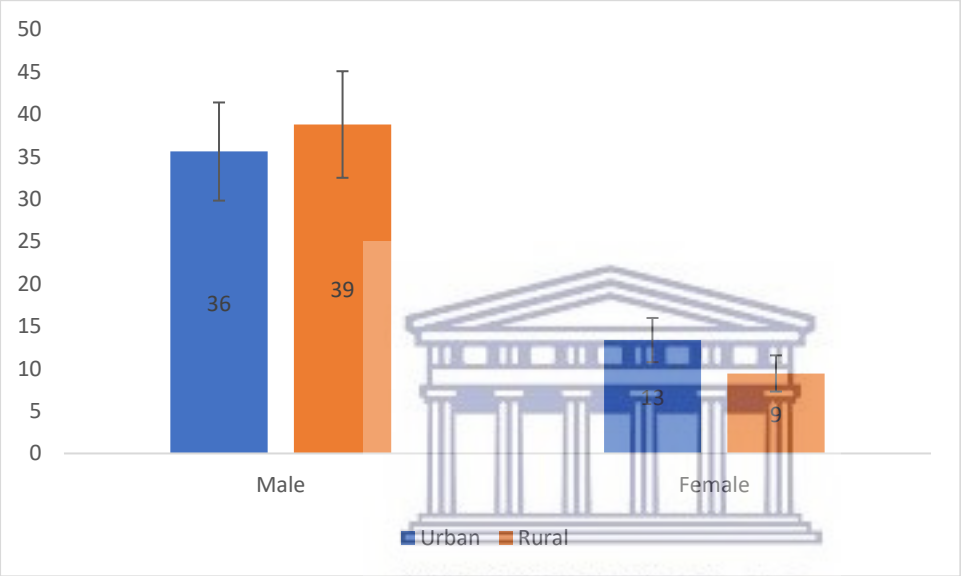


Figure 5.1. Urban-Rural differences in prevalence of tobacco use, 2010

The prevalence of smoking generally changes with age, hence the age of cigarette smokers plays an important role in differentiating smoking patterns in both urban and rural areas. Usually, older people smoke less. Figure 5.2 depicts the prevalence of smoking in urban and rural areas by age. In urban areas, daily tobacco smoking is more common among younger individuals < 44 years (38%) and 44-54 years old (35%). The lowest percentage of tobacco use is presented among 55 years and older (27%). In rural areas, smoking is most common among 44-54 years age group (37%) with the lowest prevalence recorded among <44years old (30%). Overall urban setting is showing a steady decrease in smoking in all age groups.

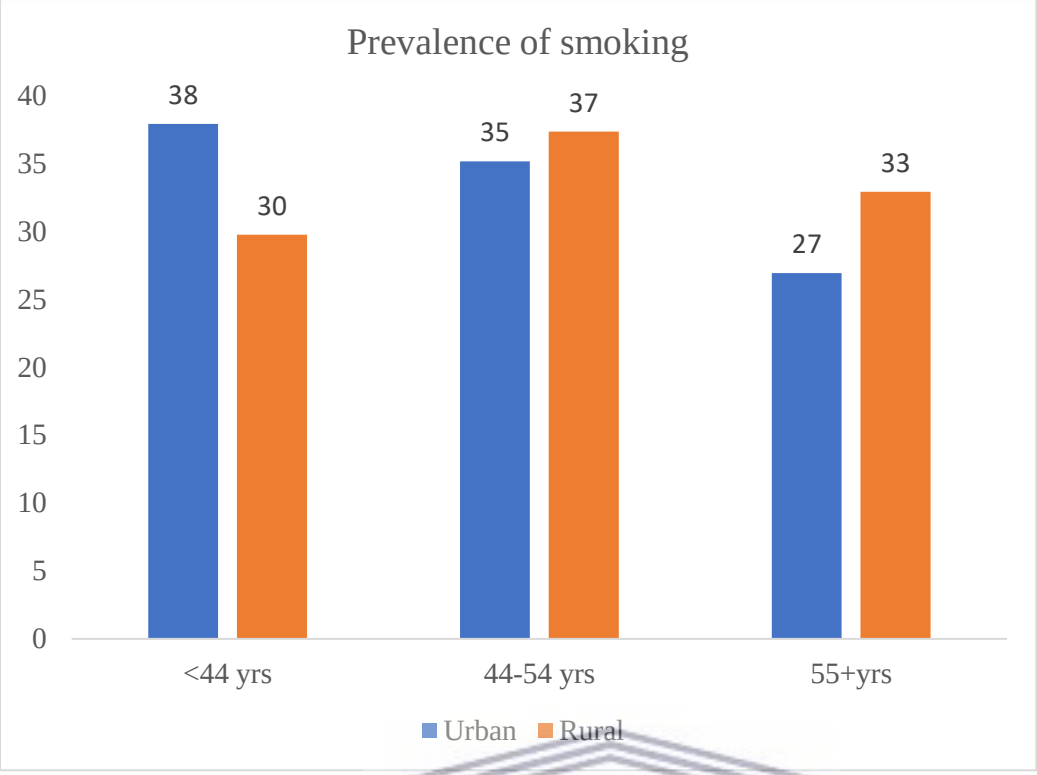


Figure 5.2 Urban-rural prevalence of smoking by age, 2010

5.4 Environmental audit and assessment of tobacco control policy environment

The environment in which people live is known to be important in influencing NCD risk factors including, smoking. Therefore, it may be easier for individual to choose to smoke in a community where tobacco is easily accessible (GBD 2015 Risk Factors Collaborators, 2016). For example marketing of tobacco play a major role in smoking initiation (World Health Organisation, 2009a). This section, reports findings on information about the direct observation of the community and recorded physical aspects of the environment on tobacco control policy assessment (such as point of sale advertisement, number of tobacco outlets, vender and number of tobacco advertisements) using EPOCH 1 tool. Both areas appear to be similar to each other with most aspects except that, in urban area, there were no visible signs/information about the dangers of smoking on entering the shop. Both communities appear unlikely to endorse anti-smoking policies and health promotion, as seen in Table 5.4. The urban and rural environment exhibited less or no support for signs prohibiting tobacco

smoking as well as no health promotion (smoking cessation). In the urban area, there are more convenient stores (3) that sell cigarettes than in the rural setting (1). It was noted that cigarettes and tobacco products were openly displayed at the shops in both settings. However, it was interesting to note that although cigarettes were openly displayed in the store, tobacco advertisements were also visible at the point of sale in some stores displaying brands of cigarettes to stimulate impulse purchases. This marketing technique places the tobacco products in convenient, visible racks, usually self-service, and in point-of-purchase displays. Support of cigarette brands through point-of-sale advertising helps to strengthen the legitimacy of a brand in the eyes of retailers who make stocking decisions. In both communities, a variety of cigarette packets were available including pack of 2, 10 and 20 cigarettes. Local brands of cigarettes are cheaper (R12.20) in rural areas compared to urban areas (R24.20). The cigarette packets in both communities displayed health warnings as required. When assessing the presence of tobacco cigarette advertisement in the community overall, rural area recorded 2 while urban area recorded none.

Table 5.4: The characteristics of community support for tobacco control policies

Characteristics	Urban	Rural
Advertisiment		
Cigartte products	0	0
Signs that prohibit smoking	0	0
Health promotion (smoking cessation)	0	0
Shops and Other outlets		
Vending machine	0	0
Vendors/street stands (cigarette)	1	1
Convenience/general store (cigaretee)	3	1
Tobacco store assessment		
Do you see any of the following		
Point of sale tobacco adverisment	Y	Y
Cigarette openly displayed	Y	Y
Signs pprohibit smoking in the store	N	N
Signs/information regarding the harmful effects of smoking visible on entering the shop	N	Y
How many brands of cigarette are sold	24	19
In what sizes packets are sold in this store	single units and 2-10/pack	single units and 2-10/pack
Record the cheapest pack of cigarette		
Local brand	Mega pacific R24.20	Chicago R12.24
International brand	Morlboro 26.24	Danhill R32.20
How many health warnings are on the packet	2	2
What is the location of the warnings	Front and back	Front and back
Assess the presence of tobacco/cigarette advertisment	No	2

5.5 Perception about the community on tobacco control environment

5.5.1 Characteristics of sub-sample

In this second part, (EPOCH 2) residents smoking tolerance, awareness of tobacco legislation and health effects of smoking, and disapproval of smoking among children and youth were assessed. The questionnaire took between 10 and 20 minutes to administer. Results from a sub-sample of 68 individuals drawn from the original PURE cohort participants are reported here. Measures of the community environment were developed from responses to questionnaire items from 68 individuals residing in urban and rural communities in our setting using the EPOCH 2 tool. This was done to measure and quantify environments based on their ability to

influence behaviours such as smoking. Sample characteristics of the participants are presented in Table 5.5.

Table 5.5: Demographic characteristics of the sub-sample

Characteristics	Urban N=34		Rural N=34		
	N	%	N	%	p-value
Sex					
Female	10	29.4	16	50.0	p=0.007
Male	23	67.6	13	44.1	
Education					
Primary	2	5.9	5	35.3	p=0.007
Secondary	23	73.5	23	55.9	
Higher	8	17.6	4	8.8	
Employment					
Employed	3	8.8	12	35.3	p<0.001
Unemployed	31	91.2	20	61.8	
Smoking					
Current smokers	2	8.8	11	32.4	p=0.007
Ex-smokers	2	8.8	1	5.9	
Never	27	76.5	18	52.9	

Five (7%) individuals were missing data on one or more of the following covariates, age, gender, smoking status (defined as a current, former, or never smoker), or education (no education, primary school, high school, trade school, or college/university) and were excluded for analysis.

Respondents were aged 50.6 years, 55.9% were females, 73.5% in urban and 55.9% in rural had a high school education, and 8.8%in urban and 32.4% in rural were current smokers. The EPOCH 2 respondent profile was slightly older and had more males and current smokers compared to the overall PURE population where the average age was 50 years, 27.2% in urban and 18.3% in rural were employed.

5.5.2 Observed restrictions on smoking

In Table 5.6, the proportion of participants reporting observed smokers smoking in public places in the community are presented. Similarities between the two settings were observed in terms of where the people were seen smoking (at home and pubs/bars). Public places in urban areas tends to have higher proportions with no smoking inside while rural area in outside only. Many studies have shown that public smoking bans are an effective way to reduce exposure to second hand smoking (Heloma, Helakorpi, Honkonen, Danielsson, & Uutela, 2011; Hyland *et al.*, 2009) and many countries have approved legislation for smoke-free public places.

Table 5.6: Percent distribution of smoking restrictions (%)

		Urban setting (N=34)					Rural setting (N=34)					
		All indoor areas	Some designated indoor areas	Outside only	No smoking inside or outside the facility	Unsure	All indoor areas	Some designated indoor areas	Outside only	No smoking inside or outside the facility	Unsure	p-value
Where have you seen people smoke?												
	Hospital		2.9	44.1	47.1	5.9		5.9	70.6	23.5	0.0	0.316
	Train/buses or train bus stations	0.0	2.9	11.8	76.5	8.8	2.9	0.0	70.6	23.5	2.9	0.009
	Restaurants/Cafes	0.0	29.4	17.6	47.1	5.9	8.8	11.8	38.2	14.7	26.5	0.057
	Pub/bars	32.4	2.9	11.8	44.1	8.8	32.4	2.9	5.9	29.4	29.4	0.057
	Public Library	0.0	2.9	14.7	73.5	8.8	0.0	0.0	35.3	47.1	14.7	0.365
	Government building	0.0	2.9	20.6	67.6	8.8	0.0	11.8	26.5	52.9	8.8	0.722
	Work place	5.9	5.9	29.4	47.1	8.8	0.0	14.7	47.1	35.3	2.9	0.538
	Home	17.6	0.0	17.6	55.9	8.8	52.9	5.9	38.2	2.9	0.0	<0.001

5.5.3 Participants opinion

In Table 5.7, intolerance to indoor smoking in both communities is reported. Most residents preferred no smoking inside or outside public buildings and transport. However, a high proportion of respondents in the rural area consider that smoking in the home (73.5%) should be outside only compared with only 23.5% in the urban area (P=0.016), indicating that rural communities may have more tolerant of smoking.

Table 5.7: Percent distribution of preferences for smoking restrictions (%)

	Urban setting (N=34)				Rural setting (N=34)				
	All indoor areas	Some designated indoor areas	Outside only	No smoking inside or outside the facility	All indoor areas	Some designated indoor areas	Outside only	No smoking inside or outside the facility	p-value
Where do you think people should be able to smoke									
Hospital	0.0	8.8	32.4	58.8	0.0	20.6	29.4	50.0	0.623
Train/buses or train bus stations	0.0	11.8	26.5	58.8	0.0	5.9	67.6	26.5	0.065
Restaurants/Cafes	2.9	20.6	17.6	58.8	0.0	32.4	41.2	26.5	0.201
Pub/bars	0.0	14.7	41.2	44.1	20.6	20.6	44.1	14.7	0.103
Public Library	0.0	2.9	26.5	70.6	0.0	17.6	23.5	58.8	0.368
Government building	0.0	2.9	29.4	67.6	0.0	20.6	29.4	50.0	0.259
Work place	0.0	5.9	23.5	70.6	0.0	26.5	20.6	52.9	0.261
Home	0.0	5.9	23.5	70.6	2.9	5.9	73.5	17.6	0.016

5.5.4 Tobacco advertising

Table 5.8 shows the average number of advertisement media seen in urban and rural areas. Urban people exposed more to advertisement (5.2) compared with people in rural area (0.9).

Table 5.8: Percentages of responses for tobacco advertising (%)

In the last 6 months have you seen or heard any cigarette advertising in the following media	Urban (N=34)	Rural (N=34)	p-value
On posters (e.g. billboards, pasted on walls, vissible on side of taxis, buses etc	52.9	23.5	0.062
Permanently sponsored signege on shops or other building	38.2	14.7	0.104
TV	50.0	5.9	0.003
Radio	41.2	8.8	0.021
At cinema	35.3	0.0	0.006
Print media	44.1	8.8	0.019
Sponsored sporting, music, other events	50.0	2.9	0.002
On products such as umbrellas, ashtrays, shopping bags clothing or any other products	41.2	0.0	0.003
On the internet	41.2	8.8	0.029
Actors/Actress smoking in current TV series/movies	58.8	20.6	0.026
Free sanples	44.1	2.9	0.005
Promotional voucherd that allow doscount	32.4	2.9	0.024

Participants in the urban area were exposed to more health promotion and quitting messaging in the past 6 months as shown in Table 5.9. Overall similar observations were noted in both areas. Promotion regarding quiting tobacco quitting on posters was significantly higher in

urban (70.6%) than in rural (20.6%), as well as free sample which was 52.9% in urban and 5.9% in rural (P<0.01). However, on the basic media of TV, radio and print there were no differences.

Table 5.9: Percentages of responses for promotion and advertisement for quitting (%)

In the last 6 moths have you seen any advertisment/articles/programms regarding the importance of quitting smoking or regarding the health effects of smoking in any of the following media?	Urban (N=34)	Rural (N=34)	Pvalue
On posters (e.g. billboards, pasted on walls, vissible on side of taxis, buses etc	70.6	20.6	0.002
Permanently sponsored signege on shops or other building	67.6	5.9	0.000
TV	73.5	67.6	0.598
Radio	73.5	76.5	0.921
At cinema	38.2	14.7	0.091
Print media	58.8	50.0	0.599
Sponsored sporting, music, other events	50.0	23.5	0.079
On products such as umbrellas, ashtrays, shopping bags clothing or any ot	70.6	17.6	0.001
On the internet	52.9	20.6	0.042
Free sample	52.9	5.9	0.002

5.5.5 Opinion regarding smoking among youth and children

Age limits on the sale of cigarettes are important because this offers the potential to reduce smoking in young adults (Chow et al., 2009, Chen & Forster, 2006, Staff et al., 2003). In Table 5.10, percentages of responses for the accessibility of tobacco among youth 18 years and younger is shown. Cigarettes are reported to be more easily accessible in rural compared to urban areas (p=0.021).

Table 5.10: Percentages of response for access of cigarette to youth (%)

From your general observation, which statement best describes how easy it is for youth (<18years to buy cigarette	Urban (N=34)	Rural (N=34)	p-value
Can buy in most (nearly all) outlets	11.8	47.1	0.021
Can buy in some outlets	35.3	32.4	
Cannot buy in any outlets	44.1	2.9	
Don't know/unsure	2.9	2.9	

Table 5.11 presents social acceptability of smoking among adults and youth in both settings. When comparing urban and rural settings, fairly high proportions disapproved of smoking

among children <12 and adolescents 13–18-years old, and females. However, in the rural setting a lower proportion disapproved of males smoking (p=0.065) indicating differences in gender norms.

Table 5.11: Society disapproval of tobacco use for youth, males and females (%)

Do you think society disapproves of the following	Urban (N=34)	Rural (N=34)	Pvalue
Children <12 yrs smoking cigarette	50.0	67.6	0.520
Teenagers (13-18) smoking cigarette	47.1	61.8	0.629
Women smoking cigarette	47.1	61.8	0.687
Men smoking cigarette	41.2	23.5	0.063

Table 5.12 shows that participants in urban areas have least tolerance for children <12 years and adolescents 13–18 to smoke and would tell them to stop smoking. The proportions in the rural setting were lower, reporting more than 40% (41.2%) for children younger than 12 years and 41.1% for adolescents 13–18 years respectively. Interestingly, about 38% of rural residents reported that this would not occur in their community, while it was not the case in urban setting (less than 3%).

Table 5.12: Community tolerance for smoking (%)

Would adults in this community tell children/teenagers who are not their own family to stop smoking	Urban (N=34)	Rural (N=34)	pvalue
Chilrdren <12 year old			
This is common for people	2.9	20.6	
Some adults would do this	94.1	41.2	0.010
Infrequently, but it may happen	2.9	5.9	
This would not occur	0.0	32.4	
Teenagers 13-18 yrs old			
This is common for people	8.8	20.6	
Some adults would do this	88.2	41.2	0.025
Infrequently, but it may happen	2.9	5.9	
This would not occur	0.0	32.4	

5.5.6 Awareness of legislation and health impact

About half to two thirds of the participants were aware regarding various aspects of legislation and programmes. However, awareness of support programmes was significantly lower in rural setting, suggesting there is less access to quitting support. This is shown in Table 5.13.

Table 5.13: Percentage of individuals who were aware of tobacco legislation (%)

Are you aware of any of the following laws and programmes	Urban (N=34)	Rural (N=34)	p-value
That ban/restrict smoking in public places	64.7	58.8	0.933
That ban/restrict tobacco advertisement	67.6	55.9	0.470
That mandates health warnings on cigarette packets	67.6	91.2	0.146
That prohibit the sale of cigarette to children/teenagers	55.9	50.0	0.734
That state it is illegal for children/teenagers to smoke	50.0	44.1	0.615
That restrict where cigarette can be sold	52.9	35.3	0.379
Support programmes to quit smoking in the community (programmes or clinic, quit lines)	50.0	17.6	0.02

A large percent (80%) of people in urban areas compared to 71.5% in the rural areas, were aware of health problems caused by tobacco. This was calculated by adding up the percentage in the 'yes' column in Table 5.14 and dividing it by 10. However, the differences were not statistically significant between urban and rural.

Table 5.14: Percent distribution of awareness of health effects caused by tobacco smoking

	Urban (N=34)			Rural (N= 34)			Pvalue
Health effects and diseases that may be caused by smoking. Does smoking cause the following	NO	Yes	Unsure	NO	Yes	Unsure	
Chronic lung diseases	5.9	94.1	0.0	0.0	97.1	2.9	0.471
Heart diseases	14.7	82.4	2.9	5.9	82.4	11.8	0.462
Diabetes	35.3	55.9	8.8	26.5	50.0	23.5	0.495
Stroke	17.6	67.6	11.8	14.7	64.7	20.6	0.792
Arthritis	8.8	52.9	38.2	26.5	44.1	29.4	0.400
Lung cancer	5.9	88.2	5.9	0.0	97.1	2.9	0.538
Mouth and throat	2.9	88.2	8.8	0.0	91.2	8.8	0.776
Heart disease in non smokers exposed to other people smoking	5.9	85.3	11.8	2.9	85.3	14.7	0.895
Premature birth with smoking during pregnancy	5.9	82.4	11.8	26.5	47.1	23.5	0.104
Low birth weight babies with smoking during pregnancy	5.9	82.4	11.8	23.5	55.9	20.6	0.215

High levels of tobacco marketing may reflect failure to enact legislation and/or to enforce compliance (Nagler & Viswanath, 2013). These findings indicate several environmental factors that could be affecting the health-related behaviours of the two communities. Existing policies for tobacco sand awareness should be enforced to reduce tobacco use. In this sub-section of tobacco control environment,

some differences were observed between the two communities with regards, to opinion about where should people smoke, advertisement, social acceptability of smoking and easy access to cigarettes.

5.6. National trends on prevalence of tobacco use in South Africa

5.6.1 Results on national trends on prevalence of smoking

In this study, eight national surveys, which included questions on current smoking for individuals 15 years and older, were conducted between 1998 and 2016. These surveys are summarised in Table 5.15 and Figure 5.3, along with information on the year, the sampling methodology, and the prevalence. Prevalence of smoking vary depending on the specific survey.

Table 5.15: National Prevalence of smoking from different surveys between 1998-2016

Survey name	Sample size (N)	Current (daily or occasional) smoking prevalence (95% CI) 15+ years		
		Male	Female	Persons
SADHS 1998	13827	42.3 (40.6;44.0)	10.7 (9.5;12.0)	23.7 (22.4; 24.9)
SADHS 2003	8115	34.5 (31.9;37.1)	9.7 (8.3; 11.2)	20.2 (18.6; 21.9)
NIDS 2008	15556	30.5 (28.5;32.6)	7.3 (6.2; 8.6)	21.2 (19.6; 22.7)
NIDS 2010	16839	31.2 (30.0; 32.5)	9.8 (9.2; 10.5)	18.0 (16.8; 19.2)
NIDS 2012	18694	33.6 (30.4; 36.9)	7.8 (5.2; 11.6)	19.6 (16.9; 22.5)
SANHANES 2012	15475	29.4 (27.1; 31.7)	8.3 (7.3; 9.3)	18.3 (17.0; 19.6)
NIDS 2014	22727	34.5 (32.7; 36.3)	7.9 (6.7; 8.9)	20.3 (19.3; 21.4)
SADHS 2016	15,000	37.3 (35.8; 38.9)	7.8 (7.13; 8.47)	22.6 (21.9; 23.3)

The results show that the overall prevalence of smoking for males has been declining since 2003 (23.7%), however, there is an increase slightly in 2016 (22.6%). The prevalence for females is lower and remained constant throughout the period. This could be because of the variability with different methodologies employed in these surveys. For example, questions for NIDS were not the same as those in SADHS. In SADHS, the respondents were asked whether they smoked cigarettes daily, while in NIDS they were asked whether they smoked regularly

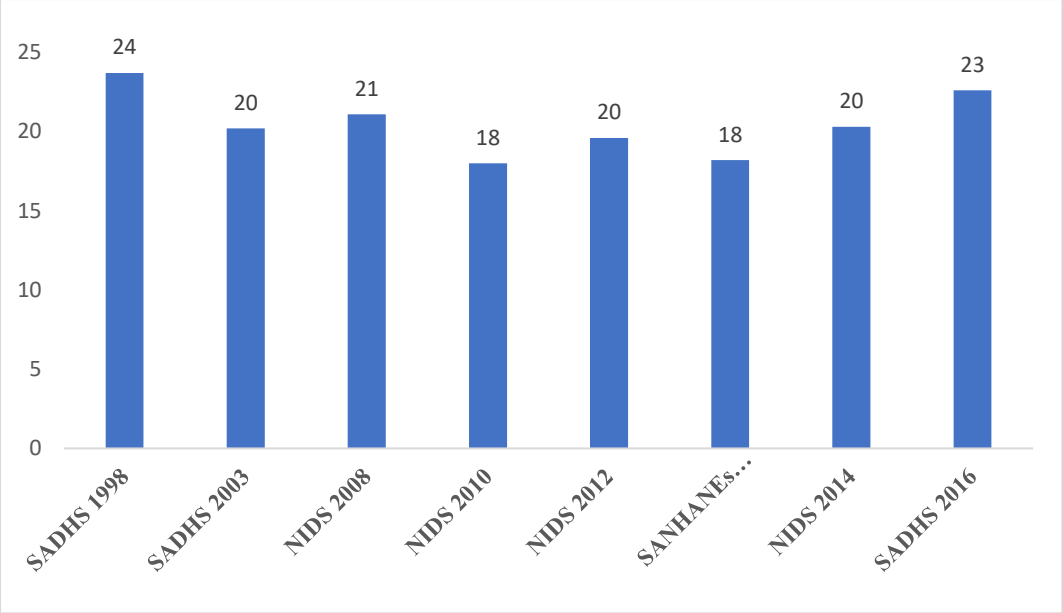


Figure 5.3. The prevalence of tobacco use from eight national surveys

In Figure 5.4, the prevalence of tobacco smoking for males and females is shown for South Africa. The prevalence for males is higher than that of females. For males there is a clear picture of decline till 2010, with slight changes until 2014, followed by a major increase in 2016. However, females showed little change over time.

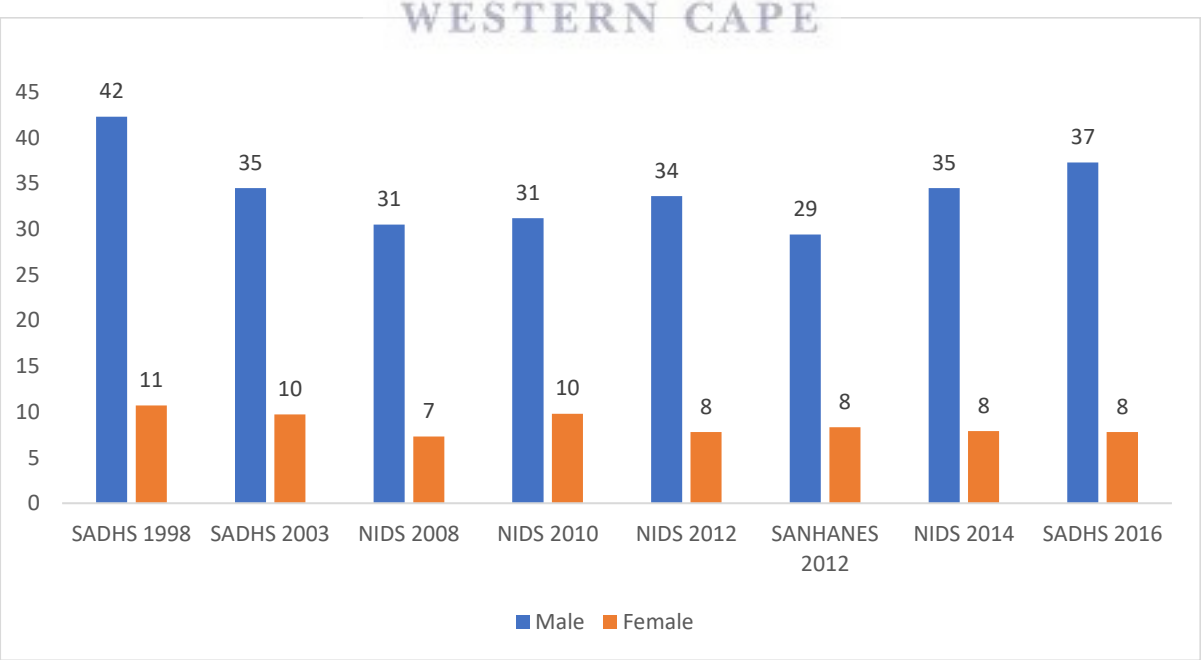


Figure 5.4 The prevalence of tobacco use among males from eight national surveys

Figure 5.5 presents trends in prevalence of smoking by age for South Africa from 1998 to 2016. Smoking starts early in life. For age 14-24 years, about 28%, 22% and 22% in 1998, 2003 and 2016 respectively, are already smoking. The prevalence is higher among 35–54-year-olds. The decline in the prevalence of smoking is observed from age 45 and above. However, a higher decline has been observed for the year 2016 for ages 35-64. There is a slightly higher prevalence among participants aged 35–44 years old in 2003, while, those aged 15–24 and 64+ years, had the lowest prevalence level.

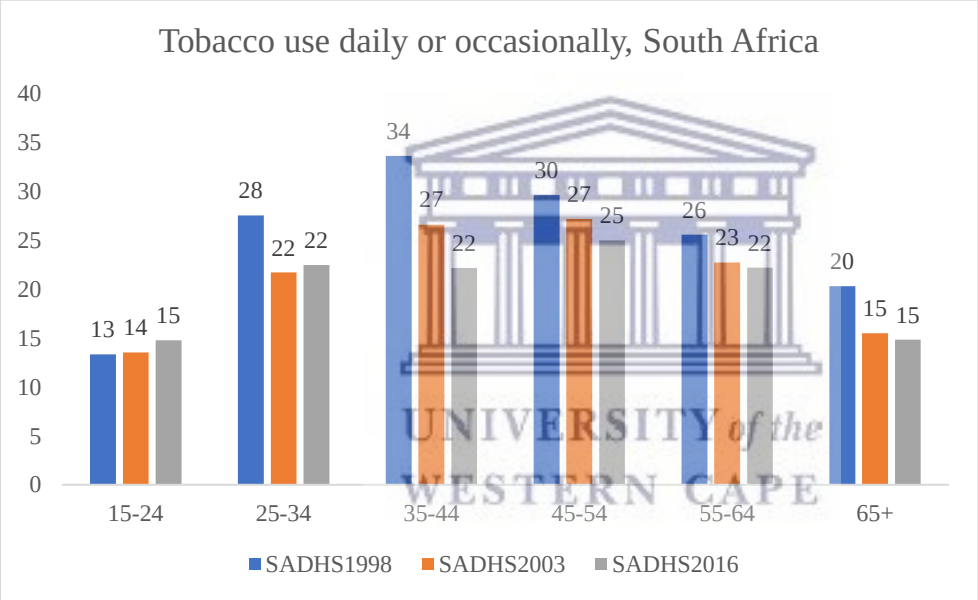


Figure 5.5. Prevalence of smoking by age group for South Africa from three surveys

In Figures 5.6 and 5.7, the prevalence of tobacco smoking by age, for males and females, is shown for South Africa respectively. Similar patterns for males and females have been observed. The prevalence is higher among 25–54-year-olds. The decline in the prevalence of smoking is observed from age 45+. However, there is slightly higher prevalence among females 55–64 years old in 2003, while males, aged 15–24 and 64+ years, had the lowest prevalence level in 1998 and 2003.

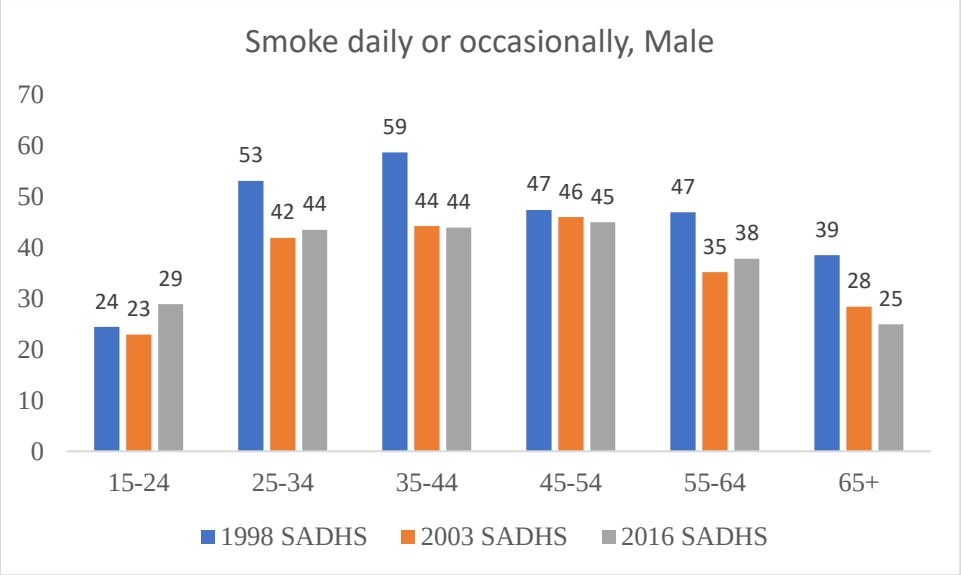


Figure 5.6. Prevalence of smoking by age group for males from three surveys

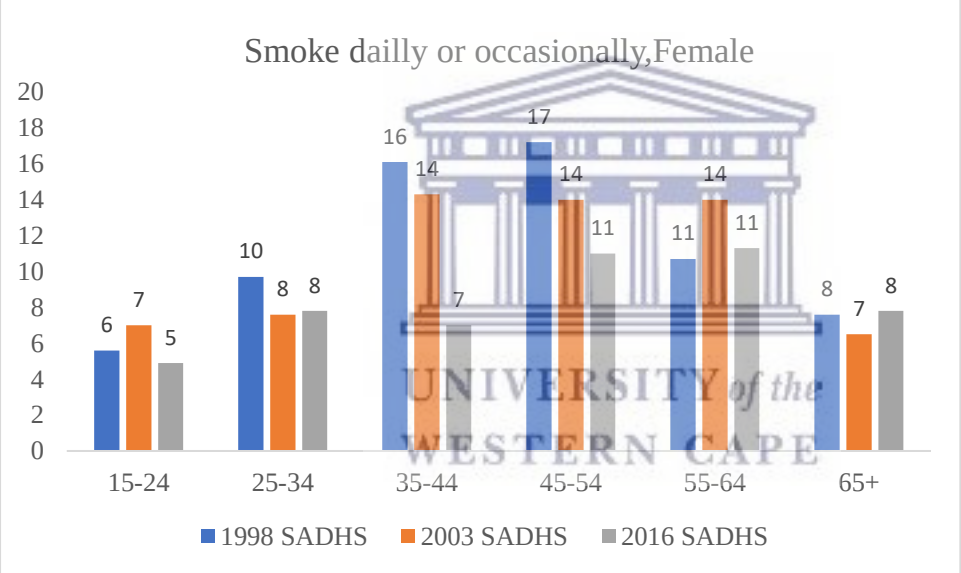


Figure 5.7. Prevalence of smoking by age group for females from three surveys

5.6.2 Urban and rural trend from national survey data

In Figures 5.8 and 5.9, the prevalence of tobacco smoking for males and females is shown for urban and rural settings. The prevalence is low in rural areas. There is a slight increase for the rates for both urban and rural areas for males; 39.2% and 32,5% respectively for the year 2016.

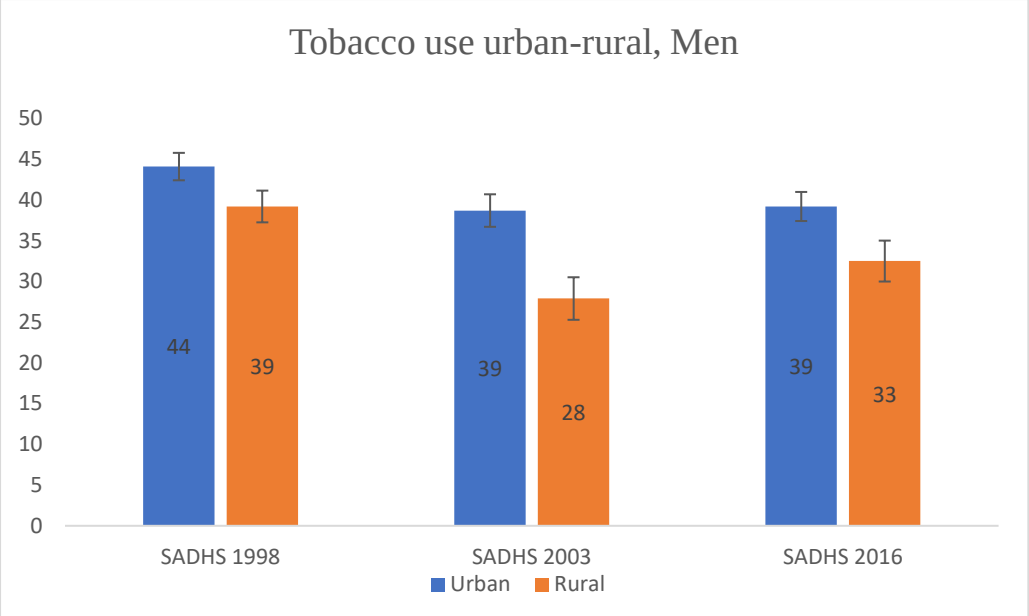


Figure 5.8. Urban-rural differences for males in three surveys

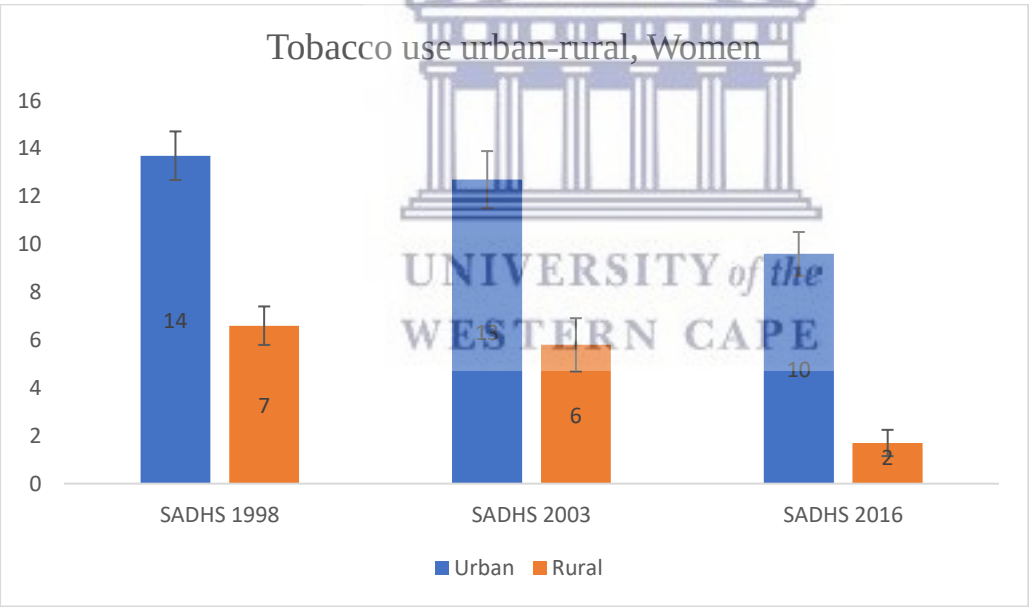


Figure 5.9. Urban-rural differences for females in three surveys

Analysis of the daily smoking pattern showed differences between the age pattern. When looking at the prevalence of smoking, a similar pattern for males can be seen from the SADHS for 1998, 2003 and 2016 (Fig. 5.9& 5.10) and that from the PURE data (Fig. 5.1). For example, the prevalence of smoking in the PURE study was low in the younger age groups, peaked in the middle-age population and declined in the older age groups (see Figures 5.2).

5.7. Tobacco related mortality

To calculate mortality trends on tobacco related conditions, secondary data from Statistics SA and burden of disease dataset were used. Figure 5.10 shows a comparison of trends in lung cancer mortality for males and females. There is a big gender difference. Mortality for lung cancer for males is about three times higher than that of females. There has been a level trend for females throughout the period, with slight increase from 2009. The large gender difference in mortality rates is consistent with the major difference in smoking prevalence between males and females. This could be explained as due to, and possibly occupational exposures for men such as mineworkers. It is a challenge to interpret the trends where other risk factors play a role.

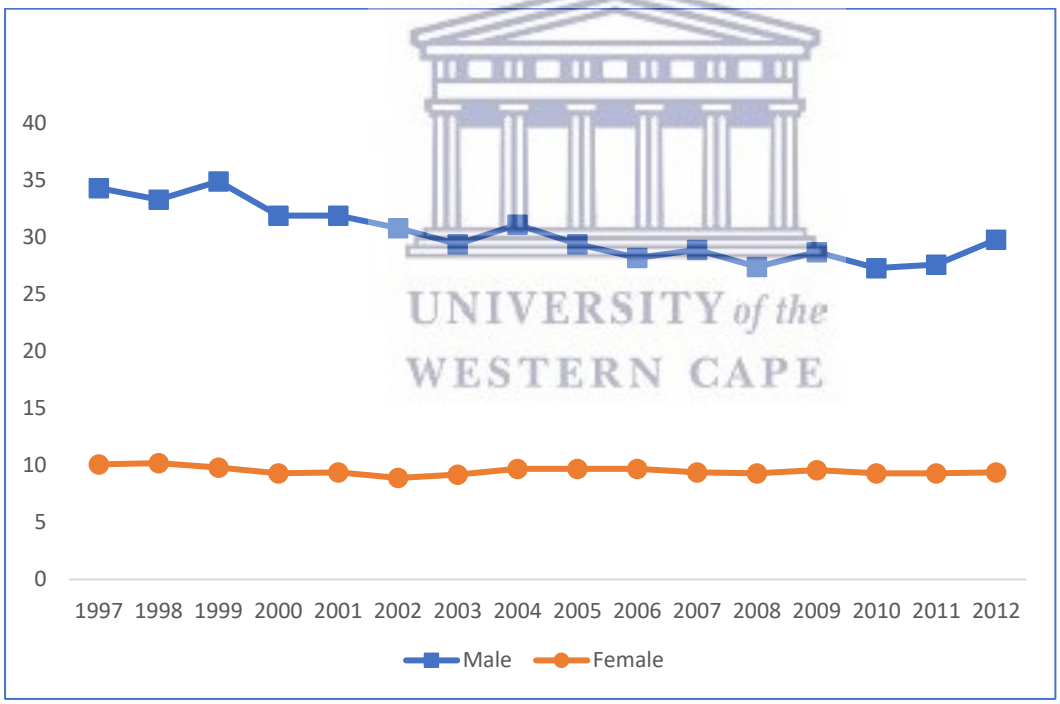
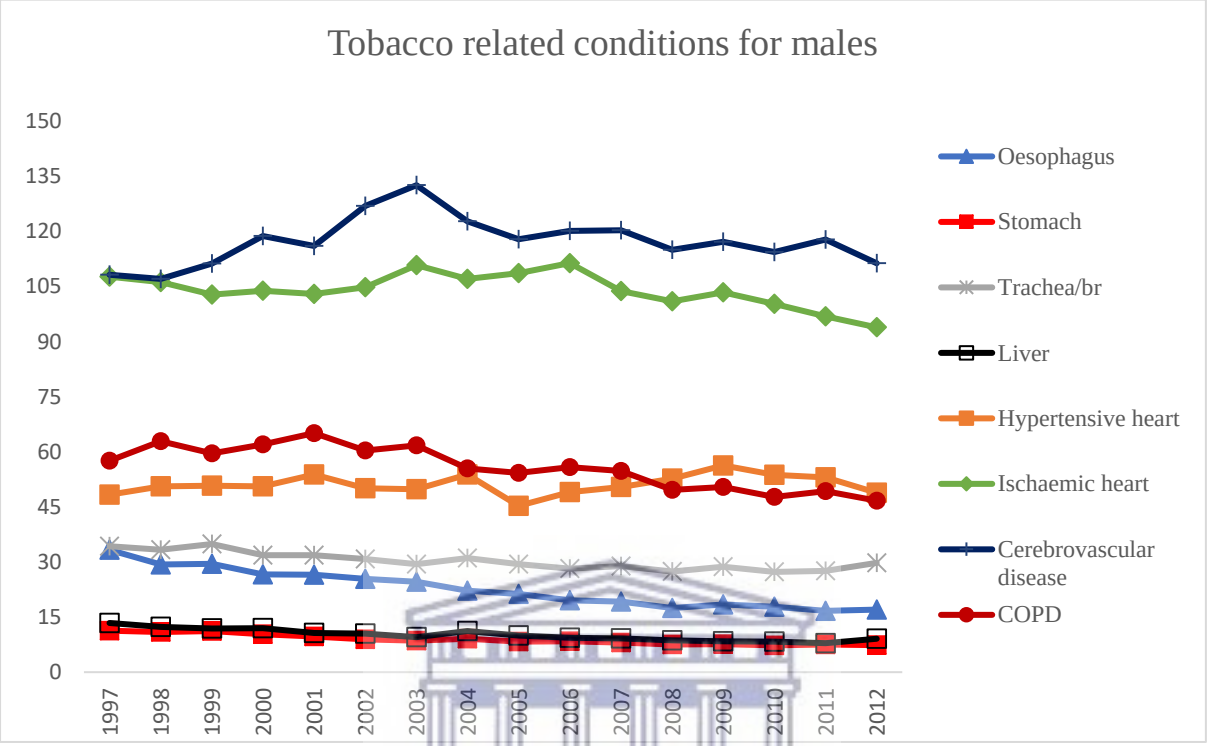


Figure 5.10. Trends in lung cancer mortality for males and females, 1997–2012

Figure 5.11 depicts trends in non-communicable disease mortality from 1997 to 2012 for both males and females. There was a constant increase in stroke mortality until 2003 followed by a decline in 2004. This peak is observed in both sexes. There is a consistent marked decline for

oesophageal cancer in males while very little decrease in females. In addition, liver and stomach cancer appear only in males, while an increase in prostate cancer was detected.



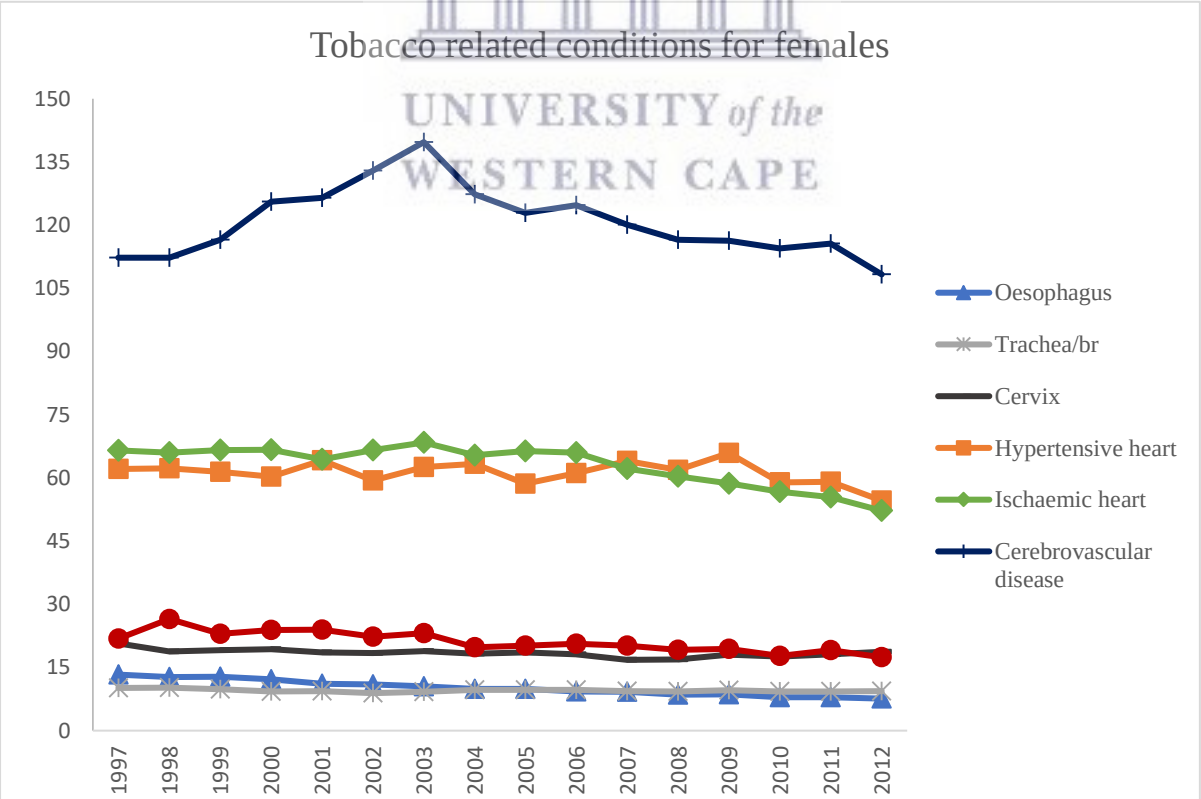


Figure 5.11. Trends in Age Standardised mortality rates from tobacco related conditions for males and females

In addition, mortality in hypertensive heart has shown up and down trends over the 14-year period, however it started declining in 2010 for males but not in females, which is consistent with the smoking trends. Mortality rates from COPD and IHD were higher for males, while mortality from stroke was higher for females. IHD remained constant throughout the study period.

5.8 Discussion

This chapter set out to assess the prevalence of tobacco use nationally and in a selected urban and rural communities, to evaluate the impact of tobacco control policies and legislation on tobacco smoking intolerance and unacceptability as well as knowledge of health effects of smoking in these as well as the national trend in the prevalence of smoking and tobacco related mortality. During the period studied, there has been some reduction in prevalence in smoking in men (who were very high). Furthermore, this appears to have impacted on mortality with declines in lung cancer mortality, other chronic respiratory conditions and ischeamic heart disease. However, recent data shows a sign of reversal in the prevalence of smoking. In contrast, the prevalence in women has remained much lower throughout the study period and has not been affected by tobacco control efforts. Economic factors such as low education, unemployment and poverty are important in determining smoking prevalence rate (Reddy *et al.*, 2015), as well as the norm that men have more disposable income to buy cigarette. Furthermore, tobacco use is believed to be more socially acceptable in men than in women in South African communities, however, is declining in urban area, predicting future reduction in tobacco use (Alamar & Glantz, 2006). Gender plays an important role in smoking behavior and smoking cessation. Further research is needed to understand how these differences may be

incorporated into intervention design on cessation among this vulnerable population of smokers.

The prevalence of smoking in the urban-rural setting has yielded mixed findings compared with the national prevalence that was conducted by SADHS. Data from SADHS has shown that the prevalence of smoking is higher among urban males (Fig. 5.8 and 5.9). These findings are similar to those reported in other countries (Levy *et al.*, 2004; Wlodarczyk, Raciborski, Opoczynska, & Samolinski, 2013) whereby smoking was higher in urban than rural areas. The PURE study found a high smoking prevalence in both urban and rural males, despite the lower income in rural area. As there is no measure of quantity smoked, it is possible that rural individuals smoke less. Another reason for this could be the relatively small sample size. However, it may also reflect smoking patterns of the specific areas included in the study.

The prevalence of smoking generally changes with age. This study found that, daily tobacco smoking is higher among middle aged individuals < 54 years in urban areas and in 44-54 years in rural area as seen in Figure 5.2. Swart, Reddy, and Pitt (2001) reported the prevalence of about 23% of youth grades 8–10 learners were current smokers. The above-mentioned differences can be explained as due to sociocultural and demographic determinants.

No differences were observed around awareness of the legislation, however, about half of the participants were aware of restrictions on the sale of cigarettes, particularly to minors which was found to be positively associated with societal disapproval of smoking in the study setting.

Knowledge of harm is similar, but the attitude around smoking seems to be more accepting in rural setting – e.g. 53% can smoke in home in rural setting vs 18% in urban. The average proportion of participants who were aware of health hazards was 77.9% in the urban area compared with 71.5% in the rural setting. This was higher than levels reported in China whereby 64.3% of the population was aware that serious diseases might be caused by smoking

(Yang, Wang, & Wang, 2011). Awareness that tobacco was associated with lung cancer and other chronic lung disease was high in both settings (about 90%). It was not so high for certain conditions. Our findings provide some suggestions for the direction in which tobacco prevention strategies which suggests that is since most of the findings are comparable, similar policies could work in both areas.

This study found that the implementation and enforcement were weak in both settings although there were some differences. For example, higher levels of tobacco marketing were observed in urban than in rural areas. More than half of the participants (59%) reported seeing at least one advertisement, furthermore, more participants in the urban area reported observing more people smoking inside the facility in public places in the last six months. This in contravening the law in South Africa. In view of this there is a need to employ stronger enforcement on tobacco control policies. Stricter measures to prosecute offenders is needed at local setting. Research suggests that increasing awareness regarding tobacco policies may result in decreasing tobacco use in the community (Aslam, Mehboob, Zaheer, & Shafique, 2015; Rennen *et al.*, 2014).

The decrease in smoking prevalence has been attributed to strong and comprehensive tobacco control initiatives (Swart & Panday, 2003). Since the introduction of tobacco legislation over 25 years ago, the prevalence of smoking has progressively been decreasing as found in the study. Saloojee and Steyn (2005) reported that daily smoking rates fell by 20% from 30.2% in 1995 to 21.1% in 2004. In addition, it has been reported that during this period, 2.5 million smokers stopped smoking and the poorer smokers in South Africa were more likely to quit than more affluent smokers (Saloojee & Steyn, 2005).

The consensus among most tobacco control researchers and advocates was that South Africa's tax increases are a powerful tool which had been the most effective tobacco control measure. For example, van Walbeek (2003) conducted several research studies on excise tax increases

and suggested that a 10% increase in the price of cigarettes resulted in a 5% to 7% decrease in cigarette consumption (Van Walbeek, 2003). The burden of tobacco excise taxes falls more heavily on the poor (Van Walbeek, 2005). However, it was pointed out in this study that the poor are generally more sensitive to price changes, and an increase in the cigarette excise tax will reduce cigarette consumption among the poor by a greater percentage than among the rich.

The recent slight increase in smoking rates from 20.2% in 2003 to 22.6% in 2016 (SADHS, 2016) occurred despite the initial success of tobacco control and public health policies of the past 20 years. This suggests that the strategies which the tobacco industry uses to encourage young people (particularly girls), to smoke, have been successful. Therefore, we don't need to depend on the legislation alone to do the work but should also look at the broader interventions to address the social determinants of health such health education. The proportion of deaths from tobacco use is expected to continue to grow because the smoking epidemic is still maturing, thus, the fraction of those most vulnerable is still increasing.

5.9. Study limitations

There are limitations to population-based data. The small sample used for analysis may underestimate the observed estimates (PURE data). It prevented more in-depth analysis of the prevalence of smoking in urban and rural settings. The current data is reliant on data of the primary study. Despite the limitation some strengths of the study include the selection of subjects in the primary study. PURE was not designed to be nationally representative. Within communities, however, representative samples of adults aged 35-70 years have been included. In addition, the standard approaches for the identification of individuals, recruitment procedures, follow-up, and accurate data collection all contribute to ensuring the internal validity of PURE (Corsi *et al.*, 2013). In addition, the EPOCH study was conducted on a convenience sample. However, the EPOCH tool was feasible and pre-tested for reliability and validity (Chow *et al.*, 2010).

Data on the prevalence of smoking came from eight national surveys which were conducted at different times in South Africa. Gathering quality prevalence data may be difficult. All surveys have collected self-reported smoking behaviour, but given the stigma attached to smoking in some communities, respondents might lie about their smoking behaviour if a family member is present during interviews. In addition, questions about smoking were not the same, for example in SADHS, participants were asked if they were daily smokers, and in NIDS they were asked if they were current smokers, but there was no definition for current smokers. SANHANES questions were, have you ever smoked tobacco regularly? These surveys were done at irregular intervals and after policies were implemented. Recall bias is likely to have occurred since individuals often do not remember everything. The complexity of technical approach to NBD methodology and imprecision in epidemiological data.

5.10 Conclusion and recommendations

In this study, some degree of decline in selected tobacco-related mortality has been shown. The reduction in tobacco-related mortality is only seen among males, which is consistent with the higher smoking prevalence among men and decline that has been observed over the period. There were also suggestions that some of the tobacco-related causes may be influenced by other risk factors such as hypertension. Several factors have supported the legislative measures in South Africa. These include a change of government, political will and support, scientific evidence and continuous amendments. To sustain this and improve the fight against the tobacco use epidemic, South Africa needs to improve the enforcement of legislation, fully align its policies with the FCTC and implement all elements of MPOWER to strengthen smoking control efforts. It has been reported that females start smoking at an older age compared to males, therefore it is important that anti-smoking legislation and regular tax increases should target females in their reproductive years to prevent the onset of smoking.

The need for South Africa to step up efforts to adopt and implement effective tobacco control legislation that is fully compliant with the FCTC as outlined in the MPOWER, has been highlighted. These include, significantly higher tobacco tax increases, cover >50% of the cigarette package with warning message or image and complete ban of tobacco use inside public buildings (World Health Organization, 2015a). Tobacco control must remain an immediate priority for the prevention of NCDs.

Monitoring of tobacco use in the general population is a critical tobacco control activity. Population-based national monitoring data are required to effectively plan and implement the WHO FCTC. Through accurate measurement, problems caused by tobacco can be understood and interventions can be effectively managed and improved. Monitoring can provide policymakers and public health authorities with essential information on the following: public awareness of the epidemic and attitudes towards tobacco control; the extent of the tobacco epidemic in a country; government enforcement and societal compliance with tobacco control policies including tax collection and tax evasion, smoke-free places, and advertising and marketing bans; the tobacco industry practices that may increase tobacco use or hinder implementation of tobacco control policies and programmes. Surveys should be repeated at regular intervals using the same questions, sampling, data analysis and reporting techniques so that data are comparable across different survey years. This is necessary to enable accurate evaluation of the impact of tobacco control interventions over time.

CHAPTER 6: SALT REDUCTION

6.1 Introduction

In the previous chapter, descriptive cross-sectional, secondary analysis of data collected in two communities (1) urban and 2), was undertaken. This chapter reports the findings related to salt reduction legislation (objective 4). Extensive scientific evidence has shown that high dietary salt intake is an important risk factor of hypertension which is a major risk factor for CVD and other NCDs including gastric cancer, osteoporosis, cataracts, kidney stones and diabetes (Cappuccio *et al.*, 2000; Cappuccio & MacGregor, 1997; He & MacGregor, 2009). Population salt reduction interventions have been identified as a cost-effective approach to lowering the prevalence of hypertension and preventing CVD (Asaria *et al.*, 2007; He & MacGregor, 2009; World Health Organisation, 2011a). Subsequently, salt intake has been identified as an indicator of a global monitoring framework for NCDs control (World Health Organisation, 2013a). Under this framework, a 30% relative reduction of dietary salt intake has been targeted by 2025 towards achieving a 25% relative reduction of premature mortality of NCDs (Webster *et al.*, 2015; World Health Organisation, 2012a). However, there is no national data on the effectiveness of such policies in South Africa.

In this chapter, the status of salt reduction regulation and its impact on population-level and health-related outcomes in South Africa are investigated. Trends in hypertension from national surveys between 1998 and 2016 and mortality data from 1997 and 2012, as well as an assessment of the potential impact of the legislation in an urban and rural setting, are presented.

In this chapter, we employed the Schematic Framework for promoting healthy lifestyles and preventing NCDs (Figure 3.2). As explained earlier in chapter 3 and in chapter 5, the framework works to address the determinants of NCDs, in this case through increased awareness on high salt intake, as well as mechanisms to support better health and behaviour among the population such as regulations on the content of salt in processed foods.

6.1.1 WHO recommended salt and potassium intake

The World Health Organization recommended the consumption of less than 5 g salt (or 2 g sodium) per day to prevent CVDs (World Health Organization, 2003). However, dietary salt intake is reported to be much higher than this in many countries including South Africa (Bertram, Steyn, Wentzel-Viljoen, Tollman, & Hofman, 2012; National Department of Health, 2013; Powles, Fahimi, Micha, *et al.*, 2013; Swanepoel, Schutte, Cockeran, Steyn, & Wentzel-Viljoen, 2016).

It has been reported that if the average person would decrease salt intake by about 5 g per day as per WHO recommendations, a reduction of 23% of strokes and 17% of CVD would result in preventing an estimated four million deaths annually worldwide (Strazzullo *et al.*, 2009). Subsequently, comprehensive strategies to reduce salt intake to the recommended level is being encouraged or promoted (World Health Organization, 2012) to promote health and prevent NCDs.

The impact of diet on health is extremely complex as it is multifaceted. In terms of hypertension, potassium intake also plays an important role. The more potassium consumed, the more sodium is passed out of the body through urine. This is because potassium diminishes the effects of sodium. In addition, potassium supports the relaxation of blood vessel walls, which helps to lower blood pressure (American Heart Association, 2016). While some recommend a daily intake for adolescents and adults of 4700 mg, the WHO recommends a daily intake of 3510 mg (World Health Organisation, 2014b). It is recommended that this should come from food sources such as fruits and vegetables (. Examples of food containing potassium include fruits, vegetables, fat-free or low-fat (1 percent) dairy foods and fish. For example, a medium banana has about 420 mg of potassium and half a cup of plain mashed sweet potatoes has 475 mg (American Heart Association, 2016). The ratio of sodium to potassium in the diet may be more important than the amount of either one alone, because it

has been reported to be strongly associated with an increased risk of hypertension and cardiovascular disease related mortality than the risk associated from either sodium or potassium alone (Du *et al.*, 2014; Perez & Chang, 2014; Zhang *et al.*, 2013) however, meeting the recommended intake of both sodium and potassium is a major challenge. The median sodium to potassium ratio recommended by the WHO is 1:1 (86 mmol/d/90 mmol/d) (2g/d:3). (Na:K) (World Health Organization, 2003, 2012). If an individual consumes sodium at the level recommended by the WHO and potassium as recommended, it is considered beneficial for health.

6.1.2 Salt consumption in South Africa

In line with a the United Nation's nine targets to reduce the burden of NCDs by 25% by 2025, in 2013 (World Health Assembly, 2013), the South African government set a target to reduce the mean population's salt intake to < 5 grams per day and reduce the prevalence of people with raised blood pressure by 20% by 2020 (compared with the 2010 baseline)(National Department of Health, 2013). The main aim is to reduce cardiovascular morbidity and mortality.

There are no nationally representative studies of dietary salt intake in South Africa, however, several small-scale studies have been conducted, suggesting high levels of salt intake for different communities and population groups in South Africa (Charlton, Steyn, & Levitt, 2005; Charlton, Steyn, Levitt, Peer, *et al.*, 2008; Lategan, 2011; Wentzel-Viljoen, Steyn, Ketterer, & Charlton, 2013; World Health Organisation, 2012b). The mean salt intake in South Africa is estimated to be between 6 g and 11g per day (Eksteen & Mungal-Sing, 2015; Wentzel-Viljoen *et al.*, 2013). The majority of the population are believed to consume more than 10 g per daily (Charlton, Steyn, & Levitt, 2005; Norton & Woodiwiss, 2011; Swanepoel *et al.*, 2016). A study conducted in Cape Town reported ethnic differences in salt consumption (Charlton, Steyn, Levitt, *et al.*, 2005). Based on urinary sodium, they found that South Africans consume more

salt than the recommended amount of 5 g per day, with 7.8, 8.5 and 9.5 g/day in black, Coloured and white individuals, respectively (ibid). Studies attributed the high intake of salt partly to the fact that some individuals use salt for taste and flavour (Charlton, Jooste, Steyn, Levitt, & Ghosh, 2013).

These studies were conducted more than ten years ago and are outdated; however, they have provided information on the prevalence, health status, knowledge, attitudes and behaviour around salt intake. Recent findings reported by Swanepoel *et al.*, 2016, stated median sodium and potassium was 122.9mmol/day (equivalent to 2826.7mg) and 122,9mmol/day (3287.5mg) (Swanepoel *et al.*, 2016). There is an urgent need to collect nationally representative data on salt intake.

In another study, that was conducted to establish baseline sodium and potassium intake, and blood pressure, prior to legislation coming into effect in South Africa reported that, the overall median salt intake was 6.7g/day (equivalent to 2.7g/day sodium). Young adults (18-49 years) had a higher salt intake of 8.6g /day (equivalent 2.7g sodium) than older people (50 year and older) 6.1g/day (2.4g/d sodium). The intake of potassium was very low 1.3g/day in their study. Sodium: potassium ratio of 3.3 (Schutte, Ware, Charlton, & Kowal, 2016; Ware *et al.*, 2017).

Several studies have reported that approximately 46% of the salt consumed is added during preparation of food or at the table (Charlton, Steyn, & Levitt, 2005; Eksteen & Mungal-Sing, 2015; Wentzel-Viljoen *et al.*, 2013). However, a high proportion of the salt (54%) is found in processed food produced by the food industry in South Africa. Identified foods that contribute to high salt intake in South Africa include bread, margarine, butter spreads, stock cubes and breakfast cereals (Charlton, Steyn, Levitt, Peer, *et al.*, 2008; Charlton, Steyn, Levitt, *et al.*, 2005).

6.1.3 Prevalence and impact of hypertension in South Africa

Hypertension is among the leading risk factors for NCDs mortality globally (World Health Organisation, 2009a), and contributes to the considerable burden in South Africa (Wentzel-Viljoen *et al.*, 2013).

It has been reported that more than 6,2 million South Africans have a blood pressure higher than 140/90 mmHg. Furthermore, about 3,2 million of these people have a blood pressure higher than 160/95 mmHg, a level which is unacceptably high (Steyn, Fourie, & Temple, 2006). It has been established that most of the deaths from NCDs occur before the age of 65 years, thus affecting the workforce and impacting on the economy of the country (Mayosi *et al.*, 2009; Nojilana *et al.*, 2016; Steyn *et al.*, 2006).

Study done by Bradshaw, Steyn, Levitt, *et al.* (2011) reported that, the prevalence of hypertension for males doubled between 1998 and 2008, from 22% to 42% in males 35–44 years, and 30% to 60% in males aged 45–54 years respectively. However, the prevalence in females increased from 24% to 34% in females aged 35–44 years and 38% to 50% in females aged 45–54 years. According to (Maepe & Outhoff, 2012)The prevalence of hypertension increased with age, ranging from 16.1% in the 18–29-year-old age group to 83.0% in the 60–69-year-old age group.

The South Africa Comparative Risk Assessment by Norman *et al.* (2007) estimated that 9% of all deaths in the year 2000 were attributable to hypertension. In particular, it was estimated that 42% of IHD, 50%% of stroke and 72% of hypertensive heart disease, were attributable to raised blood pressure among adults 30 years and older.

Selassie et al. (2011) suggested that one of the possible contributors to the high prevalence of hypertension in South Africa may be an excessive salt intake that is associated with urbanisation and a shift in dietary patterns. The transition from the traditional diet to a more

westernised one includes an increase in salt intake (He, Pombo-Rodrigues, & Macgregor, 2014).

Several studies have observed BP-lowering effects associated with the introduction of a low sodium diet (Appel *et al.*, 2006; Charlton, Steyn, Levitt, Jonathan, *et al.*, 2008; Law *et al.*, 1997; Sacks *et al.*, 2001). Reducing sodium intake is a worldwide health priority to curb NCDs burden (World Health Assembly, 2013; World Health Organisation, 2013a). Prevalence of hypertension and mortality from NCD can be reduced through population wide interventions to reduce risk factors such as unhealthy diet etc, in the form of policy or legislation (Beaglehole *et al.*, 2007; World Health Organisation, 2011a, 2014a). Strategies to reduce population salt intake include, food reformulation through voluntary or mandatory legislation, taxation, increased public awareness, food labelling as well as monitoring and evaluation (European Commission, 2009). Several countries have adopted population salt reduction strategies (Webster *et al.*, 2011). For example, it has been reported that in 2014, out of 75 countries that had national salt reduction strategies, 81% of countries included food reformulation, 95% consumer education and 41% included front of the package labelling (Trieu, 2015).

6.1.4 Salt reduction legislation in South Africa

South Africa was the first country to develop comprehensive mandatory legislation to reduce sodium levels across a wide range of processed foods. Subsequently, it has been acknowledged in playing a leading role in salt reduction globally by being a global leader (Charlton *et al.*, 2014). The legislation aims to address 55% of salt in processed food (Charlton *et al.*, 2013; Charlton, Steyn, & Levitt, 2005).

The ground-breaking legislation was signed on 18 March 2013 by the Minister of Health. The regulation was published in the Government Gazette as one of the steps to reduce population salt intake to less than 5 g/day. The first set of targets came into effect on 30 June 2016, with the second level of sodium targets scheduled for June 30, 2019 (Government Gazette, 2013).

The government granted a three-year implementation period to allow time for manufacturers to experiment with reformulation and produce lower salt products that are still acceptable to consumers. The bill imposes maximum sodium level targets for a basket of commonly consumed foods. Foods groups affected include bread, breakfast cereal, margarines and butter, savoury snacks, potato crisps, processed meats, sausages, soup and gravy powders, instant noodles and stocks (Charlton, Steyn, & Levitt, 2005; Government Gazette, 2013, 2016).

In South Africa, a preliminary analysis suggested that substantial health gains could be realized from a modest salt reduction in targeted food groups (Bertram *et al.*, 2012). A modelling study suggests that salt reduction legislation could reduce population-level salt intake by 0.85 g/day and reduce annual deaths from hypertensive heart disease by 11%, stroke by 8.0% and ischaemic heart disease by 6.5%. The intervention is estimated to save the government R300 million/year in healthcare costs (Bertram *et al.*, 2012).

The newly passed salt regulations in South Africa reflect a new NCDs target set by the WHO and is crucial for achieving '25 by 25' agenda for reducing NCDs in South Africa (World Health Organisation, 2013a). The Heart and Stroke Foundation of South Africa has been at the fore front leading in advocating and complemented the salt reduction legislation by developing a national salt awareness campaigns through SaltWatch (Heart and Stroke Foundation South Africa, 2013) , similar to the approach in United Kingdom (UK) SaltWatch (Charlton *et al.*, 2014).

Reports suggest that, several countries have reduced population salt intake successfully (Laatikainen, Pietinen, & alsta, 2006; Vartiainen, Laatikainen, & Peltonen, 2010). Important to note is that many public health experts believe that regulation is a much stronger driver for industry reformulation than a voluntary approach (Montero, Gomes, & Cannon, 2010; Webster, 2009). However, many countries with a voluntary approach seem to be making progress (Webster, 2014).

6.2 Sociodemographic characteristics of the participants from the PURE study

Data for 2026 participants from PURE cohort, (1000 from a rural and 1026 from an urban setting) aged 35 years to 70 years old regardless of having been diagnosed with NCDs, such diabetes, hypertension, and others, were included to the assessment of dietary salt intake. See Table 5.3. for selected socioeconomic differentials in health and behaviour between urban and rural settings.

6.3 Dietary intake of sodium and potassium in an urban and rural setting

Dietary data were collected using a quantitative food frequency questionnaire as described in the Methods section 3.3.3.4 and this section reports on the intake of sodium and potassium. Tables 6.1 and 6.2 show the commonly eaten food items based on the proportion who consume the item in urban and rural area respectively. Foods consumed by 50% or more, the sodium and potassium content per 100g of each food item from the SAFOODS tables and the median (IQR) intake based on the reported frequency and portion size among the participants who consumed the food are shown in the tables (6.1 & 6.2). Maize, rice, bread and samp and beans were the common staple foods eaten in both communities of our study. Chicken was the most commonly consumed source of protein in both communities. Milk, tea and coffee were commonly consumed. Bananas (about 70%) and oranges (about 60%) were commonly consumed fruits. With the exception of cabbage, vegetables are eaten infrequently in both communities. However, the urban participants reported some diversity with more than 40% consuming carrots (58.5%) and pumpkin (47.7%).

Table 6.1 List of foods commonly consumed (>50% of participants) and the median (IQR) Sodium and Potassium intakes (mg) for urban participants who consume the food item

Urban			Mean portion	Content /100g		Sodium		Potassium	
Food item	N	%	size (g)	Na	K	Median	IQR	Median	IQR
Maize meal, special, porridge, stiff (white, unfortified)	884	91.3	65.9	7	71	4	2-6	37	24-60
Salt, table	855	88.3	6.0	38850	0	2331	2331-2331	-	-
Rice, white, cooked	849	87.7	45.9	2	39	1	1-1	14	10-22
Sugar, white, granulated	845	87.3	26.2	1	2	0	0	0	0-1
Banana, raw (peeled)	737	76.1	34.6	1	241	0	0	67	34-103
Samp and beans, 1:1	706	72.9	36.0	6	184	2	1-3	63	31-79
Chicken, white meat, fresh, cooked - moist	688	71.1	32.9	46	259	11	7-20	62	41-115
Milk, full fat/whole, fresh	661	68.3	65.3	48	157	26	17-43	84	57-141
Bread/rolls, white (fortified)	649	67	44.1	653	214	224	104-392	73	34-128
Maize meal, special, porridge, crumbly (white, unfortified)	618	63.8	34.1	7	128	2	1-3	40	16-46
Margarine, brick/hard	611	63.1	6.1	802	9	40	27-56	0	0-1
Orange, raw (peeled)	609	62.9	47.1	1	176	0	0-1	80	40-121
Tea, brewed	587	60.6	351.6	3	37	8	5-15	93	67-185
Maize meal, special, porridge, soft (white, unfortified)	578	59.7	102.9	4	22	3	1-5	16	8-28
Bread/rolls, brown (fortified)	570	58.9	83.0	648	227	518	292-778	182	102-272
Carrot, boiled, with sugar	566	58.5	18.2	28	148	3	2-7	18	10-35
Coffee, brewed/instant	507	52.4	280.0	2	54	5	4-7	135	97-194
Peanut butter, smooth style	490	50.6	4.7	478	721	19	7-29	29	10-43

Source for content/100g: SA Food Composition Table (SAFOODS) (Wolmarans P, 2010)

Table 6.2 List of foods commonly consumed (>50% of participants) and the median (IQR) Sodium and Potassium intakes (mg) for rural participants who consumed the food items

Rural			Mean	Content/100g		Sodium		Potassium	
Food item	N	%	portion size	Na	K	Median	IQR	Mean	IQR
Maize meal, special, porridge, stiff (white, unfortified)	1009	94.3	79.7	7	71	5	2-7	49	24-76
Rice, white, cooked	990	92.5	48.2	2	39	1	1-1	14	10-23
Sugar, white, granulated	933	87.2	34.6	1	2	0	0-1	1	0-1
Salt, table	897	83.8	6	38850	0	2331	2331-2331	-	-
Margarine, brick/hard	802	75	6.4	802	9	40	23-56	0	0-1
Maize meal, special, porridge, crumbly (white, unfortified)	792	74	38.9	7	128	2	1-4	44	20-67
Samp and beans, 1:1	790	73.8	44.9	6	184	2	1-4	66	33-112
Banana, raw (peeled)	778	72.7	43.2	1	241	0	0-1	69	34-138
Bread/rolls, white (fortified)	744	69.5	54.7	653	214	287	149-522	94	49-171
Maize meal, special, porridge, soft (white, unfortified)	706	66	133.9	4	22	4	2-10	24	11-55
Chicken, white meat, fresh, cooked - moist	692	64.7	30.3	46	259	11	6-17	59	31-93
Orange, raw (peeled)	663	62	61.5	1	176	0	0-1	84	53-141
Milk, full fat/whole, fresh	650	60.7	73.9	48	157	29	22-43	94	71-141
Apple, Granny Smith, raw	618	57.8	74.6	5	69	3	1-5	41	16-69
Potato, boiled without skin	609	56.9	47.2	2	279	1	0-1	109	109-179
Mealie, sweetcorn, boiled	585	54.7	57.1	17	249	7	3-13	108	108-192
Coffee, brewed/instant	573	53.6	247.2	2	54	4	4-5	97	97-135
Tea, brewed	573	53.6	264.5	3	37	5	5-11	67	67-133

Source for content/100g: SA Food Composition Table (SAFOODS) (Wolmarans P, 2010)

Figure 6.1 shows the percentage of people who consumed food items that contributed 30mg or more to the median intake of the food items eaten. The urban and rural participants are reflected respectively. Examining the use of discretionary salt, 83.3%% of urban and 83.8% of rural participants reported using table salt. The median salt intake was estimated to be greater than 2300mg sodium (Tables 6.1 and 6.2), which is slightly higher than the level recommended by the WHO. Furthermore, the data show that table salt was the main single contributor to the total reported sodium intake. This reflects limited awareness on the dangers of high sodium intake in both of these communities.

The most common food source of sodium intake in these communities include bread and margarine, followed by sausages (different types in the urban and rural settings). Food sources with high sodium content are not eaten frequently and vary by setting. These include chutney and potato chips/snacks which are more common in the urban area and tomato sauce in the rural area.

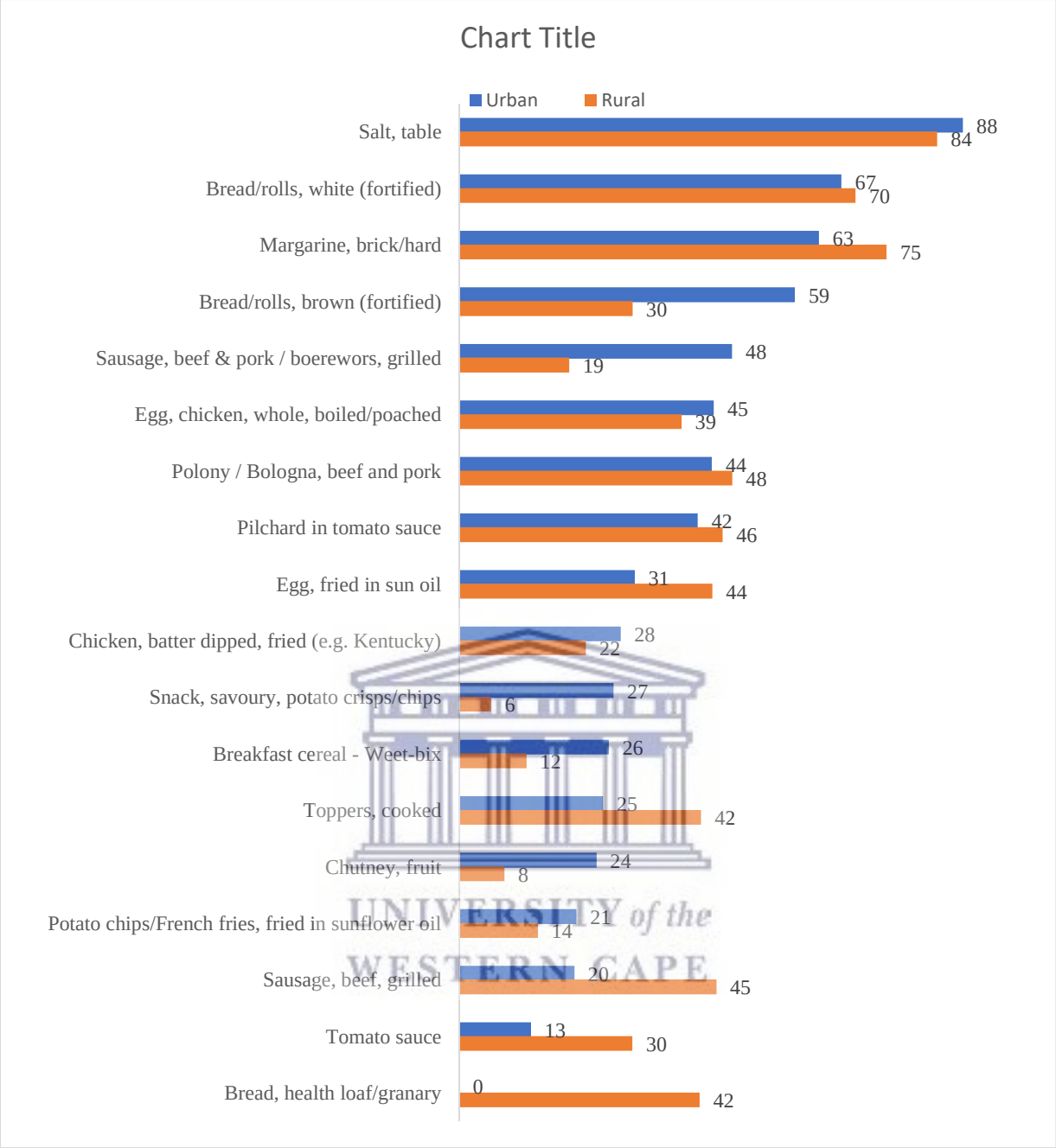


Figure 6.1 Percentage sodium containing foods (median sodium intake >30mg) consumed by urban and rural participants

In terms of potassium intake, Tables 6.1 and 6.2 show that milk, coffee, tea, bread and oranges are the commonly eaten foods that provide potassium. Table 6.3 shows the foods that contributed 80mg or more of potassium for those who consumed that food item. These foods are, ranked according to the percentage of participants who consumed the food. Items with <80mg potassium (due to the portion size or frequency of eating) were not numbered but

included in the table if they were in the top 10 in the other area. From Table 6.3, it can be seen that bread, milk and oranges were the most commonly eaten foods contributing to potassium intake in both the urban and rural areas. The type of bread (brown vs white), however, differed by urban and rural. Spinach, other green leafy vegetables and raisins which contain high amounts of potassium, were consumed infrequently in both settings (data not shown).

Table 6.3 The proportion of the respondent who eat foods contributing 80mg or more potassium to the median intake in urban and rural areas

	Urban			Rural	
1	Milk, full fat/whole, fresh	68.3	1	Bread/rolls, white (fortified)	69.5
2	Orange, raw (peeled)	62.9	2	Orange, raw (peeled)	62.0
3	Tea, brewed	60.6	3	Milk, full fat/whole, fresh	60.7
4	Bread/rolls, brown (fortified)	58.9	4	Potato, boiled without skin	56.9
5	Coffee, brewed/instant	52.4	5	Mealie, sweetcorn, boiled	54.7
6	Potato, boiled without skin	39.8	6	Coffee, brewed/instant	53.6
7	Bread/rolls, wholewheat	23.2	7	Pilchard in tomato sauce	46.2
8	Potato chips/French fries, fried in sunflower oil	20.6	8	Toppers, cooked	42.4
9	Milk, full fat/whole, UHT	13.0	9	Bread, health loaf/granary	42.1
10	Milk, low fat/2% fat, fresh	9.2	10	Bread/rolls, brown (fortified)	30.4
	Bread/rolls, white (fortified)	67.0	12	Potato chips/French fries, fried in sunflower oil	13.1
	Pilchard in tomato sauce	41.8	15	Milk, full fat/whole, UHT	6.6
	Mealie, sweetcorn, boiled	40.0	17	Bread/rolls, wholewheat	5.5
	Toppers, cooked	25.2		Milk, low fat/2% fat, fresh	6.0
	Bread, health loaf/granary	0.0			

The median (IQR) of total daily sodium (mg) and potassium (mg) intakes are shown in Table 6.4, by area. Median sodium intake was similar (Quintile regression analysis p=0.443) for urban (3543mg) and rural (3569mg) (equivalent to 8.75g salt), but higher than the recommended level of less than 2300 mg/day by the WHO (World Health Organization, 2012). However, the intake of potassium was very low in both areas. The recommended level for adult is 4,700 mg/day (World Health Organization, 2012).

Table 6.4 Median (IQR) of Sodium and Potassium consumption by urban and rural participants

Nutrient	Urban N=968#		Rural N= 1070	
	Median	IQR	Median	IQR
Sodium (mg)	3542.7	965	3569.4	1029.8
Potassium (mg)	1734.5	951.5	1782.3	978.8

#58 cases have missing information

Sodium intakes of the two settings was calculated by age group and sex and is shown in Table 6.5. Based on the quintile regression analysis, the median intake of both Potassium and Sodium by age and sex were similar between urban and rural, p=0.248 and p=0.443 respectively. Furthermore, there was not difference between the intake for males and females (p=0.276). The data shows slight differences of daily intakes of sodium by age group. The median intake sodium in the 55-64-year olds was significantly lower than the 35-44-year olds (p<0.001).

Table 6.5 Median (IQR) total dietary Sodium intake (mg) by sex and age group for the urban and rural setting

	Urban#			Rural		
	N*	Median	IQR	N*	Median	IQR
Total	968	3543	965	1070	3569	1030
Female	615	3579	963	736	3586	1155
Male	258	3515	944	243	3564	940
35-44 yrs	307	3663	1107	315	3598	915
45-54 yrs	270	3649	893	303	3590	974
55-64 yrs	226	3414	842	267	3495	1336
65+ yrs	70	3267	1086	94	3675	970

* 186 cases have missing age and gender
# 58 cases have missing information

Potassium intakes of the two settings by age group and sex is shown on Table 6.6. The median intake of potassium was similar in urban and rural settings(p=0.248). The median intake of potassium shows differences between males and females but did not reach statistical

significance (p=0.066). Females in urban area consumed an average of 1816 mg of potassium daily, while males consumed an average of 1713 mg potassium per day. In rural area, females consumed more potassium (1920 mg) than males (1776 mg) per day. When looking at potassium intake by age groups, the median intake potassium in the 55-64-year olds was significantly lower than the 35-44-year olds (p=0.007).

Table 6.6 Median (IQR) total dietary Potassium intake (mg) by sex and age group for urban and rural settings

	Urban #			Rural		
	N*	Median	IQR	N*	Median	IQR
Total	968	1735	952	1070	1782	979
Female	615	1758	964	736	1808	988
Male	258	1648	960	243	1748	1054
35-44 yrs	307	1896	989	315	1772	948
45-54 yrs	270	1854	963	303	1789	941
55-64 yrs	226	1530	784	267	1807	1140
65+ yrs	70	1465	879	94	1841	1037

* 186 cases have missing age and gender
# 58 cases have missing information

6.4 Trends in the prevalence of hypertension

The trend in the prevalence of hypertension was evaluated from available national surveys. Figure 6.2 shows that the prevalence of hypertension has increased dramatically over the past 18 years, from 23.8% in 1998 to 41.6% in 2016. The observed prevalence was low in 2003, but the survey report acknowledged that the data were not accurately collected, and caution should be taken when interpreting these data (National Department of Health *et al.*, 2007). Data from the SANHANES 2012 cannot be directly compared with other surveys because the reported prevalence of hypertension reflects the proportion of respondents with raised blood pressure and excludes participants on medication and controlled hypertensives. Furthermore, there was a high non-response rate as many participants declined to give permission for their

blood pressure to be measured (Day *et al.*, 2014). Although there are many national estimates of the prevalence of hypertension from household surveys, they fail to give a reliable trend that could be used to assess the impact of the salt legislation introduced in 2013. However, they do confirm the high prevalence of hypertension in South Africa.

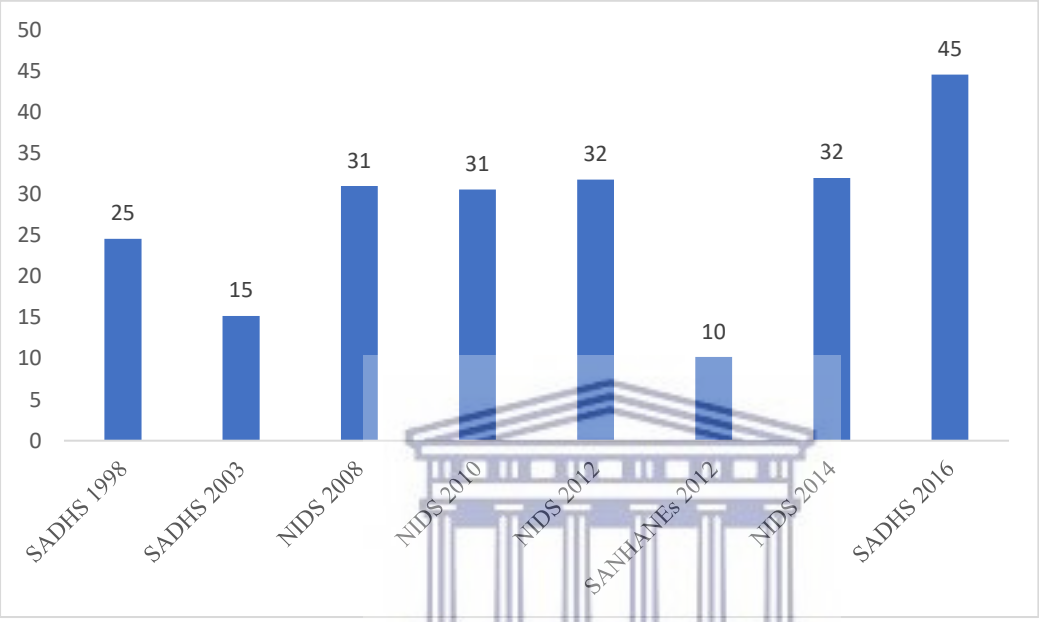


Figure 6.2. Trends in prevalence of hypertension 1998–2016, South Africa

In Figure 6.3, the trend in hypertension for males and females is shown according to the same national surveys. Hypertension is higher in females than in males, throughout the period, with the exception of the year 2003, whereby we see a prevalence of 18% and 13% for females and males, respectively. The SADHS 2003 report cautioned about the reliability of the results as quality issues had been identified in the fieldwork.

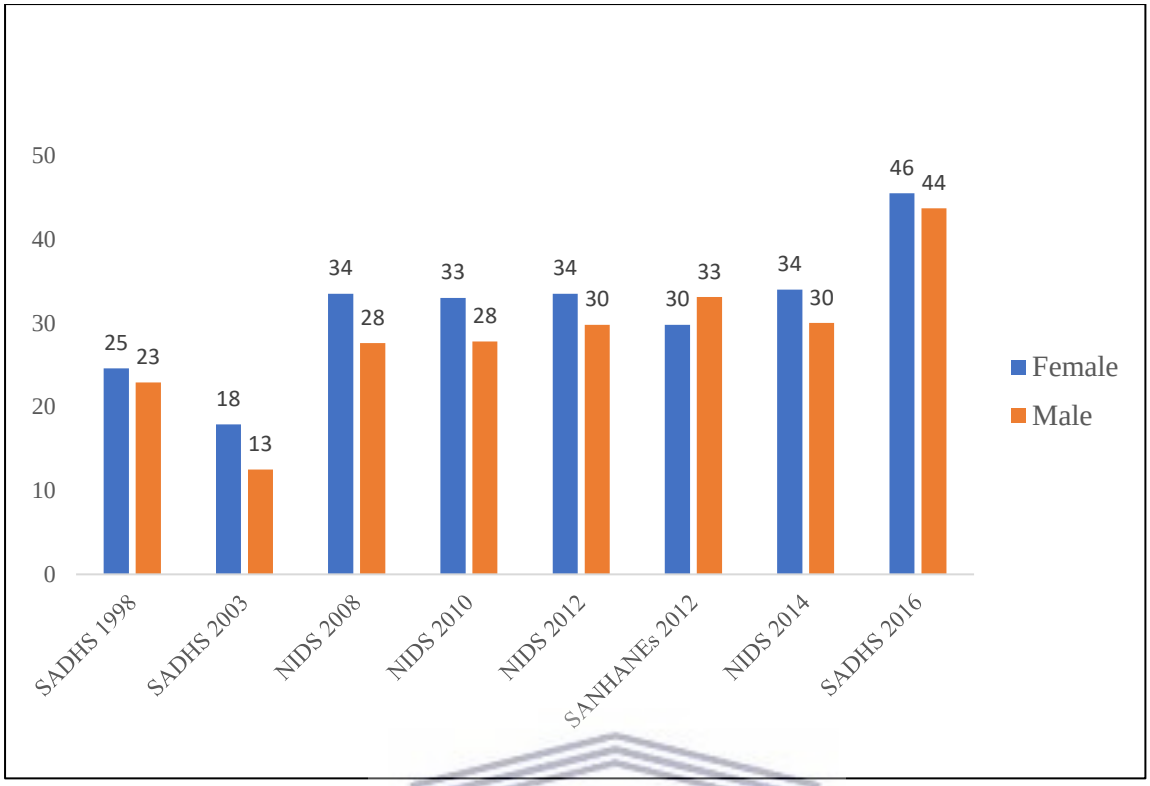


Figure 6.3. Trends in the prevalence of hypertension, males and females, 1998–2016

The prevalence of hypertension for males by the urban-rural area for the years 1998, 2003 and 2016 is shown in Figure 6.4. The prevalence of hypertension was higher in 1998 then declined in 2003, but increased in 2016, as seen in the figure. The prevalence is slightly higher in the urban area compared to the rural setting. A similar pattern is seen for females in Figure 6.4. According to the report, the 2003 survey had technical issues which affected the findings, therefore, data for 2003 should be cautiously interpreted.

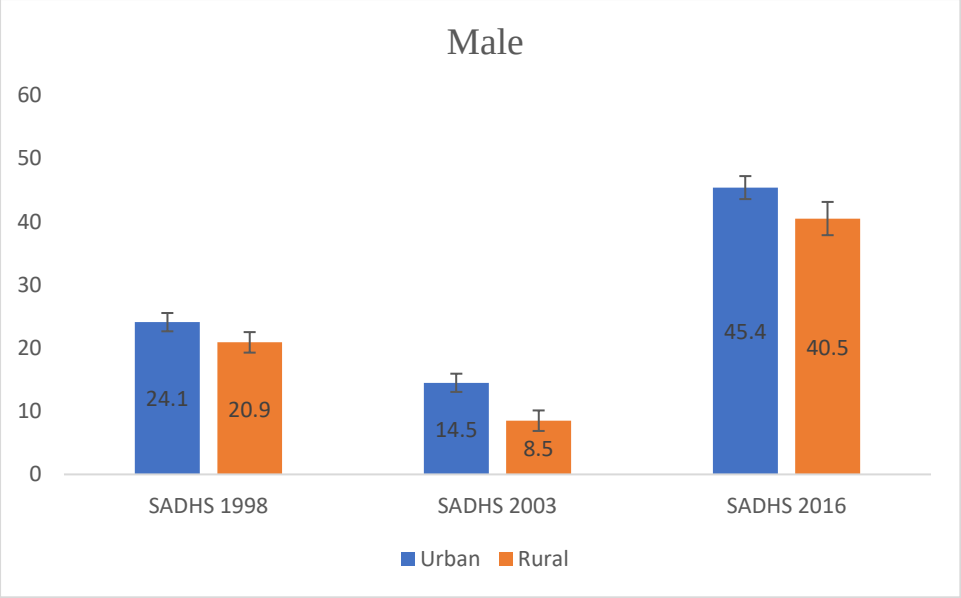


Figure 6.4. The prevalence of hypertension in 1998, 2003 and 2016 for urban and rural males

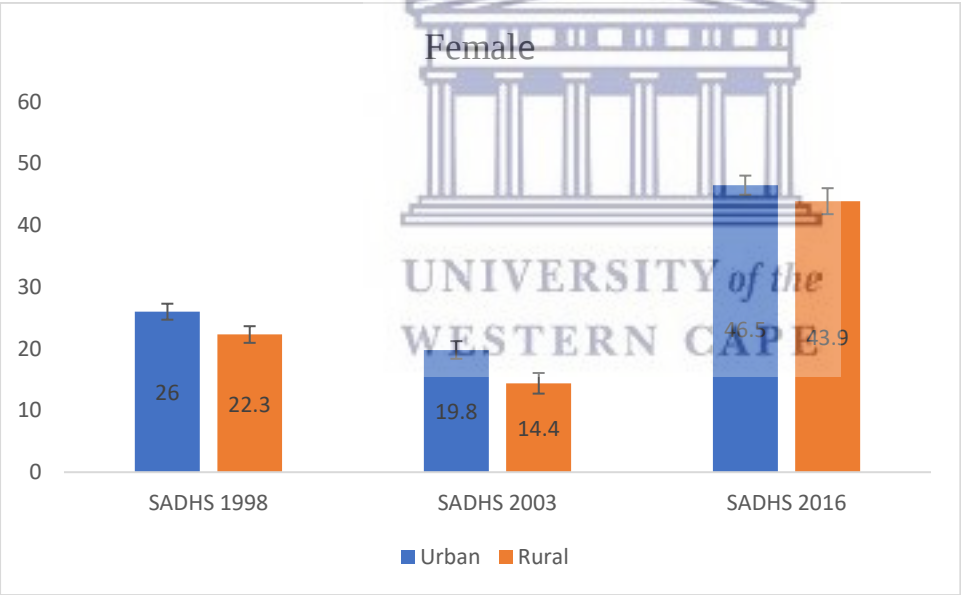


Figure 6.5. The prevalence of hypertension 1998, 2003 and 2016, for urban and rural females

6.5 Mortality associated with high salt intake

When looking at age-standardised mortality related to high salt intake for South Africa, selected conditions are presented in Figure 6.6. Stroke was the leading cause of death followed by IHD, hypertensive heart, kidney disease and stomach cancer. As it can be seen here, kidney

disease is shown to be increasing slightly, while stroke, IHD and hypertensive heart are decreasing. Stomach cancer has remained level throughout the period.

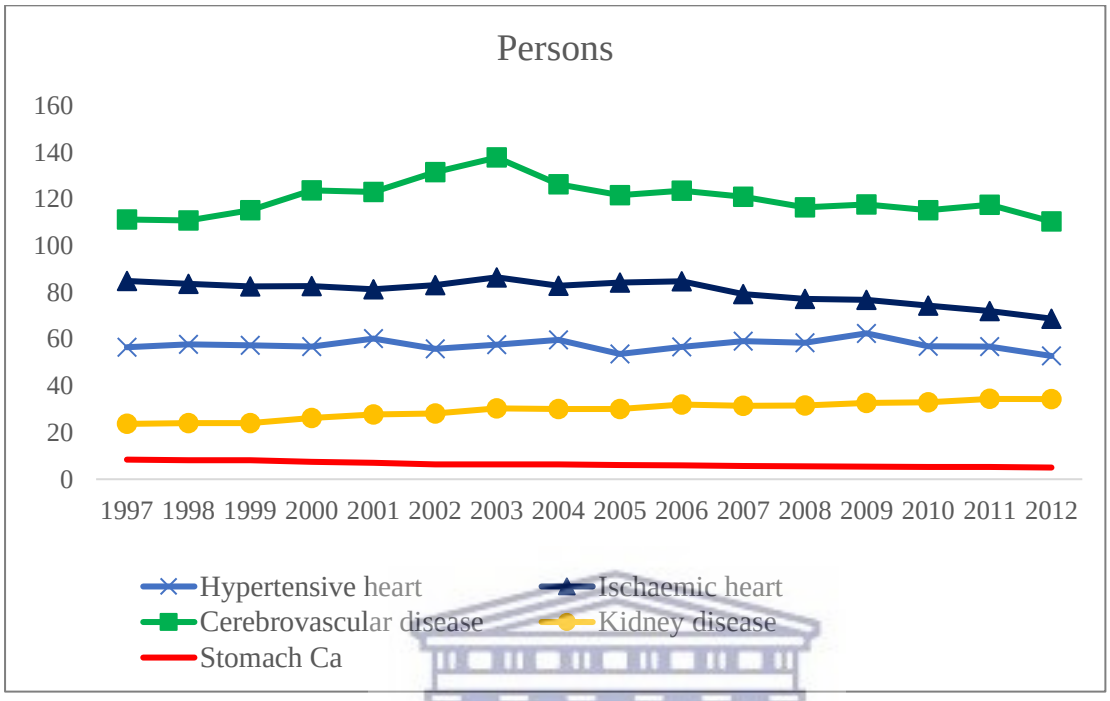


Figure 6.6. The mortality trend related to high salt consumption 1997–2012, South Africa

In Figure 6.7, the Age Specific Death Rate related to high salt consumption for males and females in South Africa, is presented. The rates are higher for females compared to males. Hypertensive heart and kidney disease for males are shown to have been increasing slightly throughout the period. Stroke and IHD have been declining since 2005, while cancer of the stomach has remained level most of the time. Mortality in females has shown that stroke was the leading cause and appeared to be twice as high as IHD. As for males, kidney disease is increasing, and stomach cancer has remained constant throughout the period.

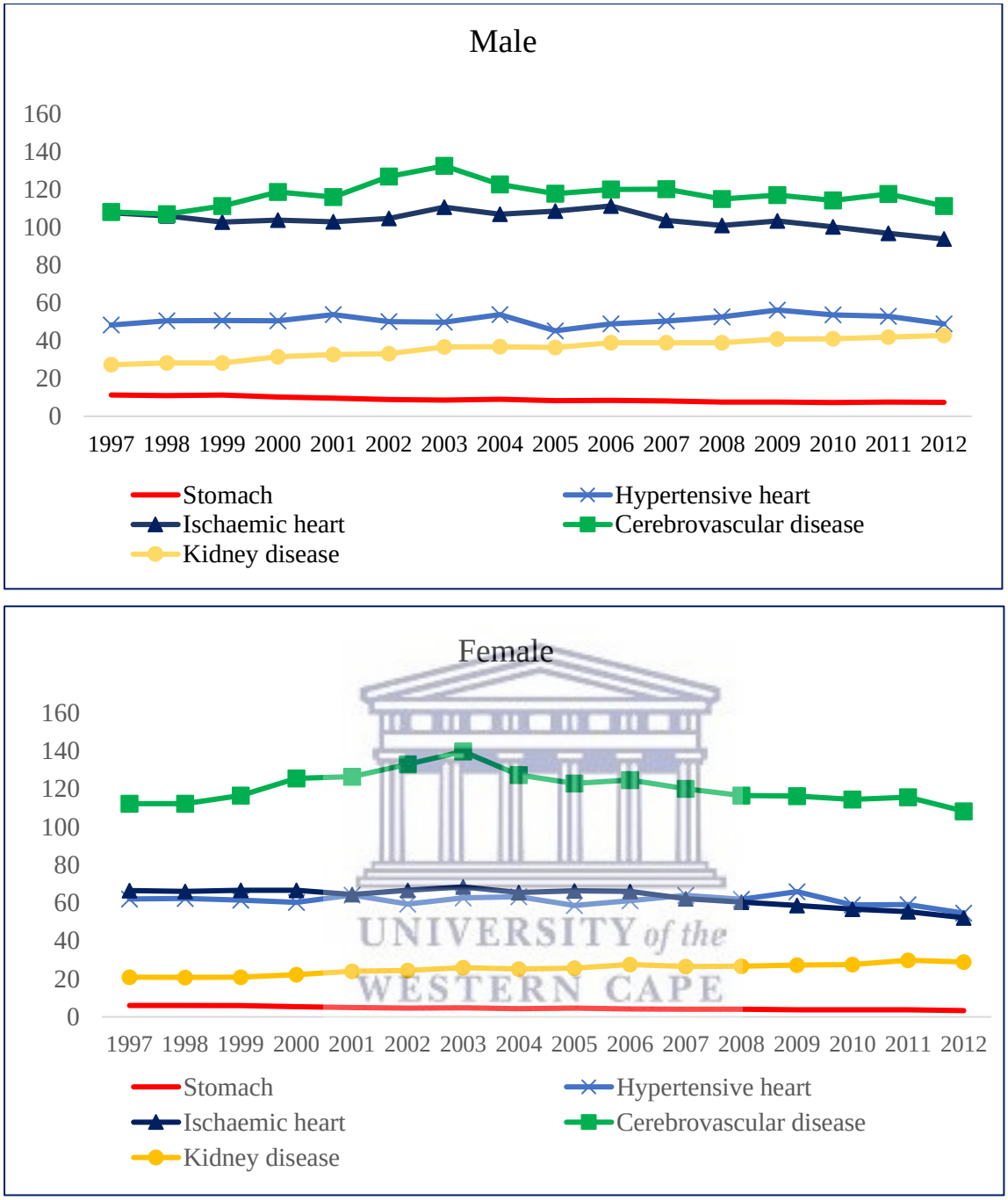


Figure 6.7. Age Specific Death Rate related to high salt consumption for males, 1997–2016

6.6 Discussion

This chapter set out to assess the potential of the newly introduced salt regulations by investigating dietary salt intake for selected urban and rural settings in 2009/10, the national trends in the prevalence of hypertension, as well as the national trend in high salt intake related

mortality. This is the first study to compare the dietary intake and sources of sodium and potassium in South African urban-rural settings. Although dietary methodology for sodium intake has limitations, these data potentially provide information about sources of sodium in the diet allowing the linking of sodium intake and foods in different populations (McLean, 2014) which can inform public health interventions to lower salt intake (Trieu, 2015). In addition, studies suggested that a combination of methods, such as the FFQ with 24-hour urinary collection or the FFQ with biomarker levels, be used to obtain more accurate estimates of dietary intakes than that of individual methods (Shim, Oh, & Kim, 2014).

The current study found that the discretionary salt intake contributed between 55 and 58% of total dietary sodium intake for both urban and rural areas studied. This is higher than 46% reported by (Charlton, Steyn, & Levitt, 2005), observed using a different methodology (three repeated 24-h urine samples). This study also found the median dietary intake of sodium was 3.5g/day in urban and 3.6g/day in rural, both higher than the level of <2.0g/day recommended by the WHO for adults (World Health Organization, 2006). Quintile regression analysis revealed no difference between the intake for males and females (p=0.276). However, the data showed a slight decline in sodium intake by age group. The median sodium intake in the 55-64-year olds was significantly lower than the 35-44-year olds (p<0.001). Overall, the median daily sodium consumption in our study sample is comparable with the wide range of values reported in other studies worldwide (Brown *et al.*, 2009; Ravi *et al.*, 2016; World Health Organisation, 2012b). Furthermore, findings from this study are similar to those reported by Charlton *et al*, (2005) on habitual intakes of sodium, potassium, magnesium and calcium in Cape Town which found the average of salt consumption ranged between 7.8 - 9.5g/day i.e. 3.1-3.8g/day sodium. A more recent study has been conducted in the North West and KwaZulu Natal provinces by Swanepoel *et al*., (2016) to establish sodium and potassium intake (based on 24-hour urine) among 3 population groups (black, white and Indian). This study found the

average sodium intake in 2017 was 122.7 mmol (2.8g/day), which is lower than the levels reported by Charlton *et al.* (2005) and the current study. This could be an indication that sodium intake in South Africa has started to decline although still high. The current study data was collected in 2009/2010 before much emphasis was put on salt reduction in the media. The decline appears to be confirmed by the World Health Organization Study on Global AGEing and Adult Health (SAGE) conducted in 2016 which found a median salt intake of 6.8g/day (2.7g/day sodium). In addition, the intake in younger individuals (18-49 years) was significantly higher than in older adults (50+years) i.e. 8.6g/day (3.4g/day sodium) vs 6.1g/day (2.4g/day sodium) ($p<0.001$) (Ware *et al.*, 2017). However, unlike our study based on single urban and rural communities, this national study found that urban participants had a significantly higher sodium intake compared to rural populations (7.0g/day (2.8g/day sodium) vs 6.0g/day (2.4g/day sodium); $p = 0.033$). It is interesting that this echoes the findings on tobacco which also found that the PURE communities do not display the usual pattern.

Potassium intake was found to be insufficient (WHO recommends 4,700 mg/day) for both the urban and rural residents in our study, with no statistical difference (1.7g/day vs 1.8g/day) ($p=0.248$). The median intake of potassium was different for males and females but did not reach statistical significance ($p=0.066$). Females in urban area consumed a median of 1.8g/day, while males consumed a median of 1.6g/day. In rural area, females consumed more potassium (1.8g/day) than males (1.7g/day). The median intake potassium in the 55-64-year olds was significantly lower than the 35-44-year olds ($p=0.007$). Few studies have reported on potassium intakes. Charlton *et al.* (2005), reported an average mean potassium intake of 3.0g/day for Black, 2.1g/day for mixed race and 2.5g/day for White people in Cape Town. Swanepoel *et al*. (2016) reported lower average potassium intake of 33.5mmol (1.2g/day) in North West and KwaZulu Natal provinces. Compared to the intake in rural Nigeria, the

observed potassium intake of 5.6 g/day based on 24-hour urinary excretions (Ejike & Ugwu, 2012) appears to be higher than the potassium intake in South Africa.

The ratio of Na:K in this study is 2:1 which is twice the recommended ratio of 1:1 by the WHO (World Health Organisation, 2012b). The high sodium and low potassium intake is worrying since it has been established that they both contribute to raised blood pressure and the development of NCDs (Cappuccio *et al.*, 2000; He & MacGregor, 2009). The multi-country PURE study that assessed the association of urinary sodium and potassium excretion with blood pressure, found a strong and linear association between the estimated sodium-to-potassium ratio and systolic blood pressure ($P<0.001$ for trend) and between the sodium-to-potassium ratio and diastolic blood pressure`(Mente *et al.*, 2014). Furthermore, they found that the highest blood pressures were observed in the group with the highest estimated sodium excretion.

The dietary data shows that maize, bread and samp and beans were the common staple foods eaten in both communities of our study. Chicken was the most commonly consumed source of protein in both communities. Bananas (about 70%) and oranges (about 60%) were commonly consumed fruits. With the exception of cabbage, vegetables are eaten infrequently in both communities. However, the urban participants reported some diversity with more than 40% consuming carrots (58.5%) and pumpkin (47.7%). Furthermore, the most common source of sodium intake in these communities include bread and margarine, followed by sausages (different types in the urban and rural settings).

Food sources with high sodium content are not eaten frequently. However about, 88% of adults in urban and 84% in rural areas reported that they add salt to their food at the table, indicating that the use of discretionary salt is a common practice in this population. For potassium, milk, coffee, tea, bread and oranges are the commonly consumed foodstuffs that provide potassium in both areas. However, there are difference in the quantities of these food

items consumed. Tea and coffee have lower potassium content per 100g but are consumed in relatively large quantities. Spinach, other green leafy vegetables and raisins which contain high amounts of potassium, were consumed infrequently in both settings (data not shown).

The common use of discretionary salt is a concern. The high quantity and frequency in our study is fairly higher than the 80% reported from the study which assessed knowledge, attitudes and practices about salt among Ghanaians and South African adults (Menyanu *et al.*, 2017). They reported that South Africans have poor knowledge related to the adverse effects of salt on health (Menyanu *et al.*, 2017) and the lack of awareness as about the correct amount of daily salt requirement has been reported before (Charlton, Steyn, & Levitt, 2005; Eksteen & Mungal-Sing, 2015). Individuals who know about the health effects of excess salt in the diet have been shown to be more likely to reduce their salt intake (Menyanu *et al.*, 2017; Wentzel-Viljoen *et al.*, 2017). It has been demonstrated that a mass media awareness campaign to increase to reduce discretionary salt use can influence this behaviour. The before and after surveys conducted in the suburbs of Gauteng, Eastern Cape and KwaZulu-Natal showed a significant increase in participants who reported that they were taking steps to control their salt intake (38% increased to 59%) (Wentzel-Viljoen *et al.*, 2017).

Deaths directly related to hypertension (hypertensive heart and kidney diseases) have increased over the study period. In addition, an increase in the prevalence of hypertension was observed in this study. The prevalence of hypertension for 2016 has doubled since 1998 to 2016, as well as for urban and rural. In addition, prevalence of hypertension in both sexes was high throughout the study period. The increase in prevalence of hypertension with little improvement in mortality, signals the enormous future burden of NCDs that can be anticipated in the country. In 2016, the prevalence of hypertension was 45%, with 46% of females, indicating that the salt regulations are timely. The possible reason for the increase in hypertension, may be the influence of urbanisation, adapting to western lifestyle such as

consuming more salt and other factors (Steyn, Bradshaw, Norman, & Laubscher, 2008). Cultural and spiritual beliefs and practices that encourage the use of salt, however, will make it challenging to change behaviours on salt intake (Delobelle *et al.*, 2016; Eksteen & Mungal-Sing, 2015). For example, in some cultures salty water is used to induce vomiting which is intended to cleanse the body system. It is possible that formal education plays an important role in health education and will need to be addressed as part of a salt reduction strategy. For example, Steyn *et al.* (2008), conducted a study to identify the groups of patients with high prevalence and poor control of hypertension in South Africa. The study found among other things, high risk of hypertension was associated with low level of education.

An intervention to lower salt consumption in the general population ought to result in a substantial reduction in the prevalence of hypertension (Asaria *et al.*, 2007; Cook *et al.*, 2007; Gaziano, 2007). For example, Cook *et al.* (2007) conducted a randomised controlled trial of hypertension prevention (TOHP) to examine the long-term effects of reduction in dietary sodium intake on cardiovascular disease events after 18 months (TOHP I) and after 36-48 months (TOHP II). The study found that participants with prehypertension allocated to a sodium reduction intervention had a 25-30% lower risk of cardiovascular outcomes in the 10 to 15 years after the trial. A comprehensive review to analyse the impact of the salt reduction programme (voluntary reformulation, labelling and health promotion campaigns) in the United Kingdom showed a 15% decrease in the salt intake between 2000-2011. This reduction is reported to be equivalent to a decrease of 2% per year since the commencement of the salt reduction programme (He, Brinsden, & Macgregor, 2014).

With the high level of discretionary salt intake reported in this study, it is crucial that health education messages are disseminated to encourage individuals and populations to decrease the level of salt intake. This may positively influence individuals to take actions as it has been reported that, individuals who know about the health effects of excess salt in the diet have been

shown to be more likely to reduce their salt intake (Nasreddine, Akl, Al-Shaar, Almedawar, & Isma'eel, 2014). Knowledge of hypertension may influence both salt intake and self-care behaviours such as taking medications, checking weight, improve diet and sodium restrictions, seeking medical attention and social support (Gary, Payne, Mathunjwa, & Yarandi, 2007).

Interventions to reduce sodium intake will need a wide focus and varied approaches to reach all sections of the population. Although it has been reported (Peters *et al.*, 2017), that about two thirds of targeted processed food in South Africa have reached a sodium level at the legislated limit, because of a high level of discretionary salt intake, legislation around processed food alone will not be sufficient to reduce salt intake. Consumer education to increase awareness of the dangers of high salt consumption, as suggested by (Wentzel-Viljoen *et al.*, 2017), is essential to change behaviour and reduce sodium consumption. To increase potassium intake, promotion of a diet high in potassium such as eating fruits and vegetables daily should also be encouraged. In addition, fortification of food products with potassium in South Africa should possibly be investigated. In addition, with salt reduction legislation, South African food industry have an opportunity to achieve its target as set out in the strategic plan, since it has been reported that about two thirds of targeted processed food in South Africa have reached a sodium level at the legislated limit (Peters et al., 2017).

6.7 Monitoring and population data

For effective public health efforts to reduce salt intake, it is essential to assess the actual salt consumption in the normal population. Strict yet practical targets and timelines then need to be set and adequately monitored and evaluated. The ideal time or duration for intervention trials reported in the literature is between 5 weeks for normotensives and 4 weeks for hypertensives (He & MacGregor, 2002). However, it would be important to track longer term effects in a population wide initiative.

Tracking salt intake in the population is very challenging due to the high costs of measuring 24-hour urine and dietary intake, limited national health surveys, paucity of food tables, lack of measures for added salt, lack of suitable tracking and accountability for local foods, restaurant foods, and foods from street vendors (Maalouf *et al.*, 2013; Peters *et al.*, 2017). Similar challenges were reported in India (Choudhury, 2013). Further challenges include problems with frequency (interval) of surveys, and non-standard questions that reduce reliability of data.

When tracking salt intake in a population it is important that sample is representative of the population and should for accuracy collect a 24-hour urine excretion is required. Collecting for a representative sub-sample would reduce the cost and logistical challenges. Since it is not ideal to monitor salt intake using dietary questionnaires, one could relatively easily include "intention to change" questions in a national survey to provide some indication about behaviours.

It is difficult to interpret the trends in mortality to monitor the impact of legislation, because of multiple risk factors influence on some of the causes of death. The decline in mortality seen from stroke and IHD may be because of other interventions such as tobacco legislation. Interventions should focus on hypertensive heart disease and possibly kidney disease. It is therefore very important to be able to monitor population-based trends in high blood pressure/hypertension.

Tracking the prevalence of hypertension is an essential component of the NCDs surveillance and contributes to an understanding of the effectiveness of salt legislation. It is noteworthy that, much of the data available on hypertension prevalence comes from national surveys. These surveys provide prevalence estimates based on varying definitions and data collection methodology. It is critical to ensure that standardised methodologies are used for such data.

Sentinel surveys may also be useful where the resources for national sampling are lacking. Alternatively, routine NCDs surveys could be modified to include questions about salt usage.

To monitor the implementation of the regulation, it is also important to regularly update food composition tables and conduct food store surveys. Since it is not feasible to monitor every food product on the market, the Centre for Disease Control recommends a system of sentinel food surveillance. This will involve selecting a list of processed foods and a complete nutrient profile for each product listed and to provide baseline assessments for sodium consumption.

6.8 Study limitations

The lack of national data on sodium intake makes it difficult to evaluate the impact of the salt legislation. However, small-scale studies on the prevalence of salt intake provide an indication of salt intake in a feasible way. This data can be used to derive a country's estimates on salt intake. Another limitation of this study relates to the use of dietary method to assess sodium and potassium intakes. This method potentially under-estimates dietary salt consumption due to underreporting of food intake as reported in other studies (Nasreddine, Akl, Al-Shaar, Almedawar, & Isma'eel, 2014; Newson *et al.*, 2013; Papadakis *et al.*, 2010). A relative overestimation of foods that are perceived as socially desirable (and related nutrients) may also occur (Michels, Welch, & Luben, 2005). Added salt is often not included due difficulty in its quantification (Gemming, Jiang, Swinburn, Utter, & Mhurchu, 2013; McLean, 2014; Wentzel-Viljoen *et al.*, 2013). In this study data were collected on frequency using discretionary salt but assumptions needed to be made about the quantity taken. Information about sources of sodium in the diet as measures of diet change over time (Trieu, 2015) can inform public health interventions to lower salt intake. In addition, dietary assessment allows the linking of sodium intake and identification of foods associated with high intake in different populations (McLean, 2014). The 24-hour sodium urinary excretion methodology is considered to be the gold standard because it provides more accurate measurement of salt intake. However, it is costly

and is burdensome on participants which in turn may influence the response rates (McLean, 2014; Trieu, 2015).

Study limitations on measuring the trend in the prevalence of hypertension include the use of several surveys with different methodologies. Standardised methods of sampling, measurement and quality control could not be ensured. The two selected areas (PURE data) may not be generalisable to all urban and rural settings. Nonetheless, the median intake of sodium were comparable with other studies.

6.9 Conclusion

The message is clear that daily sodium consumption exceeds the WHO's recommended amounts for individuals in our study setting. Both sodium intake and hypertension rates are high in rural as well as urban areas, an important factor for planning interventions. Population-level interventions for dietary sodium reduction have the potential to result in population wide reductions in salt intake. It has been argued that multi-component (more than one intervention activity) intervention activities of a structural nature (e.g. food product reformulation), are important and can have an impact amongst males. Surveys provide limited demographic and disaggregation and trend analysis, but they lack standard definition and are not regularly conducted. Therefore, there is a need to standardise the definition of hypertension indicators and apply a robust methodology to ensure uniformity across all monitoring frameworks. Surveillance systems need to be strengthened to enable monitoring of the target set.

The findings of this study have shown that it is too early to assess the impact of the salt reduction legislation. It is not clear if the recent salt reduction legislation has started to show its effects yet. Although data for sodium intake was collected during 2009/10, data on trends in prevalence of hypertension was collected between 1998 and 2016, while data on trends in mortality related to high sodium intake was collected between 1998-2012. These data show more of a level pattern throughout the period.

Regulation is only one aspect of the process to ensure an adequate salt reduction strategy for South Africa. The issue of discretionary salt added during domestic food preparation and at the table will require an active and intense public education initiative, which was conducted in 2013 in collaboration with the NDoH and the South African Heart and Stroke Foundation. Health professionals and members of the health research organisations can also play an important role in this initiative.

Encouragingly, there is a suggestion that on understanding the potential harms of high sodium intake, people are prepared to change their behavior and reduce their sodium consumption (Newson *et al.*, 2013; World Health Organization, 2012). A focused strategy on health education and awareness to reduce the frequency and amount of salt added during cooking, and increasing more general awareness of improving dietary habits, is required. This needs to be customised for urban and rural settings.

CHAPTER 7: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

The purpose of this research was to review available policies for reducing risk factors for chronic NCDs and to explore the role of population-based data in supporting environmental and policy approaches to prevent NCDs. The thesis also examined whether there are differences in urban and rural settings in the implementation of tobacco control and salt reduction. It also assessed how well these policies match evidence-based WHO recommendations. Barriers and successes of the implementation of the National Strategic Plan for prevention and control of NCDSs were also explored in two provinces of South Africa. In addition, we assessed the availability and quality of data measuring the NCDs risk factors and mortality. This was done to evaluate the impact of policy approaches to reduce the NCDs burden by analysing population trends for the two cases studies: tobacco control and salt reduction.

7.1.1 Tobacco control

Key findings of component one of this study show that South Africa has made considerable progress in the fight against tobacco use. A timely and coordinated response to NCD was observed, with tobacco control policies being implemented since the early 1990s (Table 5.1). This research has shown that since the introduction of tobacco legislation over 25 years ago, the prevalence of smoking has progressively been decreasing. The decline has been more noticeable in males, particularly individuals 35–44 years. Similar to the decline in the prevalence of smoking, the study found that mortality from smoking related causes such as lung cancer, IHD and COPD, declined. The consistency between the two data sources may be the evidence of the real impact of the tobacco control policies.

The tobacco environmental assessment found differences between the urban and rural communities studied, with disparities in education level, income and access to media. Despite,

these differences, the tobacco control policies have impacted on both communities in our study in such a way that all cigarettes packages have health warnings and no visible tobacco adverts were observed. Breaches in implementation of the regulations were observed with the sale of single cigarettes and some differential gaps in the enforcement were observed, with cigarettes being accessible to people <18 years in the rural area. However, despite low income levels in both communities, cigarettes are easily accessible in both settings and to some extent affordable, with no difference in the prevalence of smoking in the two settings. This research did not investigate the actual amount of cigarettes smoked in the two settings. Given the differences in income levels or in socioeconomic status, it is possible that the quantities smoked differ.

The macro level tobacco control policies are clearly having an impact at the micro level, both in the urban and rural setting. However, sizable numbers of people still smoke tobacco and of major concern is the fact that the prevalence of smoking has remained constant for males 15-24 years at about 20%. There has been little decline among females, but the prevalence for this group is much lower. It is clear that tobacco control remains an important public health priority in the country.

The WHO FCTC provides the international legal foundation for countries to implement measures for tobacco control. Several studies have reviewed the progress in the implementation of selected demand-reduction measures for tobacco. The findings suggest that progress is slow and there is still much work to be done in South Africa (Gravely *et al.*, 2017; Hussain *et al.*, 2016; Spires *et al.*, 2016).

The paucity of policy monitoring and evaluation data highlights the strong need for evidence systems to track the progress and effect of policy implemented and the full range of WHO FCTC policies and guidelines (Alwan *et al.*, 2010; Gravely *et al.*, 2017). Alwan et al. (2010) suggest that the ideal situation would be to conduct regular national standardised surveys

including indicators, questionnaires and age groups, preferably every five years (World Health Organisation, 2012d).

7.1.2 Salt reduction

South Africa's salt reduction policy contains two components, 1) Mandatory regulation of maximum salt content in selected commercially produced foods; and 2) An informational/media campaign to reduce discretionary salt use (Hofman & Lee, 2013). Because of South Africa's high discretionary salt intake, and the new finding from this study of 55% to 58%, (caution when interpreting this data due limitations) it is important that salt reduction legislation be accompanied by awareness campaigns and health education.

When evaluating salt reduction, this study identified high sodium intake but may be declining slightly in both urban and rural settings. The study also found that people consume sodium most commonly from bread, margarine and sausage. Although there were some differences between the urban and rural diet, there was no difference in the median average daily sodium intake which was 3.5g/day in both settings. This is very high compared with the recommended amount of 2g (World Health Organization, 2006, 2011). Based on dietary intake data, the sodium intake that is reported here can be expected to understate the actual intake because discretionary salt was not measured. Since discretionary salt is consumed by the majority in both settings, it suggests that salt legislation alone will have only partial impact. However, if accompanied by health education to influence the amount of salt used in cooking and address the high use of discretionary salt, it can be expected to yield the desired results. Mass media campaigns is an effective tool for strategies to reduce the consumption of discretionary salt intake among the South African population and have a potential to effectively increase knowledge and awareness of dangers of high salt consumption (Wentzel-Viljoen et al, 2017). Pre and post intervention reported that more participants stated that they were taking steps to control their salt intake.

Reducing hypertension is a major aim of the new regulation. This study found an increase in the prevalence of hypertension in both sexes throughout the period. In 2016, hypertension was present in 45.0% of the population in South Africa (males: 44.0% vs. females: 46.0 nationally). Among males, the prevalence of hypertension was much higher in urban than in rural areas (45.4% versus 40.1%) whereas among females this difference was smaller and nonsignificant (46.5% versus 43.9%). The prevalence varied by setting and was higher in the urban setting for males and females. The prevalence for 2016 has doubled since as well as for the urban-rural settings. In addition, mortality from NCDs remained level throughout the study period except for hypertensive heart disease which has been increasing since 2006. There has been a slight increase in kidney disease. It was challenging to apply the prevention framework to evaluate the impact of salt reduction as a result of the contribution of other risk factors for hypertension and related mortality, making it impossible to determine the impact without population-based data on salt intake. Nonetheless, it is clear from the community data that the recent salt reduction legislation has not started to show its effects and the national trends in hypertension may indicate that there has been an increase in sodium intake in recent years due to the fact that risk factors are increasing in South Africa (Mayosi *et al.*, 2009) as a result of rapid urbanisation and dietary environmental changes.

This study found that the intake of potassium was low in the selected study areas. This is consistency with the findings by (Charlton, Steyn, & Levitt, 2005) who reported that potassium consumption may be insufficient due to the low availability of fruit and vegetables (Noubiap, Bigna, & Nansseu, 2015). Hence, this suggests that it will be important for the health education efforts to include information which promotes a higher intake of potassium from food sources., it plays an important role in reducing hypertension. The implications of these findings are that 24-h urinary collections should be used to collect information on sodium and salt intake in a population.

7.1.3 Implementation of NCDs policies in South Africa

The NSP, which was introduced in 2013, provides the road map for addressing NCDs in South Africa. The plan was developed in response to local evidence showing the rising burden of NCDs and the push from global commitments such as the UN political declaration on NCDs. The overall objective of the plan is to reduce exposure to risk factors and NCDs burden. The plan is well developed with the "best buy" identified by the WHO and has set targets for 2020. Multiple stakeholders were involved in the development of the plan.

National preventive strategies are crucial to reducing NCDs, but, the NSP fails to clearly spell out specific activities/direction that will ensure the targets are met. Furthermore, there was neither an implementation plan nor budget accompanying the plan from either the NDoH or the provinces included in this study. Ideally, policies and strategies should be launched with an implementation mechanism and financial support. This research found that the process of developing the NSP lacked these crucial components, thereby contributing to challenges faced by the implementers (District managers).

Furthermore, the study shows that the implementation of the NSP has not been uniform. In the comparison between two provinces, the study found that one province was very slow to adopt the guiding principles of the strategy. This appears to be due to lack of leadership buy-in, and lack of implementation skills within the province. In the other province, existing mechanisms, such as strong collaboration with researchers, academics and NGOs, made it easier to adopt and move forward with planning. Interventions to prevent NCDs have been on the agenda of this province for some years through the Burden of Diseases Reduction project (Narain *et al.*, 2011).

This study found that robust health programmes and policies were often absent at municipal/district level. The complexity and weaknesses in intergovernmental structures of the three spheres, which create an intricate co-operative governance system, were observed and,

thus, suggest constraints to implementing an adequate response to chronic diseases. Similar findings were reported by Samb et al. (2010) who identified aspects of governance such as weakness in governance processes as constraints to implementation. Participants at this level admitted having not seen the strategic plan and were operating according to out-dated treatment guidelines. This could be attributed to disjointedness in activities across the levels. The researcher is not aware of findings of similar context (three sphere), however political will and full commitment from all levels may be crucial.

These findings suggest that implementation of policies is complex and therefore need full support from the NDoH through coordination and proper communication. Furthermore, Bonita et, al, (2013) suggested that effective interventions require full support from the highest level of government and local government in their implementation. In this study, it was highlighted that many countries experience more or less similar challenges when implementing policies (areas that need more action). For example, Moosa et al., (2017) evaluated the Primary Health care (PHC) outreach teams and found that they struggled with leadership challenges, similar to the findings in this study. When looking at governance, Bosu (2012) suggested that weak governance hindered the implementation process (Bosu, 2012; Moosa *et al.*, 2017). Furthermore, goodwill and commitment of actors were some of the enablers for effective implementation (Mosquera *et al.*, 2014).

As South Africa moves towards the end of the timespan of the NSP and starts to update it, it would be important to create targeted messages that prioritise a small set of outcome-oriented objectives within the health sector. Our review of tobacco control in the country highlights considerable gaps in enforcement and regulation while our review of salt reduction policies has highlighted the critical importance of increasing awareness about the dangers of excessive salt consumption and the required amount in simple language that could be understood by people with low levels of education. It would be ideal for these aspects to address in the new

NSP. Several other policy interventions that are being considered include restriction of smoking in a car with miner under 12, Ban of sale of liquor on Sundays and ban advertisement of unhealthy food to children.

7.1.4 Policy interventions for the prevention of NCDs in South Africa

This study has documented the considerable progress that had been made from 1993 to 2013 in formulating, adopting and implementing policy on NCD prevention and control in South Africa. Table 7.1 presents the key elements of the introduction of tobacco control, salt reduction and NSP using the policy analysis framework of Walt & Gilson (1994). Application of the Kingdon theory suggests that there were "policy windows" for the tobacco control and salt reduction legislations that were introduced in 1993 and 2013 respectively. In both these cases, the "problem stream", the "policy stream" and the "politics stream" came together.

Table 7.1 Policy analysis of tobacco control policy, salt reduction legislation and National Strategic Plan (NSP)

	Tobacco control policy	Salt reduction legislation	NSP (national Strategic Plan)
Context	The beginning of the new democratic government (ANC) in 1994 provided a window of opportunity from political stream for tobacco control policy which saw the introduction of comprehensive tobacco control policies to address the growing epidemic of tobacco use in the country in 1993. Prior to 1993, historical, political and socio context of tobacco control were characterised by lack of government interest because the government had close ties with the industry. With the political transition underway, it appears that the tobacco industry interests had not been able to sway the new government. Several incremental legislations have been amended between 1993 and 2009. Policies include taxation, comprehensive ban on advertising and promotion of tobacco products, banning of smoking in public places and workplaces, health warning labels on cigarette boxes, better consumer information and communication including media campaign.	The findings revealed that the development of the salt reduction legislation was triggered by several events including international pressure which coincided with local evidence on salt consumption and foods contributing to high salt intake. Salt reduction was identified by the WHO as a best buy for public health effort. A call made by the UN High level meeting in 2011, to reduce premature mortality from salt intake by 30% by the year2025. (World Health Organization, 2013) the call emphasized the need for member countries to develop strategies to reduce salt reduction to combat the NCD prevention burden.	Similar to the introduction of salt legislation. The development of the South African Strategic Plan for Prevention and Control of NCDs was triggered by an urgent call made by the UN High level meeting in 2011, to reduce premature mortality from NCDs by 25% by the year 2025. (World Health Organisation, 2013) which emphasizes the need for member countries to develop National NCD prevention policies to combat the challenge.
Content	Tobacco control policies address the WHO "best buys 'which are considered cost effective (World Health Organisation, 2011). Currently the legislation is almost compliant to the WHO FCTC. South Africa ratify to the framework in 2005. However, at the time that South Africa introduced the policy, it was still	Policies address the WHO 'best buys' which are considered cost effective (World Health Organisation, 2011) and have the strongest evidence and the highest likely magnitude of health effect through a whole-of-government approach (Watkins et al., 2017). A modelling study showed the feasibility	The Disease Control Priorities (DCP) project that supports the use of economic evaluation for priority setting has consistently stressed the importance of intersectoral action for health and the feasibility of intersectoral action in LMICs. The 3rd Edition, DCP3, has identified 29

	based on the harms of tobacco rather than on evidence base on cost-effectiveness.	of the proposed strategy and predicted that if a reduction in sodium content of bread by 50% along with margarine, soups and gravies would decrease salt intake of 0.85g/day resulting in mortality from NCDs and save health cost.	modifiable behaviour and environmental risks that can be tackled through intersectoral approaches that have been reviewed and determined to have the strongest evidence and the highest likely magnitude of health effect through a whole-of-government approach (Watkins et al., 2017). The policy tools include taxation, regulatory and information and education. (Watkins et al., 2017). The development of the NSP was collaboratively within the NDoH through various consultations with other relevant health stakeholders, academics and other sectors to ensure common understanding and feedback. The plan is comprehensive, based on "best buys" and existing national policies and strategies, and is aligned with the WHO plan. South Africa has identified that a multi-sectoral approach is a cornerstone of NCDs prevention.
Actors	The introduction of the South African tobacco control policy can be largely attributed to strong and consistent lobbying. Lobbying groups included, the Tobacco Action Group, the Cancer Association of South Africa (CANSA), National Council Against smoking and the Heart Foundation of Southern Africa	The Minister of Health, Dr Motsoaledi, has been sensitized to the NCD burden and has been seeking cost-effective interventions. He supported the NDOH in engaging the industry and has played an important leadership role in the adoption of	The Minister of Health, Dr Motsoaledi, has been sensitized to the NCD burden and has been seeking cost-effective interventions. He supported the NDOH in engaging the industry and has played an important leadership role in the

	(HFSA), the Medical Research Council and civil society. In addition, the Minister of Health then, Dr Dlamini-Zuma, a medically qualified doctor, was convinced by the harms of tobacco and took on a bold role in leading tobacco control.	population wide interventions. For salt reduction, lobbyists included, civil society, NGOs, PLWNCDs eg, Soul City, Heart and Stroke Foundation South Africa, Academic, different national departments, Salt Watch, etc. (National Department of Health, 2013).	adoption of population wide interventions. For salt reduction, lobbyists included, civil society, NGOs, PLWNCDs eg, Soul City, Heart and Stroke Foundation, Academic, different national departments, Salt Watch, etc. (National Department of Health, 2013). The Minister of Health, Dr Motsoaledi, has been sensitized to the NCD burden and has been seeking cost-effective interventions
Process	Committed group of advocates who assess the needs, advocated for action and assisted with development of national policy and planning. International collaboration took place to provide political and technical support during the process of drafting and reviewing the policy until endorsement.	South Africa was the first country to globally to develop mandatory legislation to reduce salt intake. Policy direction was influenced by the original data on salt intake pattern and cultural practice related to salt use. The NDoH led the process by having consultations with food industry. This was followed by invitation to academics and international experts, NGOs and other stakeholders to start a series of consultation with food industry which began with the baking industry followed by other procced food.	The national Minister of Health has taken the lead to mobilise multi-sectoral response to NCDs, signaling high level political mandate. In addition to participation in global meetings, he supported the NDoH's two-day national NCDs Summit on the 12-13 September 2011 in Gauteng. Committed advocates who assessed the needs, lobbied for action and assisted with development of national policy and planning provided technical support. Followed the steps outlined by Epping-Jordan et al, 2005. Strong communication in the development but lack of implementation plan and limited subsequent communication.

When assessing problem stream, there has been awareness of the impact of NCDs there for a long time, even in the early 1990s when it was recognized that tobacco use was causing harm to the population. Due to the emergence of HIV/AIDS, however, the country went through a period when NCDs got much less attention. It appears that salt reduction legislation was driven by the high level of awareness of re-emergence of NCDs, the high prevalence of hypertension in the country as well as the international drive on reducing NCDs.

The politics stream encompasses the engagement by the key health professionals and stakeholders for specific policy recommendation. The introduction of the South African tobacco control policy can be largely attributed to strong and consistent lobbying from, the Tobacco Action Group, the Cancer Association of South Africa (CANSA), National Council Against Smoking and the Heart Foundation of Southern Africa (HFSA), the Medical Research Council and civil society. In addition, the Minister of Health then, Dr Dlamini-Zuma, played a significant role to make sure tobacco control policies were implemented. With salt reduction legislation, the Minister of Health, Dr Motsoaledi, has been sensitized to the NCD burden and has been seeking cost-effective interventions. The awareness of the availability of cost-effective interventions was a huge motivation for developing salt reduction legislation. In the case of salt legislation, the policy stream provided much information about the multisectoral approach and best-buys approaches. This was largely absent in the case of tobacco control as there was a limited evidence base around policy wide interventions at that time.

Clear successes for NSP included increased recognition of NCDs as a major problem that required engagement of different actors and sectors in prevention and control of NCDs in South Africa. The presence of multisectoral structure to oversee NCD policy agenda beyond the health sector has proven successful in one of the provinces in our study. Other success factors included collaboration with the academic and researchers. As another province had yet to establish this structure at the time of interview. Barrier to multisectoral activities included lack

of implementation guideline which seem to be problematic to one of the provinces hindered the process of implementation.

The prevention and control of NCDs requires a shift towards population wide strategies that address major NCD upstream factors. Lessons from the introduction of the two policies investigated in the thesis highlight the critical role of advocates together with political leadership as well as the importance of multisectoral action for effective and sustainable NCD response nationally. In the case of the implementation of the NSP, the important lesson has been to ensure a funded implementation plan. However, slow or lack of progress in addressing complex social determinants of health may be due to inadequacy and assistance for alternative science is needed (Sharma *et al.*, 2017).

7.1.5 Monitoring and evaluation of tobacco control and salt reduction legislations

It has long been acknowledged that routine information systems exist for infectious diseases as well as maternal and child healthcare, however, there is only minimal information available for NCDs and its risk factors (Swart & Panday, 2003). Massyn & Day (2013) report that the data related to NCDs collected by the District Health Information System are inadequate and difficult to interpret.

From this study, it became apparent that there are no monitoring mechanisms in place for the implemented policies. Surveillance of the major modifiable NCDs risk factors in the population is essential for programme and policy planning, implementation and evaluation. This is particularly important for South Africa, where the burden of NCDs has been increasing (Nojilana *et al.*, 2016; Pillay-van Wyk *et al.*, 2016). Bradshaw et al (2007) highlighted the country's need for "institutional capacity to collect, analyse and utilise population health data at national, provincial and local levels, and to draw on the available evidence in the process of identifying appropriate interventions."

Population-based surveys can be used to monitor the prevalence of tobacco use, dietary salt intake hypertension and the impact of tobacco control salt reduction legislations (McLean, 2014; Swart & Panday, 2003; Wandai *et al.*, 2017). Since 1998, these surveys have included information on NCDs which researchers have been able to use. It was possible to see the correspondence between tobacco use and mortality, but more challenging to interpret the mortality trends related to high sodium intake. Effective monitoring mechanisms to assess the impact of salt reduction legislation on population and health-related outcomes are needed.

To assess the prevalence of smoking, it was observed that these surveys have asked different questions when trying to obtain information on tobacco use. Some surveys ask about daily smoking while another asked about regular smoking, and some ask about current smoking. To track salt reduction and prevalence of hypertension more is needed. A number of different ways of measuring dietary salt intake are currently available including dietary (diet recall) and urinary assessment (McLean, 2014). There has been reports of challenges associated with the accurate measurement of dietary salt intake both intra and inter individual variability of salt intake is high due to high variability of dietary intake (Dyer, Elliott, Chee, & Stamler, 1997). However measuring population salt intake require a valid estimate of a range and frequency of intakes across the population using the sample that is representative of the population (McLean, 2014). It is important that the methods used provide a valid estimate of the mean population level intake. However, it has been reported that dietary assessment often under-estimates intake due to underreporting and problems to quantify sodium concentration from variety of recipes as well as discretionary salt intake. Urinary assessment is reported to be time consuming and faced with under-collection and lack of suitable methodology to accurately identify incomplete samples as well as burdensome to participants (McLean, 2014).

In addition, reliable and timely health information is essential for any public health action and system strengthening, as well as to improve evidence-based public health programming for better health outcomes.

It is challenging to monitor morbidity data. Self-report data are not reliable. However national representative heath surveys about health and related behaviours (risk factors) of people comprises a questionnaire with taking some physical measurements and blood samples, and other biomarkers can be used to collect morbidity data. Questions on specific diseases such as cancer, cardio-vascular disease and accidents are also asked, and clinical data or medical records can also be used. Therefore, it is important to emphasise that the health information system should provide data for various needs in the country, including monitoring and evaluation of policies. Sentinel surveillance has been recommended as a practical approach, of measuring sodium excretion to track the impact of the regulations.

7.2 Study limitations

This study has several limitations. In the component of the measurement of the implementation of the NSP, it is possible that the time of interview could have been too soon after the launch of the National Strategic Plan. A little more time may have given the NCDs managers enough time to develop an implementation plan. A small sample of the population was used for the study. It was not possible to secure an interview with national programme directors; a larger sample size could have enhanced the understanding of the problems and provided an additional perspective regarding the policy development and implementation processes. However, the use of a combination of desk review, field notes and semi-structured individual interviews, enhanced the validity of the research. Strategies to ensure rigour were developed and adopted based on the work of Lincoln (1985). This included the training of the researchers and practical practice in interviewing skills and data analysis. In addition, a pilot study was done to ensure adequacy of data collection and recruitment. Study limitations include the use of several surveys which has several problems in terms of different methodology used and study

robustness. Data on prevalence of smoking and hypertension was obtained from eight national surveys which were conducted at different times. Gathering quality prevalence data may be difficult. All surveys collected self-reported smoking behavior, but given the stigma attached to smoking in some communities, respondents might lie about their smoking behavior if family members are present during interviews. In addition, questions about smoking were not the same, for example SADHS asked participants if they were daily smokers, and NIDS asked if participants were current smokers, but there was no definition for current smokers. SANHANES's question was "have you ever smoked tobacco regularly"? These surveys were done at irregular intervals and after policies were implemented. Recall bias is likely to have occurred since individuals often do not remember everything. It was also observed that surveys can be compromised by data quality concerns e.g. hypertension prevalence in the 2003 SADHS as reported. The frequency of surveys has been challenging. While NDoH intended for the SADHS to be conducted every five years, this was not the case to date

The investigation into the difference in urban and rural settings relating to tobacco use and salt intake is based on two selected areas (PURE data) and may not be generalizable to all urban and rural settings. The small number of observations for the environmental aspect of the study prevented more in-depth analysis. Ideally, more than 100 people randomly selected will be needed for the study. The lack of national data on sodium intake makes it difficult to evaluate the impact of the salt legislation.

7.3 Contribution of the thesis to knowledge

The research question set out by this research has been answered. Policy interventions, in line with evidence-based cost-effective recommendations, have been widely used in South Africa to fight the burden of NCDs, with extensive use of tobacco control measures. The consistent trends in the prevalence of smoking and mortality from tobacco related causes have demonstrated the impact of tobacco control efforts. In contrast, it is too early to report the

effects of salt reduction. Despite limitations, the data from the urban and rural settings suggest that the policy wide interventions are relevant in both.

This study has provided useful information for advocating and improving the policy development process. The investigation into the implementation of NSP found that it was confronted with many challenges and few successes. The process of developing NSP was aligned with the success factors of the WHO Stepwise Framework, however, the experience at provincial level was not aligned with the Framework. The implementation of the NSP was not uniform and had unequal processes between the provinces studied with poor coordination between the NDoH and provinces. Robust health programmes and policies were generally absent at district/municipal level. The research highlights the complexity and weaknesses in intergovernmental structures of the three spheres of the government, which create a complex co-operative governance system. The study has identified the critical role of meso level organisation and resources.

While the collected data using the EPOCH tool have been included in the multi-country report (Chow *et al.*, 2017), this thesis is the first to do an analysis comparing urban and rural settings in South Africa. Although some differences were observed, the results suggest that regulatory interventions would impact in both settings.

National epidemiological data was used to assess the impact of policies. This work has highlighted that using mortality rates alone is insufficient because of the contribution of multiple risk factors to NCDs. The pathway of the health promotion framework indicates the necessity of tracking lifestyle and risk factors in addition to the mortality outcomes. This study also highlights the importance of monitoring risk factors and the NSP with standardised tools and, in the case of the challenges around reliable measurement of salt intake, it will be essential to set up designed evaluation studies to monitor the salt regulations. There should be

monitoring of salt intake (using 24-hour urine collection) of the population and monitoring the sodium content of processed foods as per the regulation.

7.4 Monitoring framework developed from this research

In planning this research, it was identified that monitoring and evaluation was missing in the ICCC framework. This body of research has identified that the process of monitoring and assessing the implementation of action to prevent and control NCD at country level, is linked with a number of challenges related to data availability, comparability, timing, and quality. Although risk factors and NCD-related data are available in in South Africa from a number of national data sources (surveys, death registration), limitations of the data, as well as the lack of comparability of some indicator definitions and the timeliness of data reporting, among others, were identified. It is clear that ways of improving the harmonisation and quality of data need to be considered, as well as alternative forms of data collection to develop a robust M &E system for prevention of NCDs.

To facilitate monitoring of NCD risk factors and the impact of policies on NCDs, a monitoring framework is necessary. The case studies in this thesis suggest that such a framework would have three domains of health information, including the determinants of health, risk factors for NCDs and health status (Figure 7.1).

The use of the EPOCH tool has demonstrated the importance of monitoring the environmental factors. A comprehensive information system should be developed but this should be limited to the key information that can provide robust sub-national data that can be used to monitor differences in the population.

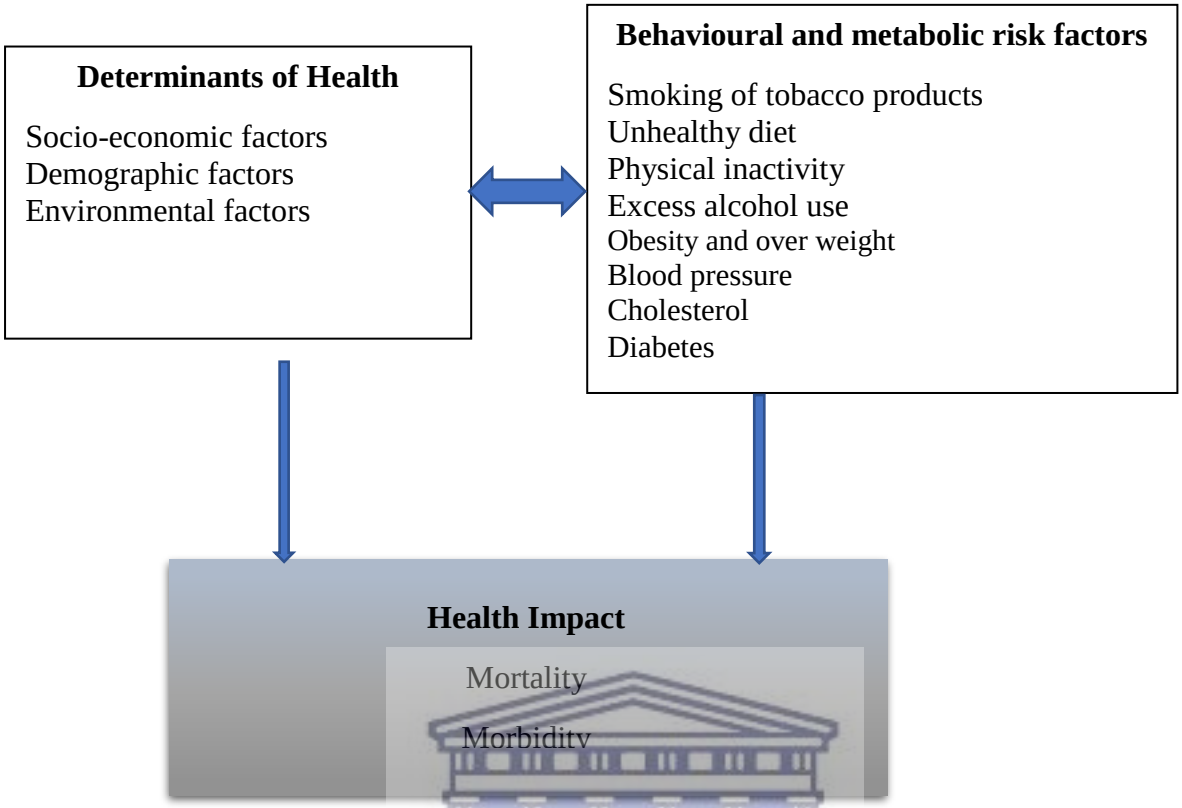


Figure 7.1. Framework to monitor NSP

7.5 Conclusions and recommendations

Tobacco control has been in place for many years but there are gaps, and concerns about enforcement. Despite the decreased rates of smoking and consequent reduction in some of the tobacco related mortality, there has been a lapse in the efforts to reduce tobacco use. It is important to note that some NCD causes, which didn't show any changes, may be influenced by other risk factors such as hypertension. The reduction in tobacco related mortality is only seen among males and may indicate that the tobacco control efforts do not reach females or maybe females who smoke are only starting to be reported now as females are increasingly adopting smoking.

The paucity of policy monitoring and evaluation data highlights the strong need for surveillance to track the progress and effect of policy implemented and the full range of WHO

FCTC policies and guidelines (Gravely et al, 2017). Alwan et al (2010) suggests that the ideal situation would be to conduct regular national surveys including standardised indicators, questionnaires and age groups, preferably every five years (World Health Organisation, 2013a). Specific recommendations include:

- South Africa needs to improve enforcement efforts of legislation and fully align its policies with the FCTC. The government should continue to support the FCTC by fully implementing MPOWER elements to preserve the gains achieved and to protect against strong global marketing and trade by the tobacco industry.
- Implement all elements of MPOWER to strengthen smoking control efforts in order to sustain this and improve the fight against tobacco use epidemic.
- There is a need to investigate the factors associated with tobacco use among females and some settings and as well as young males 24-35 years that will enable the development of relevant smoking prevention and cessation.
- It might be useful to develop a focused action plan (with outcome-oriented objectives) along the lines recommended by Epping-Jordan (Epping-Jordan et al., 2005). An implementation plan led by skilled and experienced people is needed.

For effective public health efforts to reduce salt intake, it is essential to measure the actual salt consumption in the population. In addition,

- A focused strategy on health education and awareness of the dangers of salt consumption and on how to reduce the amount of salt consumption to reduce the frequency and amount of salt added during cooking and increasing more general awareness of improving dietary habits, is required. This needs to be customised for urban and rural settings.

Barriers to the implementation should be strategically addressed; this can be done through involving all the stakeholders, including the National Department of Health, policymakers/ NCDs managers in the province and district managers, throughout the development and implementation processes, to ensure their support and effective implementation of policies at all levels.

- Creation of a task team by the National Department of Health to oversee the implementation process and feedback in the initial stages at provincial level may be useful.
- Interactive follow-up workshops for managers to discuss challenges could be used as feedback and guidance for effective implementation of the strategy.
- The interrelationship among the three spheres needs attention if service delivery is to be improved.

Considering the growing NCDs burden and government's efforts to control NCDs in South Africa, NCDs risk factor surveillance should be a priority for the national health information system. As our findings suggest, efforts to control the increasing burden of NCDs in SA involve establishing adequate systems for monitoring NCDs risk factors and using these data to refine control strategies.

Monitoring and evaluation of preventive policies are critical to inform the decision makers and public health authorities with essential information. It is only through accurate measurement, that problems caused by tobacco and high salt can be understood and interventions be effectively managed and improved. Robust population surveys are needed to shed light on whether smoking rates are still declining and whether they may be attributed to current tobacco control policies or if further initiatives are needed.

- Monitoring of risk factors' prevalence and NCDs policies, is critical. Population-based national monitoring of data is necessary to effectively plan, implement and monitor policies.
- A clear assessment of the data gaps would be helpful in developing relevant policies for better monitoring of NCDs risk factors.
- It is important for SA to heighten the focus of NCDs policies and strengthen and sustain them over the next decades to combat the current NCDs burden. This will achieve a real reduction and additional rigorous measures are required to continue to address the burden of NCDs in South Africa.
- There is a need to improve cause of death information so that the reported deaths can be used to monitor trends without the need to undertake a National Burden of Disease Study.

This study has answered the research question posed and has provided useful information for advocating and improving the policy development process. The study found similar situations in rural and urban settings which have been explained in detail in chapter 5 and 6 and concluded that population wide interventions could work in both settings. Lesson learned from tobacco control legislation suggest that these policies when implemented fully can reduce NCD risk factors and therefore improve health of the population. Furthermore, the study laid the groundwork for areas of further exploration or evaluation of the extent of policy implementation in achieving the 25x25 goal in South Africa (Beaglehole *et al.*, 2012). Future research needs to focus on interventions for behaviour change in tobacco use and high salt intake.

Appendix 1 - Ethics approval

UNIVERSITY of the
WESTERN CAPE

OFFICE OF THE DEAN
DEPARTMENT OF RESEARCH DEVELOPMENT

14 December 2011

To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape has approved the methodology and ethics of the following research project by:
Mrs B Nojilana (School of Public Health)

Research Project: Policy approaches to prevent chronic non-communicable diseases: The role of population based data

Registration no: 11/10/31

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

Private Bag X17, Bellville 7535, South Africa
Tel: +27 21 959-2948/9
Fax: +27 21 959 3170
Website: www.uwc.ac.za

Appendix 2 - Permission letter for Western Cape .

Beatrice Nojilana

From:	Beatrice Nojilana
Sent:	Tuesday, April 30, 2013 4:34 PM
To:	charlene.roderick@westerncape.gov.za
Cc:	Debbie Bradshaw
Subject:	Re:request for health research
Attachments:	Beatrice Nojilana_Final_ Proposal corrected_NOVEMBER 2011.docx; guidelines_for_approval_of_health_research_in_the_western_cape 050313_SA (3) DB.doc; ethics_nojilana_11_10_31.pdf

Dear Charlene,

I hope this email finds you well.

My name is Beatrice Nojilana, ,I am a PHD student from the School of Public Health at the University of Western Cape and also I work at Burden of Disease Research Unit at MRC. I submitted a request for permission to do research with some of your staff member 03/04/2013. So far I haven't heard any response yet. The title of my research is: **Policy approaches to prevent non communicable disease: The role of population based data.**

I am writing today to enquire about the progress of my application.

I attach the proposal, request form and Ethics approval from the University of the Western Cape.

Thank you for your co-operation,
Kind regards,

Beatrice.

Beatrice Nojilana
Burden of Disease Research Unit
South African Medical Reseach Council
P O Box 19070 Tygerberg
7505

Tel +27 21 9380411
Fax +27 21 9380310

Medical Research Council of South Africa

Appendix 3 proposal summary for western cape

ANNEXURE 2 PROPOSAL SUMMARY

Name of Institution/organisation conducting research	University of the Western Cape
Name of Investigators	Beatrice Nojilana (student) **Supervisors:** Prof Thandi Puoane Prof Debbie Bradshaw Prof David Sanders
Postal Address	Medical Research Council P.O Box 19070 Tygerberg7505
Telephone Number	021 9380411
Fax number	021 9380310
Mobile Number	082 3874135
Email Address	beatrice.nojilana@mrc.ac.za
Institution which gave ethical approval	University of the Western Cape
Date of Ethical approval	14 Dec 2011
Date research expected to commence	March 2013
Proposed data collection dates at requested facilities	March 2013
Date research expected to end	Sep 2013
Western Cape Districts where research will be done: **(Please mark with an X)**	**Metro √** West Coast □ Cape Winelands □ Overberg □ Central Karoo □ Eden □
WC DOH Facilities where research will be done: **(Please list the name of the facility under appropriate category)**	**NONE**
facilities in the WC DOH where research will be done (Please specify)	**Other:** Provincial and Local Government Policy makers and programme mangers
Research title	**Policy approaches to prevent chronic non-communicable diseases: The role of population-based data**
Research aim	The overall aim of the research is to identify whether South Africa is making use of policy approaches around tobacco use and diet and how these can be monitored using population based data. This phase of the research aims to do a situational analysis to identify the policy interventions that are being used and the challenges in the implementation of policy based approaches.

Research objectives	*Objective 1* To identify and review cost-effective evaluations of population wide interventions to reduce NCDs in South Africa *Objective 2* To identify challenges and successes and the role played by health managers in the development and implementation of National Strategic Plan.
Keywords	Policy interventions, chronic non-communicable diseases.
Brief description of methodology **(Please specify estimated sample size and duration of contact with each participant e.g. interview length, clinical exams)**	***Study design*** The study involves a literature review complemented by qualitative research. A literature review will be undertaken to identify the available evidence of cost-effectiveness of population-wide interventions that could be applied in South Africa. A rapid assessment of existing policy interventions and strategies for the prevention and control of non-communicable disease in South Africa will be undertaken and key informants will be interviewed to identify the challenges that are experienced with implementation of population wide interventions. ***Sample and sampling procedure*** Purposive sampling of key informants will be employed. The informants will be selected on the basis of their role in the department of health for non-communicable diseases, and will include policy makers, programme managers and stakeholders. Informants will be selected from three levels of governance: national, provincial and municipality level. Three national government departments will be selected – the Departments of Health, Trade and Industry and Agriculture the food production and industry plays a critical role in diet. At the national Department of Health, the sub-directories for NCDs and Nutrition will be included. At provincial level – 3 provinces have been selected (Western Cape, Gauteng and Eastern Cape). A minimum of three people per section will be interviewed in each area. ***Literature review*** Cost-effectiveness evaluations will involve a literature review of published articles and reports that have modeled the cost-effectiveness of interventions aimed at the prevention of NCDs in the South African setting. A multidisciplinary journal database search for articles on NCD priority interventions will be done. Google scholar, Google, PubMed and Science direct will be used as search engines for published reports and journal articles. The initial search terms will include non-communicable diseases, health policy, health promotion, modeled interventions, economic evaluation, developing countries and South Africa. The search will be refined as the literature is identified. The interventions to be examined are those emphasize on evidence based population-wide, policy/regulation/legislation approaches. The review of current policies for South Africa will

	involve a desk review of official and non-official policy documents and legislation on the prevention and control of NCDs and confirmation of information through interviews conducted in the 3rd phase. Documents may be hard copy or electronic and may include reports, and newsletters. The South African Government Information Service website, Department of Health website, Health Systems Trust website and selected provincial Department of Health websites will be searched as well as Google scholar and Google. The publication timeframe to be searched is the since 1994, the introduction of democracy to South Africa. ***Data collection*** Data collection will involve semi-structured interviews, including confirmatory questions from the review of policies. Tape recorder and capture sheet will be used during interviews and field notes will be made. The questionnaire will be in English language only, and will be pre-tested in a local setting. Taped interviews will be transcribed immediately after interviews. Policy documents will be requested from officials during the interview. Interviews are expected to last <1 hour. ***Ethics*** The study does not pose any risk to participants. Ethical approval and permission to conduct the research has been granted by the school of public health of the University of the Western Cape for approval (Ethical approval Number 11/10/31). A consent form will be given to each person who is interviewed in the study. They will be asked to read it and if they agree to participate they will be asked to sign. Confidentiality will be maintained during the study. The information that they provide will be reported in aggregate form and kept anonymous. Pseudonyms will be used to protect participants' identities when results are reported or published. ***Analysis*** The transcripts will provide formative data from which to identify issues and experiences on current policies, strategies and population wide interventions for the prevention and control of NCDs. A set of codes will be developed from a review of the transcripts. These will be reviewed by other members of the research team, after reading the transcripts as well. The transcripts will be coded and a thematic analysis will be done with reference to relevant field notes. The research team will identify and categorize the analysis themes. To ensure consistency, a subset of transcripts will be assessed by another researcher. Data triangulation will be done. The analysis will be repetitive to identify themes. As the researcher is not experienced in qualitative methodology, guidance will be obtained from an experienced consultant. The findings from the 3 objectives will be interpreted together. ***Expected outcome***

	The study will describe the extent of the used policy based approaches and identify what challenges and realities are experienced by government officials in the implementation of population wide interventions.	
Type of Study Design: e.g. Case Control, RCT, Survey	Qualitative study	
Budget for research	R12, 000	
Source of funding for the research	Medical Research Council	
The research will have implications for the requested facilities regarding:	**Yes or No**	**If Yes what are these implications and how does your project plan to mitigate the impact**
1. Additional load on nursing	NO	
2. Support services	NO	
3. Consumables	NO	
4. Laboratory tests	NO	
5. Equipment	NO	
6. Space	NO	
7. Communications	NO	
8. Additional OPD visits	NO	
9. Admission of patients	NO	
How will the sites be prepared to participate in your research?	N/A	
Results dissemination plan **1. Tick which groups will be affected by your research findings**	1. Provincial managers √□ District Directors □ Facility manager & staff □ Patients □ Community □ Other (please specify): City managers	
2. What is the earliest date or time frame from the end of research collection that the feedback (at least the minimum requirements*) will be expected? *** Minimum research findings feedback template**	2. Within one month □ Within one to three months □ Within three to six months √□ Longer than six months □	

Appendix 4 - Permission letter for Eastern Cape

Letter to Request a Visit

Beatrice Nojilana
Burden of Disease unit
SA Medical Research Council
Student Number 2405761

Health MEC
Provincial Department of Health
Eastern Cape

20/02/13

Dear Sir/Madam

I am Beatrice Nojilana a PhD student from the School of Public Health University of the Western Cape. I am conducting a research on **Policy approaches to prevent non communicable diseases: The role of population data,** under the supervision of Professor Thandi Puoane, Professor Debbie Bradshaw and Professor David Sanders.

I am writing to request the opportunity to meet with you or your staff members during the month of March 2013 to conduct some interviews regarding policies for the prevention of non-communicable diseases (NCDs) in your province. These interviews will be conducted at provincial and municipality level. We are planning to interview one person from the province and one person form the municipality.

Your cooperation in this project is highly appreciated.

Will you please contact me at 082 3993816 or email me Beatrice.nojilana@mrc.ac.za to confirm a meeting time?

Thank you for your support of this request.

I look forward to hearing from you.

Sincerely yours,

Beatrice

Appendix 5 - Letter of approval from Western Cape

Western Cape Government
Health

STRATEGY & HEALTH SUPPORT
Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeek Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: RP 065 /2013
ENQUIRIES: Ms Charlene Roderick

Medical Research Council
P.O Box 19070
Tygerberg
7505

For attention: **Beatrice Nojilana, Prof Thandi Puoane, Dr Debbie Bradshaw and Prof David Sanders**

Re: Policy approaches on tobacco use and diet for prevention of chronic non-communicable diseases: The role of population-based data

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact the following people to assist you with any further enquiries in arranging your interview::

Unita van Vuuren	**Contact No. 021 483 3071**
Tobeka Qukula	**Contact No. 021 483 2683**
Tracy Naledi	**Contact No. 021 483 9366**
Christalin Rhoode	**Contact No. 021 483 6874**

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final report within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. The reference number above should be quoted in all future correspondence.

We look forward to hearing from you.

Yours sincerely,

DR NT Naledi
DIRECTOR: HEALTH IMPACT ASSESSMENT
DATE: 21/11/2012

Appendix 6 - Letter of approval from Eastern Cape

Eastern Cape Department of Health

Enquiries:	Zonwabele Merile	Tel No:	040 608 0830
Date:	26th July 2013	Fax No:	043 642 1409
e-mail address:	zonwabele.merile@impilo.ecprov.gov.za		

Dear Ms B. Nojilana

Re: Policy approaches on tobacco use and diet for prevention of chronic non communicable diseases: The role of population based data

The Department of Health would like to inform you that your application for conducting a research on the abovementioned topic has been approved based on the following conditions:

1. During your study, you will follow the submitted protocol with ethical approval and can only deviate from it after having a written approval from the Department of Health in writing.
2. You are advised to ensure, observe and respect the rights and culture of your research participants and maintain confidentiality of their identities and shall remove or not collect any information which can be used to link the participants.
3. The Department of Health expects you to provide a progress on your study every 3 months (from date you received this letter) in writing.
4. At the end of your study, you will be expected to send a full written report with your findings and implementable recommendations to the Epidemiological Research & Surveillance Management. You may be invited to the department to come and present your research findings with your implementable recommendations.
5. Your results on the Eastern Cape will not be presented anywhere unless you have shared them with the Department of Health as indicated above.

Your compliance in this regard will be highly appreciated.

DEPUTY DIRECTOR: EPIDEMIOLOGICAL RESEARCH & SURVEILLANCE MANAGEMENT

Appendix 7 - Interview schedule

Interview schedule

National Strategic Plan for the Prevention and Control of NCDs 2013-17

What are the priorities of the province?

What NCDs, the province is focusing on

How does the province implement NCDs policies, which are developed at the national level? Do you implement them as they are or do you modify them?

With regards to the new National Strategic Plan, can you tell me how have you implemented it?

Who are the key people (role players) for implementation?

What are the barriers/ opportunities for implementation?

Appendix 8 - Consent Form

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
Tel: +27 21-959, Fax: 27 21-959
E-mail: **sandersdav5845@gmail.com**

CONSENT FORM

Title of Research Project: Policy approaches to prevent non communicable disease: The role of population based data.

The study has been described to me in a language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.

Participant's name.....

Participant's signature.....

Witness.....

Date.....

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the study coordinator:

Study Coordinator's Name: Thandi Puoane

University of the Western Cape

Private Bag X17, Belville 7535

Telephone: (021)959-2809

Cell: 0822023316

Fax: (021)959-2872

Email: tpuoane@uwc.ac.za

Appendix 9 - EPOCH 1 Questionnaire

PURE **EPOCH Part 1** **Page 1**

Community ID

☐☐ ☐☐☐
Centre # *Community#*

Date: ☐☐ ☐☐ ☐☐☐☐
day *month* *year*

1. Was a map of the community obtained?

☐ No ☐ Yes, map of route attached

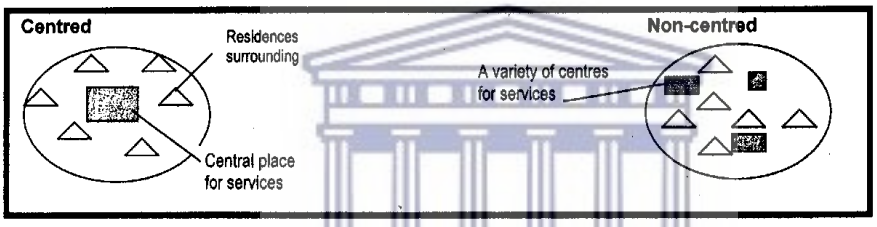
a) Additional measures taken to define the community area:

_____

_____

_____

2. Which statement best describes the arrangement of your community (check one only):



☐ Centred ☐ Non-centred ☐ Other, please describe _____

Community Demographics (Please answer all prices in local currency)

3. Community name/s _____

4. Postal code/s of area ☐☐☐☐☐☐☐

5. Centre name _____

6. Cost per unit area of residential land ☐☐☐☐☐☐☐☐☐☐ _____ Unit of measure _____ Local currency

7. Is this community connected to other towns/cities with a network of transport e.g. bus, train or tram network?

☐ No, there are no regular services **(Go to Question #8)**

☐ Yes, there is a regular service

a) What types of services are there? (mark all that apply)

☐ Train ☐ Bus ☐ Shared Taxi ☐ Other, please specify _____

Community ID

☐☐ ☐☐☐
Centre # *Community#*

b) What is the maximum frequency per day of any regular services? (Mark one box only)

- ☐ 2 or more times per hour (20 or more times per day)
- ☐ Hourly (10 to 19 times per day)
- ☐ 5 to 9 times per day
- ☐ 2 to 4 times per day
- ☐ Daily
- ☐ Less than once a day

8. Do the following facilities exist in this community?

No	Yes	
☐	☐	Supermarket where you can buy food supplies
☐	☐	Free Market **(China only)**
☐	☐	General store/ Convenience store
☐	☐	Market store (e.g. bakery, butcher, fruit market)
☐	☐	Store that sells tobacco/ cigarettes
☐	☐	Restaurant/ cafe/ fast-food outlet - place where one can buy food and **sit down and eat** it in an establishment outside the home
☐	☐	Take out store/ Street store/ coffee or food cart/ Tea shop/ Food stand - place where you can buy food - but there is **no place to sit down**.
☐	☐	Vending machine - where you can buy snack foods/ soft drinks
☐	☐	Vending machine - where you can buy cigarettes
☐	☐	Primary or Secondary School
☐	☐	College/ University/ Post-secondary Technical college
☐	☐	Post office
☐	☐	Police station
☐	☐	Government building accessible to community (e.g. community centre, library)
☐	☐	Public Park/ recreational area/ gardens
☐	☐	Paved roads
☐	☐	Electrical street lighting
☐	☐	Internet access enabled
☐	☐	Traffic lights
☐	☐	Factory
☐	☐	A highway - where cars can exceed speeds of 50km/ hour

Community ID

☐☐ ☐☐☐
Centre # *Community#*

9. **Do the following health care facilities exist in this community?**
(Public refers to government run)

No	Yes	
☐	☐	Public nurse-only clinic
☐	☐	Public medical clinic
☐	☐	Private medical clinic
☐	☐	Public hospital (Government hospital)
☐	☐	Public sector hospital (Hospital for employees) **(India only)**
☐	☐	Private hospital
☐	☐	Chemist/ pharmacy that sells medications

10. Is this a rural community?

☐ No, **(Go to Question #13, Next section Community Observation Walk)**

☐ Yes, **(Go to Question #11, Additional questions for rural communities)**

Additional questions for Rural Communities

11. What is the estimated distance from the centre of this community area to each of the following (in Kilometers)?
Note: If a railway station/ other transport/ tarred roads exist within the boundaries of this community, put zero kilometers.

a) Nearest city/ major urban centre	☐☐☐☐.☐	km
b) Nearest national state highway	☐☐☐☐.☐	km
c) Nearest long distance bus station	☐☐☐☐.☐	km
d) Nearest railway station with passenger trains stopping at least twice per day	☐☐☐☐.☐	km

12. What is the approximate travel time (in minutes) to travel from the centre of this communtiy to the following (during regular working hours)?

a) Nearest city/ major urban centre on public transport	☐☐☐☐	minutes
b) Nearest city/ major urban centre in a motorized vehicle	☐☐☐☐	minutes

Community ID

☐☐ ☐☐☐
Centre # *Community#*

COMMUNITY OBSERVATION WALK

13. Record today's date: ☐☐ ☐☐ ☐☐☐☐ *day month year*

Start Time ☐☐:☐☐ (00:00-23:59)

14. The Start point:

a) Which description best describes the central start point (Mark one only)

- ☐ Central busy intersection
- ☐ Central train station
- ☐ Central bus station
- ☐ Post office
- ☐ Supermarket or general store/ convenience store
- ☐ Market
- ☐ Shopping mall
- ☐ School
- ☐ Other - please specify _____

b) What is the address of the start point?

i) Street No.: ☐☐☐☐☐

ii) Street Name: _____

iii) Cross street: _____

iv) Latitude: ☐☐.☐☐☐☐☐ ☐ (Enter N for North or S for South)

v) Longitude: ☐☐.☐☐☐☐☐ ☐ (Enter E for East or W for West)

vi) Total distance walked (meters): ☐☐☐☐☐

15. Was a pre-planned route obtained? ☐ No ☐ Yes, route drawn or attached to page 5

16. Sidewalk completeness and quality

a) Please indicate which best describes the completeness of the sidewalk on your route. (Mark one only)

- ☐ No sidewalk
- ☐ Partial sidewalk (sections with no sidewalk)
- ☐ Complete sidewalk on one side
- ☐ Complete sidewalk on both sides

b) Give a rating between 1 and 4 for the quality of the sidewalk on your route. ☐
(Score 1 - if poorly maintained, score, 4 if well maintained)

Community ID

☐☐ ☐☐☐

Centre # *Community#*

17a) Advertisements	**Tally of Advertisements**	**Total**
i) Cigarette/tobacco product		☐☐
ii) Signs that prohibit smoking		☐☐
iii) Health promotion (smoking cessation)		☐☐
iv) Health promotion (alcohol cessation)		☐☐
v) Snack food		☐☐
vi) Sugary drink (eg Coke, juices, sports drink)		☐☐
vii) Non-commercial Health promo (diet)		☐☐
viii) Commercial Health promo (diet)		☐☐
ix) Non-commercial Health promo (Phys Act)		☐☐
x) Commercial Health promo (Phys Act)		☐☐
xi) Alcoholic drinks		☐☐
17b) Shops		
i) Vending machines (cigarettes)		☐☐
ii) Vendors/street stands (cigarettes)		☐☐
iii) Convenience /general store (cigarettes)		☐☐
iv) Vending machines (snack foods)		☐☐
v) Vending machines (sweet drinks)		☐☐
vi) Vendors/street stands/snack food shops		☐☐
vii) Convenience/general store (no cigarettes)		☐☐
viii) Supermarket		☐☐
viii) Free market (China)		☐☐
ix) Fruit & vegetable store/market		☐☐
x) Butcher/meat store/market store		☐☐
xi) Bakery		☐☐
xii) Deli/other speciality food store		☐☐
xiii) Alcohol speciality stores		☐☐
xiv) Fast food restaurants		☐☐
xv) Cafes/fast casual restaurants		☐☐
xvi) Pubs/bars		☐☐
xvii) Sit down restaurants		☐☐
17c) Public Places		
i) For recreation/ physical activity		☐☐
ii) Street trees/street flower beds		☐☐

Community ID

☐☐ ☐☐☐
Centre # *Community#*

TOBACCO STORE ASSESSMENT

18. Identify an outlet that sells cigarettes/smoked tobacco on your walk. If none available, walk to nearest place that sells cigarettes. If more than one available, visit the first store identified.

What is the street location of this spot and nearest main cross street? (Take a photo of the front of the tobacco store)

a) Distance from start point: (Meters) ☐☐☐☐☐
b) Street number: ☐☐☐☐☐
c) Street name: _____
d) Main cross street: _____

19. Referring to the above store, do you see any of the following:

No	Yes	
☐	☐	Point-of-sale tobacco advertising
☐	☐	Cigarettes/smoked tobacco openly displayed (can you see cigarettes without requesting to buy them)
☐	☐	Signs that prohibit smoking in the store
☐	☐	Signs/information regarding the harmful effects of smoking visible on entering the store/ approaching the counter

20. How many brands of cigarettes are sold in this store? ☐☐☐

20a) How many brands of beedis are sold in this store?(India) ☐☐☐

20b) How many brands of chewing tobacco are sold in this store?(India) ☐☐☐

21. In what size packets are cigarettes sold in this store? (Mark all that apply)

☐ Singles Units ☐ 2-10/pack ☐ 11-19/pack ☐ 20 - 24/pack ☐ 25 or more/pack

22. Record the cost of a pack of the cheapest cigarettes and a pack of Marlboro. If no Marlboro, use other international brand. **If there is a variety of pack sizes, record the cost, in local currency, of a pack of 20.** (or pack nearest to 20 units)

	Brand	Price	Number in Pack
a) Cheapest pack	_____	☐☐☐☐.☐☐	☐☐
b) Marlboro (or other international brand)	_____	☐☐☐☐.☐☐	☐☐

23. Buy the "local brand of cigarettes" priced above and send packet back to project office.

a) Is there a health warning on the packet? ☐ No ☐ Yes, answer 23b and c

b) What is the location of the warning on the packet? (Check all that apply)

☐ Front ☐ Back ☐ Side ☐ Top ☐ Bottom

c) Transcribe the warning and translate into English here:

_____

_____

Observational walk

Follow the instructions exactly on community observation to assess this community environment for advertisements and availabiltiy of local shops/public places and document in the following tables.
Walk down the street for approximately 300 to 500 meters then cross the road and return walking back on the other side of the street returning to the spot opposite from where you started on the other side.
As you walk, look around you for advertising (e.g. billboards, posters, signs on shops, walls, bus stop shelters, advertisements on buses/cars etc.) and the types of shops. Each time you see one of the advertisements types or shops of interest listed below, mark a check or line in the Tally column.
At the end of your walk, total the tally columns for each row.

Photographic assessment

A series of photos will assist us in qualitatively comparing neighbourhoods and will also assist communities in identifying the locations researchers have assessed. We suggest the following photographs to be included in your assessment. Please carefully label all your photos with the date and community ID number.

a. Photo of the street scene in each direction from the **start point** (a minimum of 4 photos)
b. Examples of **advertisements** that are classified in question 17a (please include one photo of each category of advertisement that is identified on your community observation walk
c. Outside/Front of shop of the **tobacco shop** visited
d. Outside/Front of shop of the **grocery store** visited
e. Photo of **fruit and vegetable display** in the shop or in the stall (a minimum of 2 photos, 1 of fruits and one of vegetables)

PURE **EPOCH Part 2** **Page 1**

Subject ID

☐☐ ☐☐☐ ☐☐☐ ☐☐

Centre # *Community#* *Household #* *Subject #*

Subject Initials ☐☐☐ *F M L*

Community Tobacco Environment

Interviewer to read: **"In the following questions I'll be asking about where you have smoked or where you have seen smokers smoke in the last year. If you haven't been to these areas in the last year and can not report on your experience then you can say you are unsure."**

1. **Which statement best describes the situation with smoking in acute care hospitals in your community *(or hospital nearest to your community that community members would use?)*** (check one only)
   - ☐ Smokers smoke anywhere in the hospital
   - ☐ Smokers smoke only in certain areas (designated indoor smoking areas)
   - ☐ Smokers only smoke outside
   - ☐ There is no smoking anywhere on premises indoor or outdoor
   - ☐ Don't know/ Unsure *(do not read this option out, only mark this option if the person states they are unsure)*

2. **Which statement best describes the situation with smoking in trains/buses and train/bus stations in your community, *(or the nearest transport to your community that community members would use?)*** (check one only):
   - ☐ Smokers smoke anywhere on trains/buses and at the station
   - ☐ Smokers smoke only in certain areas of trains or buses (designated smoking carriages or sections)
   - ☐ Smokers do not smoke anywhere on trains or buses but do smoke in the stations
   - ☐ Smokers do not smoke anywhere on trains or buses or at the stations
   - ☐ Don't know/ Unsure *(do not read this option out, only mark this option if the person states they are unsure)*

3. **Which statement best describes the situation with smoking in out-of-home eating venues such as restaurants, cafes or bars in your community?** (check one only):
   - ☐ Smokers smoke anywhere in eating venues
   - ☐ Smokers smoke only in certain areas (designated indoor smoking areas)
   - ☐ Smokers only smoke outside
   - ☐ There is no smoking anywhere on premises indoor or outdoor
   - ☐ Don't know/ Unsure *(do not read this option out, only mark this option if the person states they are unsure)*

4. **Which of the following best describes smoking in your workplace?** (check one only)
   - ☐ Smoking is allowed in any indoor area
   - ☐ Smoking is not allowed in any indoor area
   - ☐ Smoking is allowed in some indoor areas
   - ☐ There are no rules about smoking inside your workplace
   - ☐ Not applicable (e.g. Do not work/ do not have a workplace)

Subject ID

Centre # | Community# | Household # | Subject #

Subject Initials F M L

5. Which statement best describes the rules about smoking inside your home? (check one only)

- ☐ Smoking is allowed in any indoor area
- ☐ Smoking is allowed in some indoor areas
- ☐ Smoking is not allowed in any indoor area
- ☐ There are no rules about smoking inside your home

6. For each of the following public places, please tell me if you think smoking should be allowed in
Outside refers to outside areas within the public places's grounds or at or near the entrances to the place.
(Mark only one for each)

	All indoor areas	Some designated indoor areas	Outside only	Not allowed outside or inside
a) Hospitals	☐	☐	☐	☐
b) Workplaces	☐	☐	☐	☐
c) Restaurants and cafes	☐	☐	☐	☐
d) Public library or art gallery	☐	☐	☐	☐
e) Public parks/ gardens	☐	☐	☐	☐

7. In the last 6 months in your community have you seen any of the following?

No	Yes	
☐	☐	Cigarette advertisements on posters (eg. billboards, pasted on walls, visible on sides of taxis, buses etc.)
☐	☐	Cigarette advertisements on television/ radio
☐	☐	Cigarette advertisements in movies at cinemas
☐	☐	Cigarette advertisements in newspapers/ magazines
☐	☐	Cigarette sponsorship of sporting, music, other events
☐	☐	Cigarette advertising on products such as umbrellas, ashtrays, clothing or any other product
☐	☐	Actors/ actresses smoking in films/ movies or TV shows

8. In the last 6 months have you seen any advertisements/ articles/ programs regarding the importance of quitting smoking or regarding the health effects of smoking in any of the following types of media?

No	Yes	
☐	☐	Television/ radio
☐	☐	Newspapers/ magazines
☐	☐	Posters (e.g. billboards, pasted on walls, visible on the sides of taxis, buses etc.)

9. From your general observation, which statement best describes how easy it is for youth (teenagers/ children < 18yrs of age) to buy cigarettes/beedies in this community or in nearby stores used by this community? (check one only)

- ☐ Can buy cigarettes in most (nearly all) outlets
- ☐ Can buy cigarettes in some outlets
- ☐ Can not buy cigarettes in any outlets
- ☐ Don't know/Unsure *(do not read this option out, only mark this option if the person states they are unsure)*

Subject ID

Centre # | Community# | Household # | Subject #

Subject Initials F M L

	No	Yes	Unsure
10. Do you think society disapproves of children (<15yrs) smoking cigarettes?	☐	☐	☐
11. Do you think society disapproves of children (16-19) smoking cigarettes?	☐	☐	☐
12. Do you think society disapproves of women smoking cigarettes?	☐	☐	☐
13. Do you think society disapproves of men smoking cigarettes?	☐	☐	☐
South Asia Only			
10SA. Do you think society disapproves of young people smoking beedis?	☐	☐	☐
11SA. Do you think society disapproves of women smoking beedis?	☐	☐	☐
12SA. Do you think society disapproves of men smoking beedis?	☐	☐	☐
Middle East Only			
10ME. Do you think society disapproves of young people smoking waterpipes?	☐	☐	☐
11ME. Do you think society disapproves of women smoking waterpipes?	☐	☐	☐
12ME. Do you think society disapproves of men smoking waterpipes?	☐	☐	☐
14. Are there any support programs (government or non-governmental organization run programs or clinics, telephone quit-lines) that individuals in your community can access to help them stop smoking?	☐	☐	☐
15. Are you aware of any laws (national/ state or local government) that ban/ restrict smoking in public places?	☐	☐	☐
16. Are you aware of any laws (national/ state or local government) that ban/ restrict tobacco advertising?	☐	☐	☐
17. Are you aware of any laws (national/ state or local government) that mandate health warnings on cigarette packets?	☐	☐	☐
18. Are you aware of any laws (national/ state or local government) that prohibit smoking in youth?	☐	☐	☐

19. I am going to read out a list of health effects and diseases that may or may not be caused by smoking cigarettes. Based on what you know or believe, does smoking cause any of the following?

	No	Yes	Unsure
a) Heart disease in smokers	☐	☐	☐
b) Arthritis in smokers	☐	☐	☐
c) Stroke in smokers	☐	☐	☐
d) Diabetes in smokers	☐	☐	☐
e) Lung cancer in smokers	☐	☐	☐
f) Lung cancer in non-smokers from exposure to other people smoking	☐	☐	☐
g) Asthma in non-smokers from exposure to other people smoking	☐	☐	☐
h) Heart disease in non-smokers from exposure to other people smoking	☐	☐	☐

Subject ID

☐☐ ☐☐☐ ☐☐☐ ☐☐
Centre # *Community#* *Household #* *Subject #*

Subject Initials ☐☐☐ *F M L*

For Current Smokers:

20. During the last 12 months did you receive advice from a doctor or health professional to quit smoking?

☐ **No** ☐ **Yes**

21. The last time you bought cigarettes, how many cigarettes did you buy?

a) Number of packs ☐☐☐

b) Number of cigarettes per pack ☐☐☐

c) If not in packs, number of loose cigarettes ☐☐☐

d) Date of purchase *day* ☐☐ *month* ☐☐ *year* ☐☐☐☐

e) Price paid for total purchase ☐☐☐☐.☐☐ Local currency _____

Community Nutrition/ Physical Activity Environment

22. In the last 6 months have you seen any junk food/ unhealthy snack food advertisements in the following media in your community? *(Junk food/ unhealthy snack food generally are snack foods of low nutritional value e.g. (give country-specific examples of snacks)*

No	Yes	
☐	☐	On Posters (e.g. Billboards, pasted or painted on walls, visible on the sides of taxis, buses etc.)
☐	☐	TV/ radio
☐	☐	Newspapers/ magazines
☐	☐	Sponsorship of sporting, music or other cultural events
☐	☐	Products such as umbrellas, ashtrays, clothing

23. In the last 6 months have you seen any health food/fresh fruit/fresh vegetable advertisements in the following media in your community?

No	Yes	
☐	☐	On Posters (e.g. Billboards, pasted or painted on walls, visible on the sides of taxis, buses etc.)
☐	☐	TV/ radio
☐	☐	Newspapers/ magazines
☐	☐	Sponsorship of sporting, music or other cultural events
☐	☐	Products such as umbrellas, ashtrays, clothing

24. In the last 6 months have you seen any advertisements/programs/articles promoting the importance of good diets to maintaining good health in any of the following media?

No	Yes	
☐	☐	Television/ radio
☐	☐	Newspapers/ magazines
☐	☐	On posters (e.g. Billboards, pasted on walls, visible on the sides of taxis, buses etc.)

Subject ID

Centre # | Community# | Household # | Subject #

Subject Initials F M L

31. In your opinion, do people generally help others not related to them in this community?
(check one only)

- ☐ This is common for people in my neighbourhood
- ☐ Some adults would do this in our neighbourhood
- ☐ Infrequently, but it may happen
- ☐ This would not occur in our neighbourhood

32. For day to day shopping for fruit and vegetables and other daily food items, where would you usually go?
(please list from closest location to farthest away)

a) Location: _____ (include shop name and street)

b) ☐ In the community I live in ☐ Outside the community I live in (select one only, reseacher to allocate)

33. For other food and daily living items that you obtain on a weekly or less frequent basis, where would you usually go?*(please list from closest location to farthest away)*

a) Location: _____ (include shop name and street)

b) ☐ In the community I live in ☐ Outside the community I live in (select one only, reseacher to allocate)

34. Approximately what percentage of the household's fruit and vegetables are grown by the household and hence, not bought from a shop?

☐☐☐ %

35. Details of participant

a) Age: ☐☐

b) Gender: ☐ Female ☐ Male

c) Smoking status: ☐ Current ☐ Former ☐ Never

d) Education: (check highest level completed only):

- ☐ None
- ☐ Primary
- ☐ Junior high/secondary school
- ☐ Senior high/secondary schooll
- ☐ Trade school
- ☐ College/University

e) Durning your working life what was your main occupation: _____

f) Please indicate which group best describes your main occupation (see facing page for codes): ☐☐

g) What is/was the location of your workplace? _____

h) ☐ In the community I live in ☐ Outside the community I live in (select one only, reseacher to allocate)

36. Interviewer name: _____ **Date:** ☐☐☐☐ year ☐☐ month ☐☐ day

REFERENCE:

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

Aburto, N. J., Ziolkovska, A., Hoop, L., Elliot, P., Cappuccio, F. P., & Meerpohl, J. J. (2013). Effect of lower salt intaake on health : Systematic review and meta-analyses. *British Medical Journal (Clinical researched), 346f1326*, 346f1326.

Adeyi, O., Smith, O., & Robles, S. (2007). *Public Policy and the Challenge of Chronic Non-communicable Diseases: Directions in Development*. Retrieved from Washington DC:

Afshin, A., Micha, R., Khatibzadeh, S., & Mozaffarian, D. (2014). Consumption of nuts and legumes and risk of incident ischemic heart disease, stroke, and diabetes: a systematic review and meta-analysis. *The American journal of clinical nutrition, 100*(1), 278-288. doi:10.3945/ajcn.113.076901

Aksay , E. (2013). Do simple warning signs enhance the use of stairs? . *Health Education Journal*(0017896913511810). doi: doi:10.1177/0017896913511810

Alam, S., & Johnson, A. G. (1999). A meta-analysis of randomised controlled trials (RCT) among healthy normotensive and essential hypertensive elderly patients to determine the effects of high salt (NaCl) diet of blood pressure. *Journal of Hum Hypertens, 13*, 367-374.

Alamar, B., & Glantz, S. A. (2006). Effect of Increased Social Unacceptability of Cigarette Smoking on Reduction in Cigarette Consumption. *American Journal of Public Health, 96*(8), 1359-1363. doi:10.2105/AJPH.2005.069617

Alderman, M. H. (2010). Reducing dietary sodium: The case for caution. *JAMA, 303*(5), 448-449. doi:10.1001/jama.2010.69

Alderman, M. H., Madhavan, S., Cohen, H., Sealey, J. E., & Laragh, J. H. (1995). Low urinary sodium is associated with greater risk of myocardial infarction among treated hypertensive men. *Hypertension, 25*, 1144-1152.

Alwan, A., & Maclean, D. R. (2009). A review of non-communicable disease in low- and middle-income countries. *Int Health, 1*(1), 3-9. doi:10.1016/j.inhe.2009.02.003

Alwan, A., Maclean, D. R., Riley, L. M., d'Espaignet, E. T., Mathers, C. D., Stevens, G. A., & Bettcher, D. (2010). Monitoring and surveillance of chronic non-communicable diseases: progress and capacity in high-burden countries. *Lancet, 376*(9755), 1861-1868. doi:10.1016/s0140-6736(10)61853-3

American Heart Association. (2016). *How Potassium Can Help Control High Blood Pressure*. Retrieved from Dallas: http://www.heart.org/en/health-topics/high-blood-pressure/changes-you-can-make-to-manage-high-blood-pressure/how-potassium-can-help-control-high-blood-pressure

Anand, K., Shah, B., Yadav, K., Singh, R., Mathur, P., Paul, E., & Kapoor, S. K. (2007). Are the urban poor vulnerable to non-communicable diseases?A survey of risk factors for non-communicable diseases in urban slums of Faridabad. *The National Medical Journal of india, 20*(3), 115-120.

Anderson, C. L., Becher, H., & Winkler, V. (2016). Tobacco control progress in low and middle income countries in comparison to high income countries. . *Int J Environ Res Public Health, 13*(10), E1039.

Anderson, P., Chisholm, D., & Fuhr, D. C. (2009). Effectiveness and cost-eff ectiveness of policies and programmes to reduce the harm caused by alcohol. *Lancet, 373*, 2234–2246.

Appel, L. J., Brands, M. W., Daniels, S. R., Karanja, N., Elmer, P. J., Sacks, F. M., & American Heart Association. (2006). Dietary approaches to prevent and treat hypertension: a scientific statement from the American Heart Association. *Hypertension., 47*(2), 296-308.

Appel, L. J., Frohlich, E. D., & Hall, J. E. (2011). The importance of population-wide sodium reduction as a means to prevent cardiovascular disease and stroke: a call to action from the American Heart Association *Circulation, 123*, 1138 – 1143.

Asare, B. E. (2009). Tobacco regulation in South Africa: interest groups and public policy. *African Journal of Political Science and International Relations, 3*(3), 99-106.

Asaria, P., Chisholm, D., Mathers, C. D., Ezzati, M., & Beaglehole, R. (2007). Chronic disease prevention: health effects and financial costs of strategies to reduce salt intake and control tobacco use. *Lancet, 370*(9604), 2044-2053. doi:10.1016/s0140-6736(07)61698-5

Ashfin. (2014).
Aslam, S. K., Mehboob, B., Zaheer, S., & Shafique, K. (2015). Awareness and support for anti-tobacco policies among health professional students in Pakistan: findings from the Global Health Professional Students Survey, 2011. *Substance Abuse Treatment, Prevention, and Policy, 10*, 7. doi:10.1186/s13011-015-0001-x
Asma, S., Warren, W., Althomsons. S, Wisotzky, M., Woollery, T., & Henson, R. (2004). Addressing the chronic disease burden with tobacco control programs. *Public Health Reports, 119*(3), 253-262. doi:10.1016
Asma, S. M. G., Warren, C. W., & Henson, R. (2003). Tobacco use and the cardiovascular disease epidemic in developing countries: global crises and opportunity in the making. . *Ethnicity & disease, 13*(2 Suppl 2), S81-87.
Atun, R., Aydın, S., Chakraborty, S., Sümer, S., Meltem Aran, M., Gürol, I., & Nazlıoğlu, S. (2013). Universal health coverage in Turkey: enhancement of equity. *Lancet, 382*, 65–99.
Awopegba, A. J., & Cohen, J. E. (2013). Country tobacco laws and article 11 of the WHO Framework Convention on Tobacco Control: a review of tobacco packaging and labeling regulations of 25 countries. *Tobacco induced diseases, 11* (1), 23.
Ayo-Yusuf, O. A. (2005). Re-emergence of traditional tobacco products usage in south africa: An unintended consequence of existing tobacco control policy. *African Journal of Drug & Alcohol Studies, 4* (1 & 2), 33-43.
Backholer, K., Steven, C., Nusselder, W. J., Boyko, E. J., Moo, L., Tonkin, A., & Peters, A. (2011). Age- specific trends in cardiovascular mortality rates in Australia between 1980 and 2005. *Australasia Epidemiologist, 18*, 33-37.
Beaglehole, R., & Bonita, R. (2009). Alcohol: a global health priority. *Lancet., 373*(9682), 2173-2174.
Beaglehole, R., Bonita, R., Alleyne, G., Horton, R., Li, L., Lincoln, P., . . . Stuckler, D. (2011). UN High-Level Meeting on Non-Communicable Diseases: addressing four questions. *Lancet, 378*(9789), 449-455. doi:10.1016/s0140-6736(11)60879-9
Beaglehole, R., Bonita, R., Hortan, R., Ezzati, M., Bhala, N., & Nyamuzu, -. N., M. (2012). Measuring progress on NCDs: one goaland five targets. *Lancet, 380*, 1283-1285.
Beaglehole, R., Bonita, R., Horton, R., Adams, C., Alleyne, G., Asaria, P., . . . Watt, J. (2011). Priority actions for the non-communicable disease crisis. *Lancet, 377*(9775), 1438-1447. doi:10.1016/s0140-6736(11)60393-0
Beaglehole, R., Ebrahim, S., Reddy, S., Voute, J., & Leeder, S. (2007). Prevention of chronic diseases: a call to action. *Lancet, 370*, 2152–2157.
Beaglehole, R., & Yach, D. (2003). Globalisation and the prevention and control of non-communicable disease: the neglected chronic diseases of adults. *Lancet, 362*(9387), 903-908. doi:10.1016/s0140-6736(03)14335-8
Bell, R., & Lutz, B. (2013). *Disscussion paper: addressing the social determinants of non-communicable diseases*. Retrieved from USA:
Bertram, M. Y., Steyn, K., Wentzel-Viljoen, E., Tollman, T., & Hofman, K. J. (2012). Reducing the sodium content of high-salt foods: effect on cardiovascular disease in South Africa. . *S Afr Med J, 102*(9), 743-745.
Bhandari, G., Angdembe, M., Dhimal, M., Neupane, S., & Bhusal, C. (2014). State of noncommunicable diseases in Nepal. *BMC Public Health, 14*(23).
Bibbins-Domingo , K., Chertow , G. M., Coxson , P. G., Moran , A., Lightwood , J. M., Pletcher , M. J., & Goldman , L. (2010). Projected Effect of Dietary Salt Reductions on Future Cardiovascular Disease. *New England Journal of Medicine, 362*(7), 590-599. doi:10.1056/NEJMoa0907355
Blanke, D. D., & Silva, D. V. (2004). *WHO Tobacco Free Initiative,Tobacco control legislation: an introductory guide*. Geneva World Health Organization.
Bonita, R., Magnusson, R., Bovet, P., Zhao, D., Malta, D. C., Geneau, R., . . . Raman, K. (2013). Country action to meet UN commitments on non-communicable diseases: a stepwise approach. *Lancet, 381*, 575-584. doi:10.1016/S0140-6736(12)61993.X
Bosu, W. K. (2012). A comprehensive review of the policy and programmatic response to chronic non-communicable disease in Ghana. *Ghana Medical Journal, 46*(2(Supp)), 69-78.

Bradshaw, D., Schneider, M., Dorrington, R., Bourne, D. E., & Laubscher, R. (2002). South African cause-of-death profile in transition--1996 and future trends. *S Afr Med J, 92*(8), 618-623.
Bradshaw, D., Steyn, K., Levitt, N., & Nojilana, B. (2011). Non-communicable diseases - A race against time. Cape Town: South African Medical Research Council.
Bradshaw, D., Steyn, K., & Pascal-Kengne, A. (2011). *Surveillance and Research for the Prevention and Control of NCDs*. Retrieved from Cape Town:
Brewer, G., & Leon de, P. (1999.). *The Foundations of Policy Analysis.* . Homewood.: Dorsey Press.
Brown, I. J., Tzoulaki, I., Candeias, V., & Elliott, P. (2009). Salt intakes around the world: implications for public health. *Int J Epidemiol, 38*(3), 791-813. doi:10.1093/ije/dyp139
Brown, M., Daniels, R. C., De Villiers, L., Leibbrandt, M., & Woolard, I. (2012). *National Income Dynamics Study Wave 2 User Manual*. Retrieved from Cape Town:
Brownson, R. C., Koffman, D. M., Novotny, T. E., Hughes, R. G., & Eriksen, M. P. (1995). Environmental and policy interventions to control tobacco use and prevent cardiovascular disease. *Health Educ Q, 22*(4), 478-498.
Buso, D., Longo-Mbenza, B., Bovet, P., van den Borne, B., Okwe, A. N., & Mzingelwa, M. (2012). Deaths Rates in Public Hospitals of Eastern Cape Province of South Africa. . *Iranian Journal of Public Health, 41*((12),), 19–25.
Campbell, N. (2008). Health check program. *CMAJ, 178*, 1186–1187.
Campbell, N., Legowski, B., & Legetic, B. (2011). Mobilizing the Americas for dietary salt reduction . *Lancet,, 377* 793 – 795
Cancer Research UK. (2009). The Excess Burden of Cancer in Men in the UK.
Cappuccio, F. P., Capewell, S., Lincoln, P., & McPherson, K. (2011). Policy options to reduce population salt intake. *BMJ, 343*(d4995).
Cappuccio, F. P., Kalaitzidis, R., Duneclift, S., & Eastwood, J. B. (2000). Unravelling the links between calcium excretion, salt intake, hypertension, kidney stones and bone metabolism. *Journal of Nephrology, 13*(3), 169-177.
Cappuccio, F. P., & MacGregor, G. A. (1997). Dietary salt restriction: benefits for cardiovascular disease and beyond. . *Curr Opin Nephrol Hypertens, 6*, 477–482.
Casswell, S., & Thamarangsi, T. (2009). Reducing the harm from alcohol: call to action. *Lancet, 373*, 2247-2257.
Cecchini, M., Sassi, F., Lauer, J. A., Lee, Y. Y., Guajardo-Barron, V., & Chisholm, D. (2010). Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. *Lancet, 376*,(9754), 1775–1784.
Centers for Disease Control and Prevention. (1994). *Preventing tobacco use among young people: a report of the Surgeon General.* Retrieved from Atlanta:: https://www.ncbi.nlm.nih.gov/pubmed/8154552
Centers for Disease Control Prevention (CDC). (2015). *Overview of non-communicable diseases and related risk factors.* . Retrieved from www.cdc.gov/globalhealth/healthprotection/fetp/training_modules/new-8/overview-of-ncds_ppt_qa-revcom_09112013.pdf
Centre for Disease Control (CDC). (2013). Data Sources for NCD Surveillance,Facilitator Guide. Atlanta, GA: Centers for Disease Control and Prevention (CDC),.
Centre for Disease Control and Prevention (CDC). (2005). Comprehensive Tobacco Prevention and Cessation Programs Effectively Reduce Tobacoo Use.
Chaloupka, F., & Grossman, M. (1996). Price, Tobacco Control Policies and Youth Smoking. *NBER Workong Paper*, i1-37.
Chaloupka, F. J., & Warner, K. E. (2000). The economics of smoking. In C. A. Newhouse JP, . (Ed.), *The handbook of health economics*. New York: North-Holand.
Charlton, K. E., Jooste, P. L., Steyn, K., Levitt, N. S., & Ghosh, A. (2013). A lowered salt intake does not compromise iodine status in Cape Town, South Africa, where salt iodization is mandatory *Nutrition, 29* 630-634.
Charlton, K. E., Steyn, K., & Levitt, N. S. (2005). Diet and blood pressure in South Africa: intake of foods containing sodium, potassium, calcium and magnesium in three ethnic groups. *Nutrition, 21*, 39-50.

Charlton, K. E., Steyn, K., Levitt, N. S., Jonathan, D., Zulu, J. V., & Nel, J. H. (2008). Development and validation of a short questionnaire to assess sodium intake. *Public Health Nutr, 11*. doi:10.1017/s1368980007000146

Charlton, K. E., Steyn, K., Levitt, N. S., Peer, N., onathan, D., Gogela, T., . . . Lombard, C. J. (2008). A food-based randomised controlled trial to assess the impact of dietary manipulation of cations on blood pressure in hypertensive South Africans. . *Publ Health Nutr, 11*, 1397-1406.

Charlton, K. E., Steyn, K., Levitt, N. S., Zulu, J. V., Jonathan, D., & Veldman, F. J. (2005). Ethnic differences in intake and excretion of sodium, potassium, calcium and magnesium in South Africans. *Eur J Cardiovasc Prev Rehabil, 12*. doi:10.1097/01.hjr.0000170265.22938.d1

Charlton, K. E., Webtser, J., & Kowal, P. (2014). To Legislate or Not to Legislate? A Comparison of the UK and South African Approaches to the Development and Implementation of Salt Reduction Programs. *Nutrients, 6*, 3672-3695.

Chen, J., Wu, X., & Gu, D. (2008). Hypertension and cardiovascular diseases intervention in the capital steel and iron company and Beijing Fangshan community. *Obes Rev, 9*(Suppl1), 142-145.

Chimeddamba, O., Peeters, A., Walls, H. L., & Joyce, C. (2015). Noncommunicable disease prevention and control in Mongolia: a policy analysis. *BMC Public Health, 15*.

Chisholm, D., Baltussen, R., Evans, D. B., Ginsberg G, Lauer, J. A., Lim, S., . . . Tan-Torres, E. T. (2012). What are the priorities for prevention and control of non-communicable diseases and injuries in sub-Saharan Africa and South East Asia? *British Medical Journal,, 344*.

Choi, B. C. K., Corber, S. J., McQueen, D. V., Bonita, R., Zevallos, J. C., Douglas, K. A., . . . Mokdad, A. H. (2005). Enhancing regional capacity in chronic disease surveillance in the Americas. *Revista Panamericana de Salud Pública, 17*, 130-141.

Choudhury, S. R. (2013). *Current situation and capacity in the South-East Asia Region to report on the global voluntary targets: Salt/sodium intake*. Bangkok, Thailand. http://www.searo.who.int/entity/noncommunicable_diseases/events/ncd_twg_bangkok_salt_sodium_intake.pdf?ua=1

Chow, C. K., Corsi, D. J., Gilmore, A. B., Kruger, A., Igumbor, E., Chifamba, J., & Gupta, R. (2017). Tobacco control environment: cross-sectional survey of policy implementation, social unacceptability, knowledge of tobacco health harms and relationship to quit ratio in 17 low-income, middle-income and high-income countries. *British Medical Journal,, 7*(3), e013817.

Chow, C. K., Lock, K., M., M., Corsi, D. J., Gilmore, A. B., & Subramanian, S. V. (2010). Environmental Profile of a Community's Health (EPOCH): an instrument to measure environmental determinants of cardiovascular health in five countries. *PLoS ONE 5, 5*(e14294).

Chow, C. K., Lock, K., Teo, K., Subramanian, S. V., McKee, M., & Yusuf, S. (2009). Environmental and societal influences acting on cardiovascular risk factors and disease at a population level: a review. *International Journal of Epidemiology, 38*, 1580-1594.

Cohen, H. W., Haitpern, S. M., Fang, J., & Alderman, M. H. (2006). Sodium intake and mortality in the NHANESll follow-up study. *Am J Med*.

Coitinho, D., Monteiro, C. A., & Popkin, B. M. (2002). What Brazil is doing to promote healthy diets and active lifestyles. *Public Health Nutr, 5* 263-267.

Collins, M., Mason, H., M., O. F., Guzman-Castillo, M., Critchley, J., & Capewell, S. (2014). An Economic Evaluation of Salt Reduction Policies to Reduce Coronary Heart Disease in England: A Policy Modeling Study. *International Society for Pharmacoeconomics and Outcome Research*.

Connor, M. D., Thorogood, M., Casserly, B., Dobson, C., Warlow, C. P., & SASPI Project Team. (2004,). Prevalence of stroke survivors in rural South Africa: results from the Southern Africa Stroke Prevention Initiative (SASPI) Agincourt field site. *Stroke, 35:* , 627-632. doi:10.1161/01.STR.0000117096.61838.

Cook, N. R., Cutler, J. A., Obarzanek, E., Buring, J. E., Rexrode, K. M., & Kumanyika, S. K. e. a. (2007). Long term effects of dietary sodium reduction on cardiovascular disease outcomes. Observational follow-up of the trials of hypertension prevention (TOHP). *British Medical Journal,, 334* 885–888.

Cornick, R., Picken, S., Wattrus, C., Awotiwon, A., Carkeek, E., Hannington, J., . . . Fairall, L. (2018). The Practical Approach to Care Kit (PACK) guide: developing a clinical decision support tool

to simplify, standardise and strengthen primary healthcare delivery. *BMJ global health, 3*(Suppl 5), e000962-e000962. doi:10.1136/bmjgh-2018-000962

Corrao, M. A., Guindon, G. E., Cokkinides, V., & Sharma, N. (2000). Building the evidence base for global tobacco control. *Bull World Health Organ, 78*(7), 884-890.

Corsi, D. J., Subramanian, S. V., Chow, C. K., Mckee, M., Chifamba, J., Dagenais, G., . . . Iqbal, R. a. o. (2013). Prospective Urban Rural Epidemiology (PURE) study: Baseline characteristics of the household sample and comparative analyses with national data in 17 countries. *American Heart Journal, 166*, 636-646.

Corsi, D. J., Subramanian, S. V., McKee, M., Li, W., Swaminathan, S. A., Lopez-Jaramillo, P., . . . Dagenais, G. a. o., . (2012). Environmental Profile of a Community's Health (EPOCH): An Econometric Assessment of Measures of the Community Environment Based on Individual Perception. *PloS One, 7*(9), e44410. doi:doi:10.1371/journal.pone.0044410

Countrywide Integrated Noncommunicable (CINDI). (2000). *dietary guide.* Retrieved from Copenhagen: (http://www.who.dk/document/e70041.pdf)

Cutler, J. A., Follmann, D., & Allener, P. S. (1997). Randomised trials of sodium reduction: an overview. *Am J Clinical Nutrition, 65*, 643S-651S.

D'Elia, L., Rossi, G., Ippolito, R., Cappuccio, F. P., & Strazzullo, P. (2012). *Clin Nutr, 31*(4), 489-498. doi:doi: 10.1016/j.clnu.2012.01.003

Day, C., Groenewald, P., Laubscher, R., Chaudhry, S., van Schaik, N., & Bradshaw, D. (2014). Monitoring of non-communicable diseases such as hypertension in South Africa: Challenges for the post-2015 global development agenda. *S Afr Med J, 104*(10), 680-687.

De Villiers, L., Brown, M., Woolard, I., Daniels, R., & Leibbrandt, M. (2013). *National Income Dynamics Study Wave 3 User Manual*. Retrieved from Cape Town:

Dehghan, M., Ilow, R., Zatonska, K., Szuba, A., Zhang, X., Mente, A., & Regulska-Ilow , B. (2012). Development, reproducibility and validity of the food frequency questionnaire in the Poland arm of the Prospective Urban and Rural Epidemiological (PURE) study *Journal of Human Nutrion and Diet, 25,*, 225–232.

Delobelle, P., Sanders, D., Puoane, T., & Freudenberg, N. (2016). Reducing the Role of the Food, Tobacco, and Alcohol Industries in Noncommunicable Disease Risk in South Africa *Health Education and Behaviour, 43*(1(Supp)), 70S-81S.

Department of Health. (2013a). *PC-101-Guideline 2013/14*. Retrieved from Pretoria: https://www.health-e.org.za/2015/05/07/guidelines-primary-care-101

Department of Health. (2013b). *Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2013-17*. Retrieved from Pretoria: http://www.hsrc.ac.za/uploads/pageContent/3893/NCDs%20STRAT%20PLAN%20%20CONTENT%208%20april%20proof.pdf

Department of Health, Medical Research Council, & OrcMacro. (1998). *South African Demographic and Health Survey, 1998*. Retrieved from Pretoria: https://dhsprogram.com/pubs/pdf/FR206/FR206.pdf

Di Cesare, M., Khang, Y. H., Asaria, P., Blakely, T., Cowan, M. J., Farzadfar, F., . . . Ezzati, M. (2013). Inequalities in non-communicable diseases and effective responses. *Lancet, 381*, 585-597. doi:10.1016

Discussion Paper. (2013). *Addressing the Social Determinants of Noncommunicable diseases*. Retrieved from New York: http://www.undp.org/content/dam/undp/library/hivaids/English/Discussion_Paper_Addressing_the_Social_Determinants_of_NCDs_UNDP_2013.pdf

Doherty, J. (2010). Cost-effectiveness analysis for priority-setting in South Africa--what are the possibilities? *S Afr Med J, 100*(12), 816-821.

Dorrington, R. (2013). *Alternative South African mid-year estimates*. Retrieved from Cape Town:

Drüeke, T. B. (2016). Salt and health: time to revisit the recommendations. *Kidney International, 89*(2), 259-260. doi:10.1016/j.kint.2015.12.009

du Cailar, G., Ribstein, J., & Mimran, A. (2002). Dietary sodium and target organ damage in essential hypertension. . *Am J Hypertens, 15*, 222–229.

Du, S., Neiman, A., Batis, C., Wang, H., Zhang, B., Zhang, J., & Popkin, B. M. (2014). Understanding the patterns and trends of sodium intake, potassium intake, and sodium to potassium ratio and

their effect on hypertension in China. *The American journal of clinical nutrition, 99*(2), 334-343. doi:10.3945/ajcn.113.059121

Dubray, J., Schwart, z. R., Chaiton, M., O'Connor, S., & Cohen, J. E. (2015). The effect of MPOWER on smoking prevalence. *Tobacco Control, 24*(6), 540-542. doi:doi: 10.1136/tobaccocontrol-2014-051834

Dyer, A. R., Elliott, P., Chee, D., & Stamler, J. (1997). Urinary biochemical markers of dietary intake in the INTERSALT Study. *American Journal of Clinical Nutrition, 65*, 1246-1253.

Ebrahim, S., & Smeeth, L. (2005). Non-communicable diseases in low and middle-income countries: a priority or a distraction? *International Journal of Epidemiology, 34*(5), 961-966. doi:10.1093/ije/dyi188

Ejike, C. E., & Ugwu, C. E. (2012). Association between blood pressure and urinary electtrolytes in a population of non0urban-dwelling Nigerians. *Niger Journal of Clinical Practice, 15*, 258-264.

Ekpu, V. U., & Brown, A. K. (2015). The Economic Impact of Smoking and of Reducing Smoking Prevalence: Review of Evidence. *Tob Use Insights, 14*(8), 1-35.

Eksteen, G., & Mungal-Sing, V. (2015). Salt intake in SOuth Africa: a current perspective. *JEMDSA, 29*(1), 9-14.

Elliott, P., Walker, L. L., Little, M. P., Blair-West, J., Shade, R. E., Lee, D. R., . . . Ardaillou, R. (2007). Change in salt intake affects blood pressure of chimpanzees: implications for human populations. *Circulation, 116*, 1563–1568.

Epping-Jordan, J. E., Galea, G., Tukuitonga, C., & Beaglehole, R. (2005). Preventing chronic diseases: taking stepwise action. *Lancet, 366*(9497), 1667-1671. doi:10.1016/s0140-6736(05)67342-4

Epping-Jordan, J. E., Pruitt, S. D., Bengoa , R., & Wagner , E. H. (2004). Improving the quality of health care for chronic conditions. *Qual Saf Health Care, 13*, 299–305. doi:doi: 10.1136/qshc.2004.010744

Erhardt , L. (2009). Cigarette smoking: an undertreated risk factor for cardiovascular disease. *Atherosclerosis, 205*(1), 23-32.

Eriksen, M., Mackay, J., & Ross, H. (2012). *The Tobacco Atlas. 4. American Cancer Society, Atlanta, Georgia and World Lung Foundationand World Lung Foundation;* . Retrieved from New York:

Etiaba, E., Uguru, N., Ebenso, B., Russo, G., Ezumah, N., Uzochukwu, B., & Onwujekwe, O. (2015). Development of oral health policy in Nigeria: an analysis of the role of context, actors and policy process. *BMC Oral Health, 15*(1).

European Commission. (2009). *National Salt Initiatives: Implementing the EU Framework for Salt Reduction Activities*. Retrieved from

Fairall, L., Bateman, E., Cornick, R., Faris, G., Timmerman, V., Folb, N., . . . Smith, R. (2015). Innovating to improve primary care in less developed countries: towards a global model. *BMJ Innovations, 1*(4), 196.

Fichtenberg, C. M., & Glantz, S. A. (2002). Effect of smoke-free workplaces on smoking behaviour: systematic review. *BMJ, 325*(7357), 188. doi:10.1136/bmj.325.7357.188

Flottorp, S., Farah, M. G., Thürmer, H., Johansen, M., & Fretheim, A. (2008). *Non-Pharmacological Interventions to Reduce the Risk for Cardiovascular Disease: A Summary of Systematic Reviews [Internet]. Knowledge Centre for the Health Services at The Norwegian Institute of Public Health (NIPH); 2008 Nov. Report from Norwegian Knowledge Centre for the Health Services (NOKC) No. 19-2008. NIPH Systematic Reviews: Executive Summaries.* Oslo, Norway: Knowledge Centre for the Health Services at The Norwegian Institute of Public Health

Fong, G. T., Cummings, K. M., Borland, R., Hastings, G., Hyland, A., Giovino, G. A., . . . Thompson, M. E. (2006). The conceptual framework of the International Tobacco Control (ITC) Policy Evaluation Project. *Tob Control, 15 Suppl 3*, iii3-11. doi:10.1136/tc.2005.015438

Gaziano, T. A. (2007). Reducing the growing burden of cardiovascular disease in the developing world. *Health affairs (Project Hope), 26*(1), 13-24. doi:10.1377

Gaziano, T. A., Galea, G., & Reddy, K. S. (2007). Scaling up interventions for chronic disease prevention: the evidence. *Lancet, 370*, 1939–1946.

Gaziano, T. A., & Pagidipati, N. (2013). Scaling up chronic disease prevention in lower - and - middle income countries. *Annual Review of Public Health, 34*(317-335).

GBD 2015 Risk Factors Collaborators. (2016). Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. ,. *Lancet, 388*(10053), 1659-1724.

Geleijnse, J. M., Witteman, J. C. M., Stijnen, T., Kloos, M. W., Hofman, A., & Grobbee, D. E. (2007). Sodium and potassium intake and risk of cardiovascular events and all-cause mortality: the Rotterdam Study. *European Journal of Epidemiology, 22*(11), 763-770. doi:10.1007/s10654-007-9186-2

Gemming, L., Jiang, Y., Swinburn, B., Utter, J., & Mhurchu, C. N. (2013). Under-reporting remains a key limitation of self-reported dietary intake: an analysis of the 2008/09 New Zealand Adult Nutrition Survey. *European Journal Of Clinical Nutrition, 68*, 259. doi:10.1038/ejcn.2013.242

Geneau, R., Stuckler, D., Stachenko, S., McKee, M., Ebrahim, S., Basu, S., & Beaglehole, R. (2010). Raising the priority of preventing chronic diseases: a political process. . *Lancet, 376*(9753), 1689-1698.

Government Gazette. (2013). *Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972) – Regulations Relating to the Reduction of Sodium in Certain Foodstuffs and Related Matters (R214)*. Retrieved from Pretoria:

Government Gazette. (2016). *Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972) – Regulations Relating to the Reduction of Sodium in Certain Foodstuffs and Related Matters R989 Amendment (2016)*.

Government of South Africa. (1993). *Government Gazette,Tobacco Products Control Act 1993*. Retrieved from

Graudal, N. A., Galloe, A. M., & Garred, P. (1998). Effects of sodium restriction on blood pressure, renin, aldosteron,catecholamines, cholesterols and triglyceride: a meta-analysis. *JAMA, 279*, 1383-1391.

Graudal, N. A., Hubeck-Graudal, T., & Jurgens, G. (2011). Effects of low sodium diet versus high sodium diet on blood pressure, renin, aldosterone, catecholamines, cholesterol, and triglyceride. *Cochrane Database Syst Rev, 11*(CD004022).

Gravely, S., Giovino, G. A., Craig, L., Commar, A., D'Espaignet, E. T., Schotte, K., & Fong, G. T. (2017). Implementation of key demand-reduction measures of the WHO Framework Convention on Tobacco Control and changein smoking prevalence in 126 countries: an association study. *Lancet*. doi:doi.org/10.1016/S2468-2667(17)30045-2

Gray, N. J., & Hill, D. J. (1975). Patterns of tobacco smoking in Australia. *Med J Aust, 2*(22), 819-822.

Guidelines Subcommittee. (1999). 1999 World Health Organization-International Society of Hypertension

Guidelines for the Management of Hypertension. *Journal of Hypertension, 17*, 151-183.

Ha, S. K. (2014). Dietary Salt Intake and Hypertension. *Electrolytes & Blood Pressure : E & BP, 12*(1), 7-18. doi:10.5049/EBP.2014.12.1.7

He, F. J., Brinsden, H. C., & Macgregor, G. A. (2014). Salt reduction in the United Kingdom: A successful experiment in public Health. *J Hum Hypertens, 28*(6), 345-352.

He, F. J., Campbell, N. R. C., & MacGregor, G. A. (2012). Reducing salt intake to prevent hypertension and cardiovascular disease. *Rev Panam Salud Publica, 32*(4), 293-200.

He, F. J., Jenner, K. H., & Macgregor, G. A. (2010). WASH-world action on salt and health. *Kidney Int, 78*(8), 745-753. doi:10.1038/ki.2010.280

He, F. J., Li, J., & Macgregor, G. A. (2013). Effect of longer term modest salt reduction on blood pressure: Cochrane systematic review and meta-analysis of randomised trials. *BMJ, 346*(f1325).

He, F. J., & MacGregor, G. A. (2002). Effect of modest salt reduction on blood pressure: a meta-analysis of randomized trials. Implications for public health. *Journal of human hypertension, 16*, 761. doi:10.1038/sj.jhh.1001459

He, F. J., & MacGregor, G. A. (2009). A comprehensive review on salt and health and current experience of worldwide salt reduction programmes. *J Hum Hypertens, 23*(6), 363-384. doi:10.1038/jhh.2008.144

He, F. J., & MacGregor, G. A. (2013). Effect of longer-term modest salt reduction on blood pressure. *Cochrane Database Syst Rev, 4:CD004937*.

He, F. J., Markandu, N. D., & MacGregor, G. A. (2001). Importance of the renin system for determining blood pressure fall with acute sal restriction in hypertensive and normotensive whites. *Hypertension, 38*, 321-325.

He, F. J., Pombo-Rodrigues, S., & Macgregor, G. A. (2014). Salt reduction in England from 2003 to 2011: its relationship to blood pressure, stroke and ischaemic heart disease mortality. . *BMJ Open 4:e004549. 10.1136/bmjopen-2013-004549, BMJ Open*(4).

Heart and Stroke Foundation South Africa. (2013). Salt is killing South Africans and It Is Time to Take Action https://www.health24.com/Diet-and-nutrition/News/Salt-is-killing-South-Africans-20130312 [Press release]. Retrieved from https://www.health24.com/Diet-and-nutrition/News/Salt-is-killing-South-Africans-20130312

Heath, G. W., Parra, D. C., Sarmiento, O. L., Andersen, L. B., Owen, N., Goenka, S., . . . Lancet Physical Activity Series Working, G. (2012). Evidence-based intervention in physical activity: lessons from around the world. *Lancet (London, England), 380*(9838), 272-281. doi:10.1016/S0140-6736(12)60816-2

Heloma, A., Helakorpi, S., Honkonen, J., Danielsson, P., & Uutela, A. (2011). Exposure to secondhand smoke in Finnish workplaces and compliance with national smoke-free workplace legislation. *Scandinavian Journal of Public Health, 39*(7), 723-729. doi:10.1177/1403494811420325

Hercot, D., Meessen, B., Ridde, & Gilson, L. (2011). Removing user fees for health services in low-income countries: a multicountry review framework for assessing the process of policy change. *Health Policy and Planning, 26*, ii5-ii15.

Hofman, K., & Lee, R. (2013). *Intersectoral Case Study Successful Tobacco Legislation in South Africa*. Retrieved from University of Witwatersrand University:

Hooper, L., Bartlett, C., Davey Smith, G., & Ebrahim, S. (2002). Syatemaitic review of long term effects of of advice to reduce dietary salt in adults. *BMJ, 325*, 621-325.

Hopkins, D. P., Briss, P. A., Ricard, C. J., Husten, C. G., Carande-Kulis, V. G., & Fielding J.E. et al. (2001). Task Force on Community Preventive Services, et al. Reviews of evidence regarding interventions to reduce tobacco use and exposure to environmental tobacco smoke. . *Am J Prev Med, 20*, 16-66. doi:http://dx.doi.org/10.1016/S0749-3797(00)00297-X

Hussain, M. J., English, L. M., & Ramanandraible, N. (2016). An overview of tobacco control and prevention policy status in Africa. *Preventive Medicine, 91*, S16-S22.

Hyland, A., Higbee, C., Borland, R., Travers, M., Hastings, G., Fong, G. T., & Cummings, K. M. (2009). Attitudes and beliefs about secondhand smoke and smoke-free policies in four countries: Findings from the International Tobacco Control Four Country Survey. *Nicotine & Tobacco Research, 11*(6), 642-649. doi:10.1093/ntr/ntp063

Igumbor, E. U., Sanders, D., Puoane, T., Tsolekile, L., Schwarz, S., Purdy, C., & Swart, R. (2012). Big Food," the Consumer Food Environment, Health, and the Policy Response in South Africa. *PLoS Med, 9* (7), e1001253. . doi:https://doi.org/10.1371/journal.pmed.1001253

International Agency for Research on Cancer. (2007). Reversal of risk after quitting smoking. IARC handbooks of cancer prevention, tobacco control. *11*.

International Agency for Research on Cancer. (2009). Evaluating the effectiveness of smoke-free policies. Lyon. International Agency for Research on Cancer.

International Agency for Research on Cancer. (2012). *IARC Monographs 100E. Consumption of alcohol*. Retrieved from Lyon: http://monographs.iarc.fr/ENG/Monographs/vol100E/mono100E-11.pdf,

Intersalt Cooperative Research Group. (1988). Intersalt: an international study of electrolyte excretion and blood pressure. Results for 24 hour urinary sodium and potassium excretion. Intersalt Cooperative Research Group. *British Med J 297*, 319–328. doi:doi:10.1136/bmj.297.6644.319

Irving, H. M., Samokhvalov, A. V., & Rehm, J. (2009). Alcohol as a risk factor for pancreatitis. A systematic review and meta-analysis. *JOP, 10*, 387–392.

Jha, P., & Chaloupka, F. J. (2000a). The economics of global tobacco control. *BMJ, 321*(7257), 358-361.

Jha, P., & Chaloupka, F. J. (2000b). *Tobacco control in developing countries* (C. F. Jha P, . Ed.). New York: Oxford University Press.

Jha, P., Chaloupka, F. J., Corrao, M., & Jacob, B. (2006). Reducing the burden of smoking world-wide: effectiveness of interventions and their coverage. Drug and alcohol review. . *25, 6*(597-609).

Jha, P., & Peto, R. (2014). Global Health: Global Effects of Smoking, of Quitting, and of Taxing Tobacco. *New England Journal of Medicine, 370*(1), 60-68. doi:10.1056/NEJMra1308383

Jha, P., Ramasundarahettige, C., Landsman, V., Rostron, B., Thun, M., Anderson, R. N., . . . Peto, R. (2013). 21st-century hazards of smoking and benefits of cessation in the United States. *N Engl J Med, 368*(4), 341-350. doi:10.1056/NEJMsa1211128

Joffres, M. R., Campbell, N. R. C., B., B. M., & Tu, K. (2007). Estimate of the benefits of a population-based reduction in dietary sodium additives on hypertension and its related health care costs in Canada. *Can J Cardiol, 23*(6), 437-443.

Joint WHO/FAO expert consultation. (2002). *Joint WHO/FAO expert consultation on diet, nutrition and the prevention of chronic diseases,* . Retrieved from Geneva.: Available at http://www.who.int/hpr/NPH/docs/who_fao_experts_report.pd

Joossens, J. V., Hill, M. J., Elliott, P., Stamler, R., Lesaffre, E., & Dyer, A. (1996). Dietary salt, nitrate and stomach cancer mortality in 24 countries. European Cancer Prevention (ECP) and the INTERSALT Cooperative Research Group. *Int J Epidemiol, 25*, 494–504.

Joubert, J., Rao, C., Bradshaw, D., Dorrington, R. E., Vos, T., & Lopez, A. D. (2012). Characteristics, availability and uses of vital registration and other mortality data sources in post-democracy South Africa. *Global Health Organisation,. 5*(19263).

Joubert, J., Rao, C., Bradshaw, D., Vos, T., & Lopez, A. D. (2013). Evaluation of national mortality statistics fom civil registration in South Africa, 1997-2007. *PloS One, 8*(5). doi:10.1371/journal.Pon.0064592

Juma, P. A., Mohamed, S. F., Wisdom, J., Kyobutungi, C., & Oti, S. (2016). Analysis of Non-communicable disease prevention policies in five Sub-Saharan African countries: Study protocol. *Archives of Public Health, 74*, 25.

Kahn EB, R. L., Brownson RC, Heath GW,, & Howze EH, P. K. e. a. (2002). The effectiveness of interventions to increase physical activity. A systematic review. . *Am J Prev Med, 22*(4 Suppl), 73−107.

Karppanen, H., & Mervaala, E. (2006). Sodium intake and hypertension. *Prog Cardiovasc Dis, 49*, 59–75.

Khaw, K. T., Bingham, S., Welch, A., Luben, R., O'Brien, E., & Wareham, N. (2004). Blood pressure and urinary sodium in men and women: the Norfolk Cohort of the European Prospective Investigation into Cancer (EPIC-Norfolk). . *Am J Clin Nutr, 80*, 1397–1403.

Khosa, M. M. (2003). *Towards effective delivery: synthesis report on the project entitled ''Closing the gap between policy and implementation in South Africa''.* . Retrieved from Johannesburg:

Kingdon, J. W. (1984). *Agendas , alternatives and public policies*. Boston and Toronto: Litlle Brown and Company

Kivimaki, M., Vahtera, J., Virtanen, M., Elovainio, M., Pentti, J., & Ferrie, J. E. (2003). Temporary employment and risk of overall and cause-specific mortality. *American Journal of Epidemiology, 158*, 663-668.

Kloss, L., Meyer, J. D., Graeve, L., & Vetter, W. (2015). Sodium intake and its reduction by food refromulation in the European Union - A review. *NSF Journal, 1*, 9-19.

Krieger, N. (2001). A glossary for social epidemiology. *J Epidemiol Community Health, 55*, 693-700.

Krishnan, A., Gupta, V., Nongkynrih, R. B., & Thakur, J. (2011). How to Effectively Monitor and Evaluate NCD Programmes in India. Indian Journal of Community Medicine *Indian Association of Preventive & Social Medicine, 36*((Suppl1)), S57–S62. doi:http://doi.org/10.4103/0970-0218.94710

Kulik, J. (2013). *Reducing the economic burden of non-communicable disease in the BRICS: Lessons from Brazil*. Retrieved from University of Toronto, Canada: http://www.brics.utoronto.ca/biblio/Kulik-NCDs-Brazil.html

Kupari, M., Koskinen, P., & Virolainen, J. (1994). Correlates of left ventricular mass in a population sample aged 36–37 years. Focus on lifestyle and salt intake. *Circulation, 89*, 1041–1050.

Laatikainen, T., Pietinen, P., & alsta, L. (2006). Sodium in the Finnish diet: 20-year trends in urinary sodium excretion among the adult population. *Eur J Clin Nutr, 60*(8), 965-970.

Lachat, C., Otchere, S., Roberfroid, D., Abdulai, A., Seret, F. M., Milesevic, J., . . . Kolsteren, P. (2013). Diet and physical activity for the prevention of noncommunicable diseases in low- and middle-income countries: a systematic policy review. *PLoS Med, 10*(6), e1001465. doi:10.1371

Last, J. M. (2000). *A Dictionary of Epidemiology*. USA:: Oxford University Press.
Lategan, R. (2011). *The association of body weight, 25-hydroxy vitamin D, sodium intake, physical activity levels and genetic factors with the prevalence of hypertension in a low income, black urban community in Mangaung*. Retrieved from Bloemfontein, Free State, South Africa:
Law, M. R., Morris, J. K., & Wald, N. J. (1997). Environmental tobacco smoke exposure and ischaemic heart disease: an evaluation of the evidence. *BMJ, 315*(7114), 973-980.
Leibbrandt, M., Woolard, I., & De Villiers, L. (2009). *Methodology: Report on NIDS Wave 1. NIDS Technical Paper, No. 1*. Retrieved from Cape Town:
Leischow, S. J., Ayo-Yusufm, O., & Backinger, C. L. (2013). Converging research needs across framework convention on tobacco control articles: Making research relevant to global tobacco control practices and policy. *Nicotine Tobacco Research, 15*, 761-766.
Levitt, N. S., Steyn, K., Dav, J., & Bradshaw, D. (2011). Chronic noncommunicable diseases and HIV-AIDS on a collision course: relevance for health care delivery, particularly in low-resource settings—insights from South Africa. *The American journal of clinical nutrition, 94*(6), 1690S-1696S.
Levy, D. T., Chaloupka, F., & Gitchell, J. (2004). The effects of tobacco control policies on smoking rates: a tobacco control scorecard. . *J Public Health Manag Pract, 10*, 338-353.
Levy, D. T., Ellis, J. A., Mays, D., & Huang, A. T. (2013). Smoking-related deaths averted due to three years of policy progress. *Bull World Health Organ, 91*(7), 509-518. doi:10.2471
Lim, S. S., Gaziano, T. A., & Gakidou, E. (2007). Prevention of cardiovascular disease in high-risk individuals in low-income and middle-income countries: health eff ects and costs. *Lancet*. doi:DOI:10.1016/S0140-6736(07)61699-7.
Lim, S. S., Vos, T., Flaxman, A. D., Danaei, G., Shibuya, K., & Adair-Rohani, H. e. a. (2012). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet, 380*(9859), 2224–2260. doi:doi:10.1016/S0140-6736(12)61766-8.
Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. *Sage, 75*.
Lozano, R., Naghavi, M., Foreman, K., Lim, S., Shibuya, K., Aboyans, V., . . . Memish, Z. A. (2012). Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet, 380*(9859), 2095-2128. doi:10.1016/s0140-6736(12)61728-0
Lupafya, P. C., Matanje, B. L., Maseko, L. M., & Chimbali, H. (2016). Implementation of Polices and Strategies for control of Non-communicable diseases in Malawi: Challenges and opportunities. *Health Education and Behaviour, 43*(15), 645-695.
Maalouf, J., Cogswell, M. E., Gunn, J. P., Curtis, C. J., Rhodes, D., Hoy, K., & Merritt, R. (2013). Monitoring the Sodium Content of Restaurant Foods: Public Health Challenges and Opportunities. *American Journal of Public Health,, 103(9)*(103(9)), e21–e30. doi:http://doi.org/10.2105/AJPH.2013.301442
MacGregor, G. A., Markandu, N. D., Best, F. E., Elder, D. M., Cam, J. M., Sagnella, G. A., & Squires, M. (1982). Double-blind randomised crossovertrial of moderate sodium restriction in essential hypertension. . *Lancet, 1*, 351–355.
MacGregor, G. A., Markandu, N. D., Sagnella, G. A., Singer, D. R., & Cappuccio, F. P. (1989). Double-blind study of three sodium intakes and long-term effects of sodium restriction in essential hypertension. *Lancet, 2*, 1244-1247.
Mackenzie, T. D., Bartecchi, C. E., & Schrier, R. W. (1994). The human costs of tobacco use. . *N Engl J Med, 330*(14), 975–980.
Mader, E. M., Lapin, B., Cameron, B. J., Carr, T. A., & Morley, C. P. (2016). Update on Performance in Tobacco Control: A Longitudinal Analysis of the Impact of Tobacco Control Policy and the US Adult Smoking Rate, 2011-2013. *Journal of Public Health Management and Practice, 22*(5), E29-E35. doi:10.1097/phh.0000000000000358
Maepe, L. M., & Outhoff, K. (2012). Hypertension in goldminers. *South African Med Journal, 102*, 30-33.
Magnusson, R., & Patterson, D. (2011). Role of law in global response to noncommunicable diseases. *Lancet, 378*, 859-860.

Maher, D., Harries, A. D., Zachariah, R., & Enarson , D. (2009). A global framework for action to improve the primary care response to chronic non-communicable diseases: a solution to a neglected problem. *BMC Public Health, 9*, 355. doi:10.1186

Malan, M., & Leaver, R. (Eds.). (2003). *Political Change in South Africa: New Tobacco Control and Public Health Policies.*: The World Bank.

Marmot, M. (2005). Social determinants of health inequalities. *Lancet, 365*, 1099–1104.

Marmot, M., Friel, S., Bell, R., Houweling, T. A. J., & Taylor, S. o. b. o. t. C. o. S. D. o. H. (2008). Closing the gap in a generation: health equity through action on the social determinants of health. *Lancet, 372*, 1661–1669.

Mash, B., F., L., Olubunmi, A., Omozuanvbo, I., Jyoti, K., Shaheed, M., . . . Y., W. (2012). A Morbidity Survey of South African Primary Care. *PloS One, 7*(3). doi:doi:10.1371/journal.pone.0032358.

Mathers, C. D., & Loncar, D. (2006). Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med, 3*(11), e442. doi:10.1371/journal.pmed.0030442

Mayosi, B. M., Flisher, A. J., Lalloo, U. G., Sitas, F., Tollman, S. M., & Bradshaw, D. (2009). The burden of non-communicable diseases in South Africa. *Lancet, 374*(9693), 934-947. doi:10.1016/s0140-6736(09)61087-4

Mayosi, B. M., Lawn, J. E., van Niekerk, A., Bradshaw, D., Abdool Karim, S. S., & Coovadia, H. M. (2012). Health in South Africa: changes and challenges since 2009. *Lancet, 380*(9858), 2029-2043. doi:10.1016/s0140-6736(12)61814-5

McLean, R. M. (2014). Measuring Population Sodium Intake: A review of Methods. *Nutrients, 6*, 4651-4662. doi:doi:10.3390/nu6114651

Melaku, Y. A. (2016). The impact of poor-diet quality on the burden of non-communicable diseases in Ethiopia—a call for action.

Mente, A., M.J., O. D., & Rangarajan, S. (2014). Association of urinary sodium and potassium excretion with blood pressure. *N Engl J Med, 371*, g.

Menyanu, E., Charlton, K. E., Ware, L. J., Russell, J., Biritwum, R., & Kowal, P. (2017). Salt Use Behaviours of Ghanaians and South Africans: A Comparative Study of Knowledge, Attitudes and Practices. *Nutrients, 9*(9), 939. doi:10.3390/nu9090939

Messner, B., & Bernhard, D. (2014). Smoking and Cardiovascular Disease. *Arteriosclerosis, Thrombosis, and Vascular Biology, 34* 509-515.

Michels, K. B., Welch, A. A., & Luben, R. (2005). Measurement of fruit and vegetable consumption with diet questionnaires and implications for analyses and interpretation. *Am J Epidemiol 161*, 987–994.

Midgley, J. P., A.G., M., C.M., G., & A.G., L. (1996). Effect of reduced dietary sodium on blood pressure: a meta-analysis of randomized controlled trials. *JAMA, 275*, 1590–1597.

Ministry of Health Ghana. (2013). *National Nutrition Policy For Ghana 2013–2017*.

Montero, C. A., Gomes, F. S., & Cannon, G. (2010). The snack attack. *American J Public Health, 100*, 975-981.

Moodie, R., Stucker, D., Nontenero, C., Sheron, K., Neal, B., Thamarangsi, T., . . . Group., o. b. o. T. L. N. A. (2013). Profi ts and pandemics: prevention of harmful eff ects of tobacco, alcohol, and ultra-processed food and drink industries. *L:ancet, 381*, 670–679.

Moosa, S., Derese, A., & Peersman, W. (2017). Insights of health district managers on the implementation primary health care outreach team in Johannesburg, South Africa: a descriptive study with focus group discussions. *Human Resources for Health, 15*(7).

Mosquera, P. A., Hernandrz, J., Vega, R., Labonte, R., . , Sanders, D., Dahlblom, K., & San Sebastian, M. (2014). Challenges of implementing a primary health care strategy in a context of a market-oriented health care system: the experience of Bogota, Colombia. *International Journal of Health Planning and Management, 29*, e347-e367.

Mozaffarian, D., Fahimi, S., Singh, G. M., Micha, R., Khatibzadeh, S., & Engell, R. E. (2014). Global sodium consumption and death fromcardiovascular causes.. . *New Eng J Medicine, 371*, 624–634. doi:doi:10.1056/NEJMoa1304127

Msemburi, W., Pillay-van Wyk, V., Dorrington, R., Neethling, I., Nannan, N., Groenewald, P., . . . et al. (2016). *Second national burden of disease study for South Africa: Cause-of-death profile for South Africa, 1997-2012.* Retrieved from Cape Town:

Mukanu, M. M., Zulu, J. M., Mweemba, C., & Mutale, W. (2017). Responding to non-communicable diseases in Zambia: apolicy analysis. *Health Research Policy and Systems, 15*, 34.

Mulligan, J., Walker, D., & Fox-Rushby, J. (2006). Economic evaluations of non-communicable disease interventions in developing countries: a critical review of the evidence base. *Cost Effectiveness and Resource Allocation, 4*(7), 1-10. doi:doi:10.1186/1478-7547-4-7

Murray, C. J., Lauer, J. A., Hutubessy, R. C., Niessen, L., Tomijima, N., & Rodgers, A. (2003). Effectiveness and costs of interventions to lower systolic blood pressure and cholesterol: a global and regional analysis on reduction of cardiovascular-disease risk. *Lancet 2003; , 361*, 717–725.

Murray CJL, L. A. (1996). *The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020* Cambridge, MA: Harvard University Press, .

Nagata, C., Takatsuka, N., Shimizu, N., & Shimizu, H. (2004). Sodium intake and risk of death from stroke in Japanese men and women. . *Stroke, 35*, 1543–1547.

Nagler, R. H., & Viswanath, K. (2013). Implementation and research priorities for FCTC Articles 13 and 16: tobacco advertising, promotion, and sponsorship and sales to and by minors. . *Nicotine Tob Res., 15*(4), 832–846.

Naidoo, G. (2005). *Leadership and governance for a sustainable public service. The case for selected South African public service organizations.* (Philosophiae Doctor (Public Affairs)), University of Pretoria etd – Naidoo, G (2005), Pretoria, South Africa.

Naidoo, K., Gengiah, S., Yende-Zuma, N., Padayatchi, N., Barker, P., Nunn, A., . . . Abdool Karim, S. S. (2017). Addressing challenges in scaling up TB and HIV treatment integration in rural primary healthcare clinics in South Africa (SUTHI): a cluster randomized controlled trial protocol. *Implementation Science : IS, 12*, 129. doi:10.1186/s13012-017-0661-1

Naledi, T., & Househam, K. (2009). Improving data to reduce the burden of disease – lessons from the Western Cape. *South Afr Med Journal 99*(9), 641–642.

Narain, J., Garg, R., & Frick, A. (2011). Non-communicable diseases in the South-East Asia Region: Burden strategies and opportunities. *The National Medical Journal of India (Natj Med India), 24*, 280-287.

Nasreddine, L., Akl, C., Al-Shaar, L., Almedawar, M. M., & Isma'eel, H. (2014). Consumer knowledge, attitudes and salt-related behavior in the Middle-East: the case of Lebanon. *Nutrients, 6*(11), 5079-5102. doi:10.3390/nu6115079

National Department of Health. (2011). *Human Resources for Health South Africa: HRH Strategy for Health Sector: 2012/2013-2016/2017*. Retrieved from Pretoria:

National Department of Health. (2013). *Strategic plan for the prevention and control of non-communicable disease* Retrieved from Pretoria: http://www.hsrc.ac.za/uploads/pageContent/3893/NCDs%20STRAT%20PLAN%20%20CONTENT%208%20april%20proof.pdfd

National Department of Health. (2014). *Annual Report 2013-2014: A long and Healthy Life for All South Africans*. Retrieved from Pretoria:

National Department of Health, Medical Research Council, & OrcMacro. (2007). *South Africa Demographic and Health Survey 2003. Department of Health*. Retrieved from Pretoria:

National Department of Health, Medical Research Council, & OrcMacro. (2016). *South Africa Demographic and Health Survey 2003. Department of Health (preliminary results)*. Retrieved from Pretoria:

Naylor, G. M., Gotoda, T., Dixon, M., Shimoda, T., Gatta, L., Owen, R., . . . Axon, A. (2006). Why does Japan have a high incidence of gastric cancer? Comparison of gastritis between UK and Japanese patients. *Gut, 55*(11), 1545-1552. doi:10.1136/gut.2005.080358

Newson, R. S., Elmadfa, I., Biro, G., Cheng, Y., Prakash, V., Rust, P., . . . Feunekes, G. I. J. (2013). Barriers for progress in salt reduction in the general population. An international study. *Appetite, 71* 22–31.

Nglazi, M. D., Kaplan, R., Caldwell, J., Peton, N., Lawn, S. D., & Wood, R. e. a. (2012). Antiretroviral treatment uptake in patients with HIV-associated TB attending co-located TB and ART services. *S Afr Med J., 102*(12), 936–939. . doi:doi: 10.7196/SAMJ.6024

Nishtar, S. (2010). *Choked pipes: reforming pakistan's mixed health system*. Oxford Oxford University Press, Oxford

Nissinen, A., Berrios, X., & Puska, P. (2001). Community-based noncommunicable disease interventions: lessons from developed countries for developing ones. *Bulletin of the World Health Organization, 79*(10), 963–970. doi:http://dx.doi.org/10.1590/S0042-96862001001000010

Nojilana, B., Bradshaw, D., V., P.-v. W., Msemburi, W., Laubscher, R., & Somdyala, N. I. (2016). Emerging trends in non-communicable disease mortality in South Africa, 1997 - 2010. . *South African Medical Journal, 106*(5), 477-484.

Norman, R., Bradshaw, D., Schneider, M., Joubert, J., Groenewald, P., Lewin, S., . . . South African Comparative Risk Assessment Collaborating Group. (2007). A comparative risk assessment for South Africa in 2000: towards promoting health and preventing disease. *S Afr Med J, 97*(8 Pt 2), 637-641.

Norton, G. R., & Woodiwiss, A. J. (2011). Hypertension in Africa: redressing the burden of cardiovascular disease using cost-effective non-pharmacological approaches. *SA Heart, 8*, 28-36.

Noubiap, J. J. N., Bigna, J. J. R., & Nansseu, J. R. N. (2015). Low Sodium and High Potassium Intake for Cardiovascular Prevention:Evidence Revisited With Emphasis on Challenges in Sub-Saharan Africa. *J Clin Hypertens (Greenwich), 17*, 81–83.

O'Keefe, J. H., Carter, M. D., & Lavie, C. J. (2009). *Primary and secondary prevention of cardiovascular diseases: a practical evidence-based approach.* Paper presented at the Mayo Clinic proceedings, Mayo Clinic.

Oberg, M., Jaakkola, M. S., Woodward, A., Peruga, A., & Prüss-Ustün, A. (2011). Worldwide burden of disease from exposure to second-hand smoke: a retrospective analysis of data from 192 countries. *Lancet, 377*(9760), 139-146. doi:doi: 10.1016/S0140-6736(10)61388-8.

Ortegon, M., Lim, S., Chisholm, D., & Mendis, S. (2012). Cost effectiveness of strategies to combat cardiovascular disease, diabetes, and tobacco use in sub-Saharan Africa and South East Asia: mathematical modelling study. *BMJ, 344*, e607. doi:10.1136/bmj.e607

Oyebode, O., Oti, S., Chen, Y., & Lilford, R. J. (2016). Salt intakes in sub-Saharan Africa: a systematic review and meta-regression. *Population Health Metrics, 14*(1), 1. doi:10.1186/s12963-015-0068-7

Papadakis, S., Pipe, A. L., Moroz, I. A., Reid, R. D., Blanchard, C. M., Cote, D. F., & Mark, A. E. (2010). Knowledge, attitudes and behaviours related to dietary sodium among 35- to 50-year-old Ontario residents. *The Canadian journal of cardiology, 26*(5), e164-e169.

Parish, S., Collins, R., Peto, R., Youngman, L., Barton, J., Jayne, K., . . . Cederholm -Williams, S. (1995). Cigarette smoking, tar yields, and non-fatal myocardial infarction: 14,000 cases and 32,000 controls in the United Kingdom. The International Studies of Infarct Survival (ISIS) Collaborators. *Br. Med. J, 311*, 471–477.

Parry, C., Burnhams, N. H., & London, L. (2012). A total ban on alcohol advertising: presenting the public health case. *S Afr Med J., 102*(7.), 602-604.

Parry, C., Londani, M., Enkhtuya, P., Huckle, T., Piazza, M., Gray-Phillip, G., . . . Casswell, S. (2017). Support for Alcohol Policies Among Drinkers in Mongolia, New Zealand, Peru, South Africa, St Kitts and Nevis, Thailand and Vietnam: Data From the International Alcohol Control Study. *Drug Alcohol Rev, 37* (Suppl 1), S210-S217.

Parry, C. D., Patra, J., & Rehm, J. (2011). Alcohol consumption and non-communicable diseases: epidemiology and policy implications. *Addiction, 106*(10), 1718-1724.

Pearson, J. F., Bachireddy, C., Shyamprasad, S., Goldfine, A. B., & Brownstein, J. S. (2010). Association between fine particulate matter and diabetes prevalence in the U.S. *Diabetes Care., 33*(10), 2196-2201.

Peer, N., Bradshaw, D., Laubscher, R., & Steyn, K. (2009). Trends in adult tobacco use from two South African Demographic and Health Surveys conducted in 1998 and 2003. *S Afr Med J, 99*(10), 744-749.

Perez, V., & Chang, E. T. (2014). Sodium-to-potassium ratio and blood pressure, hypertension, and related factors. *Advances in nutrition (Bethesda, Md.), 5*(6), 712-741. doi:10.3945/an.114.006783

Perry, I. J., & Beevers, D. G. (1992). Salt intake and stroke: a possible direct effect. . *J Hum Hypertens, 6.*, 23–25.
Peters, S. A. E., Dunford, E., Ware, L. J., Harris, T., Walker, A., Wicks, M., & Neal, B. (2017). The Sodium Content of Processed Foods in South Africa during the Introduction of Mandatory Sodium Limits. *Nutrients*, *9*(4), 404. doi: http://doi.org/10.3390/nu9040404
Peto, R., & Lopez, A. D. (2000). The future worldwide health effects of current smoking patterns. Global Health in the 21st Century. In P. C. Koop EC, Schwarz PM (Ed.), (pp. 154–161.). New York, NY: Jossey-Bass.
Pillay-van Wyk, V., Bradshaw, D., Groenewald, P., & R., L. (2011). Improving the quality of medical certification of cause of death: the time is now! *S Afr Med J 101*, 626.
Pillay-van Wyk, V., Msemburi, W., Laubscher, R., Dorrington, R. E., Groenewald, P., Glass, T., . . . Gwebushe, N. (2016). Mortality trends and diffberentials in South Africa from 1997 to 2012: second National Burden of Disease Study. *Lancet Glob Health*, *4*, e642–653.
Pillay van Wyk, V., Laubscher, R., Msemburi, W., Dorrington, R. E., Groenewald, P., & Vos, T. (2014). *Second South African National Burden of Disease Study: Data cleaning, validation and South Africa NBD List.* Retrieved from Cape Town:
Polinder, S., Haagsma, J. A., Stein, C., & Havelaar, A. H. (2012). Systematic review of general burden of disease studies using disability-adjusted life years. *Population Health Metrics, 10*(21), 1-15.
Polonia, J., & Martins, L. (2009). A comprehensive review on salt and health and current experience of worldwide salt reduction programmes. *J Hum Hypertens.*, *23*, 771–772.
Powles, J., Fahimi, S., & Micha, R. (2013). Global, regional and national sodium intakes in 1990 and 2010: a systematic analysis of 24 h urinary sodium excretion and dietary surveys worldwide. *BMJ Open.*
Powles, J., Fahimi, S., Micha, R., Khatibzadeh, S., Shi, P., & Ezzati, M. (2013). Global, regional and national sodium intakes in 1990 and 2010: a systematic analysis of 24 h urinary sodium excretion and dietary surveys worldwide. *BMJ Open*, *3*. doi:10.1136/bmjopen-2013-003733
Proctor, R. N. (2004). The global smoking epidemic: a history and status report. *Clin Lung Cancer, 5*(6), 371-376. doi:10.3816/CLC.2004.n.016
Prospective Urban Rural Epidemiology (PURE) study investigators. (2017). Fruit, vegetable, and legume intake, and cardiovascular disease and deaths in 18 countries (PURE): a prospective cohort study. *The Lancet,, 390*(10107), 2037-2049. . doi:https://doi.org/10.1016/S0140-6736(17)32253-5
Public Health Agency of Canada and the World Health Organisation. (2008). *Health Equty through intersectoral Action: An Analyisis of 18 country Case Study*. Retrieved from
Puoane, T. R., Tsolekile, L. P., Caldbick, S., Igumbor, E. U., Meghnath, K., & Sanders, D. (2013). Chronic non-communicable diseases in South Africa: Progress and challenges: Social and developmental determinants of health In E. R. Padarath A (Ed.), *South African Health Review 2012-13* (pp. 115-126). Durban, South Africa: Health Systems Trust.
Puska, P. (2000). Nutrition and mortality: the Finnish experience. *Acta Cardiol.*, *55*(4), 213-220.
Puska, P. (2002a). Nutrition and global prevention on non-communicable diseases. *Asia Pacific Journal of Clinical Nutrition, 11*, S755–S758. doi:doi:10.1046/j.1440-6047.11.s.5.x
Puska, P. (2002b). Successful prevention of non-communicable diseases: 25 year experiences with North Karelia Project in Finland. *Public Health Medicine*, *4*(1), 5-7.
Puska, P., Pietinen, P., & Uusitalo, U. (2002). Part III. Can we turn back the clock or modify the adverse dynamics?Programme and policy issues Influencing public nutrition for non-communicable disease prevention: from community intervention to national programme

– experiences from Finland. *Public Health Nutrition, 5*(1A), 245–251.
Rabkin, M., Kruk, M. E., & El-Sadr, W. M. (2012). HIV, aging and continuity care: strengthening health systems to support services for noncommunicable diseases in low-income countries. *AIDS, 26*, S77-S83.
Rani, M., Nusrat, S., & Hawken, L. (2012). A qualitative study of governance of evolving response to non-communicable diseases in low-and middle- income countries: current status, risks and options. *BMC Public Health, 12*, 877.

Ranson, M. K., Jha, P., Chaloupka, F. J., & Nguyen, S. N. (2002). Global and regional estimates of the effectiveness and cost-effectiveness of price increases and other tobacco control policies. *Nicotine Tob Res, 4*(3), 311-319. doi:10.1080/14622200210141000

Raudenbush, S. W., & Sampson, R. J. (1999). Ecometrics: Toward a science of assessing ecological settings, with applicaiton to the systematic social observation of neighborhoods. . *Social Methodology, 29*, 1–41.

Ravi, S., Bermudez, O. I., Harivanzan, V., Chui, K. H. K., Vasudevan, P., Must, A., . . . Thanikachalam, M. (2016). Sodium intake, Blood Pressure, and Dietary Sources of Sodium in an Adult Indian Population. *Annals of Global Health, 82*(2), 234-242.

Reddy, K. S. (2002). Cardiovascular diseases in the developing countries: dimensions, determinants, dynamics and directions for public health action. *Public Health Nutr, 5*(1a), 231-237.

Reddy, K. S., & Yusuf, S. (1998). Emerging epidemic of cardiovascular disease in developing countries. *Circulation, 97*(6), 596-601.

Reddy, P., James, S., Sewpaul, R., Yach, D., & Resnicow, K. (2013). A decade of tobacco control: The South African case of politics, health policy, health promotion and behaviour change. *S Afr Med J, 103*(11), 835-840.

Reddy, P., Zuma, K., Shisana, O., Jonas, K., & Sewpaul, R. (2015). Prevalence of tobacco use among adults in South Africa: Results from the first South African National Health and Nutrition Examination Survey. *South African Med Journal, 105*(8), 648-655.

Rehm J, Gmel G, Sempos CT, & M., T. (2003). Alcohol-related morbidity and mortality. Alcohol research & health. *the journal of the National Institute on Alcohol Abuse and Alcoholism, 27*(1), 39-51.

Rehm, J., Baliunas, D., Borges, G. L., Graham, K., Irving, H., & Kehoe, T. e. a. (2010). The relation between different dimensions of alcohol consumption and burden of disease – an overview. . *Addiction, 105*(5), 817–843. doi:doi:10.1111/j.1360-0443.2010.02899.x.

Rehm, J., Taylor, B., & Room, R. (2006). Global burden of disease from alcohol, illicit drugs and tobacco. *Drug and alcohol review, 25*(6), 503-513.

Rennen, E., Nagelhout, G. E., van den Putte, B., Janssen, E., Mons, U., Guignard, R., . . . Willemsen, M. C. (2014). Associations between tobacco control policy awareness, social acceptability of smoking and smoking cessation. Findings from the International Tobacco Control (ITC) Europe Surveys. *Health Education Research, 29*(1), 72-82. doi:10.1093/her/cyt073

Rose, G. (1985). Sick individuals and sick populations. *Int J Epidemiology, 14*(1), 32-38.

Ross, H., & Chaloupka, F. J. (2006). Economic policies for tobacco control in developing countries. *Salud Publica Mex, 48*(Suppl 1), S113-S120.

Sachs, J. D. (2001). *Macroeconomics and Health: Investing in Health for Economic Development*: WHO, Geneva.

Sacks, F. M., Svetkey, L. P., Vollmer, W. M., Appel, L. J., Bray, G. A., Harsha, D., . . . Lin, P. H. (2001). Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. *N Engl J Med, 344*(1), 3-10. doi:10.1056/nejm200101043440101

Safefood. (2004). *safetrak3, Consumer Tracking Research*. Retrieved from

Safefood. (2006). *Advertising and corporate image tracking research Wave 7*. Retrieved from http://www.safefood.eu/SafeFood/media/SafeFoodLibrary/Documents/Publication/Market%20Research/satrack7.ppt

Saffer, H. (2000). *Tobacco advertising and promotion. In Tobacco control in developing countries*. Oxford, United Kingdom: Oxford University Press.

Sakuyama, H., Katoh, M., Wakabayashi, H., Zulli, A., Kruzliak, P., & Uehara, Y. (2016). Influence of gestational salt restriction in fetal growth and in development of diseases in adulthood. *Journal of Biomedical Science, 23*(12), 1-9.

Sallis, J. F., Bauman, A., & Pratt, M. (1998). Environmental and policy interventions to promote physical activity. *Am J Prev Med, 15*(4), 379-397.

Salooje, Y. (1993). *Tobacco Control: A Case Study (South Africa)*. Paper presented at the All Africa Conference on Tobacco and Health, Harare, Zimbabwe.

Saloojee, Y., & Steyn, K. (2005). Educating medical students about tobacco. *S Afr Med J, 95*(5), 330-331.

Sankoh, O. (2017). Why population-based data are crucial to achieving the Sustainable Development Goals. *International Journal of Epidemiology*, 4–7.

Sasaki, N. (1979). The salt factor in apoplexy and hypertension: epidemiological studies in Japan. Prophylactic approach to hypertensive diseases. In Y. Yamori (Ed.), *Epidemiological studies in Japan* (pp. 467-474): Raven Press.

Schmid, T. L., Pratt, M., & Howze, E. (1995). Policy as intervention: environmental and policy approaches to the prevention of cardiovascular disease. *Am J Public Health, 85*(9), 1207-1211.

Schmidt, H., & Barnhill, A. (2015). Equity and Noncommunicable Disease Reduction under the Sustainable Development Goals. . *PLoS Medicine,, 12*(9), e1001872.

Schmidt, M. I., Duncan, B. B., Azevedo e Silva, G., Menezes, A. M., Monteiro, C. A., Barreto, S. M., . . . Menezes, P. R. (2011). Chronic non-communicable diseases in Brazil: burden and current challenges. *Lancet, 377*(9781), 1949-1961. doi:10.1016/s0140-6736(11)60135-9

Schneider, M., Bradshaw, D., Steyn, K., Norman, N., & Laubscher, R. (2009). Poverty and non-communicable diseases in South Africa *Scandinavian Journal of Public Health, Vol 37*(2), 176 - 186.

Schutte, A., Ware, L., Charlton, K. E., & Kowal, P. (2016). aSalt and potassium intake, and blood pressure in South African adults: Preliminary results from the WHO SAGE Study. *J Hypertension, 34*(Suppl 1), e502.

Scientific Advisory Committee on Nutrition. (2003). *Salt and Health.* . Retrieved from London:

Scollo, M., Lindorff, K., Coomber, K., Megan, B., & Melanie, W. (2015). Standardised packaging and new enlarged graphichealth warnings for tobacco products in Australia—legislative requirements and implementation of the Tobacco Plain Packaging Act 2011 and the Tob Control Competition and Consumer (Tobacco) Information Standard, 2011. *Tob Control 2015;24:, 24*, ii9–ii16.

Scott, V., Schaay, N., Olckers, P., Nqana, N., Lehmann, U., & Gilson, L. (2014). Exploring the nature of governance at the level of implementation for health system strengthening: the DIALHS experience. *Health Planning and Policy, 29*, ii59-ii70.

Sharma, K. (2013). Burden of non communicable diseases in India: Setting priority for action. *Int J Med Sci Public Health, 2*(1), 7-11.

Sharma, S. R., Mishra, S. R., Wagle, K., Page, R., Matheson, A., Lambrick, D., . . . Vaidya, A. (2017). Social determinants of common metabolic risk factors (high blood pressure, high blood sugar, high body mass index and high waist-hip ratio) of major non-communicable diseases in South Asia region: a systematic review protocol. *Systematic Reviews, 6*(1), 183. doi:10.1186/s13643-017-0576-6

Shibuya, K., Ciecierski, C., Guindon, E., Bettcher, D. W., Evans, D. B., & Murray, C. J. (2003). WHO Framework Convention on Tobacco Control: development of an evidence based global public health treaty. *BMJ, 327*(7407), 154-157. doi:10.1136/bmj.327.7407.154

Shisana, O., Labadarios, D., Rehle, T., Simbayi, L., Zuma, K., Dhansay, A., . . . & SANHANES-1 Team. (2013). *South African National Health and Nutrition Examination survey (SANHANES-1)*. Retrieved from Cape Town:

Singh, R. B., Suh, I. L., Singh, V. P., Chaithiraphan, S., Laothavorn, P., Sy, R. G., . . . Sarraf-Zadigan, N. (2000). Hypertension and stroke in Asia: prevalence, control and strategies in developing countries for prevention. *Journal of human hypertension, 14*, 749. doi:10.1038/sj.jhh.1001057

Smith Jr, S., Collins, A., Ferrari, R., Holems Jr, D. R., Logstrup, S., McGhie, D. V., . . . Zoghbi, W. A. (2012). Our time: a call to save preventable death from cardiovascular disease (heart disease and stroke). *European Heart Journal, 33*, 2910-2916. doi:doi:10.1093/eurheartj/ehs313

South Africa Government. (2013). *Government Gazette: NO. R. 214 Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972) Regulations Relating to the Reduction of Sodium in Certain Foodstuffs and Related Matters.* . Retrieved from http://www.heartfoundation.co.za/sites/default/files/articles/South%20Africa%20salt%20legislation.pdf.

South African Noncommunicable Disease Alliance. (2015). *Civil Society Status Report 2010-2015 Maping South Africa's Response to the epidemicof Non communicable disease*. Retrieved from

Southern Africa Labour and Development Research Unit. (2009). *National Income Dynamics Study 2008, Wave 1 [dataset]. Version 5.2.* . Retrieved from Cape Town:

Southern Africa Labour and Development Research Unit. (2014). *National Income Dynamics Study 2012, Wave 3 [dataset]. Version 2.1.* . Retrieved from Cape Town:
Southern Africa Labour and Development Research Unit. (2016a). *National Income Dynamics Study 2010-2011, Wave 2 [dataset]. Version 2.2.* . Retrieved from Cape Town:
Southern Africa Labour and Development Research Unit. (2016b). *National Income Dynamics Study 2014 - 2015, Wave 4 [dataset]. Version 1.1. 2016. Cape Town: DataFirst [distributor], 2016.* . Retrieved from Cape Town:
Southern Africa Labour and Development Research Unit (SALDRU). (2013). *Wave 1 Update: Introduction to NIDS data. Cape Town:* . Retrieved from
Spires, M., Delobelle, P., Sanders, D., Puoane, T., Hoelzeli, H., & Swarti, R. (2016). *Diet-related non-communicable diseases in South Africa: determinants and policy responses*. Retrieved from
Statistics South Africa. (2013). *Mortality and causes of death in South Africa, 2010: findings from death notification*. Retrieved from Pretoria:
Statistics South Africa. (2017). *Poverty trends in South Africa: An examination of absolute poverty between 2006 and 2015. Report No. 03-10-06.* . Retrieved from Pretoria: Stats SA, :
Statistics South Africa (Stats SA). (2015). *Mortality and causes of death in South Africa, 2012: Findings from death notification. Statistical Release P0309.3.* . Retrieved from Pretoria: Statistics South Africa,:
Statistics South Africa, S. S. (2012). *Census 2011 Census in brief / Statistics South Africa, Published by Statistics South Africa* (Report no.: 03-01-41.). Retrieved from
Statistics South Africa, S. S. (2016). *Quarterly Labour Force Survey*. Retrieved from Pretoria:
Steenland, K. (1992). Passive Smoking and the Risk of Heart Disease. *JAMA., 167*.(1), 94-99. doi:doi:10.1001/jama.1992.03480010102033
Steyn, K., Bradshaw, D., Norman, R., & Laubscher, R. (2008). Determinants and treatment of hypertension in South Africans: The first Demographic and Health Survey. *S Afr Med J, 98*, 376-380.
Steyn, K., Fourie, J., & Temple, N. (2006). *Chronic diseases of lifestyle in South Africa:1995-2005. Medical Research Council report*. Retrieved from Cape Town:
Steyn, K., Gaziano, T., Bradshaw, D., Laubscher, R., & Fourie, J. (2001). Hypertension in South African adults: results from the Demographic and Health Survey, 1998. *Journal of Hypertension, 19*(10), 1717-1725.
Stolarz-Skzypek, K., Kuznetsova, T., Thijs, L., Tikhonoff, V., Seidterova, J., & Richart, T. (2011). Fatal and nonfatal outcomes, incidence of hypertension, and blood pressure changes in relation to urinary sodium excretion. *J of Hypert, 305:*, 1777-1785.
Strazzullo, P., Cairella, G., Campanozzi, A. c., Carcea, M., Galeone, D., Galletti, F., . . . Scalfi, L. (2012). Population based strategy for dietary salt intake reduction: Italian initiatives in the European framework. *Nutrition, Metabolism & Cardiovascular Diseases, 22*(161e166).
Strazzullo, P., D'Elia, L., Kandala, N. B., & Cappuccio, F. P. (2009). Salt intake, stroke, and cardiovascular disease: meta-analysis of prospective studies. *BMJ, 339*, b4567. doi:10.1136/bmj.b4567
Stringhini, S., Sinon, F., Didon, J., Gedeon, J., Paccaud, F., & Bovet, P. (2012). Declining stroke and myocardial infarction mortality between 1989 and 2010 in a country of the african region. *Stroke, 43*, 2283-2288. doi:10.1161
Strong, K., Mathers, C., & Bonita, R. (2007). Preventing stroke: saving lives around the world. *Lancet Neurol, 6*(2), 182-187. doi:10.1016/s1474-4422(07)70031-5
Strong, K., Mathers, C., Epping-Jordan, J., & Beaglehole, R. (2006). Preventing chronic disease: a priority for global health. *Int J Epidemiol, 35*(2), 492-494. doi:10.1093/ije/dyi315
Strong, K., Mathers, C., Leeder, S., & Beaglehole, R. (2005). Preventing chronic diseases: how many lives can we save? *Lancet, 366*(9496), 1578-1582. doi:10.1016/s0140-6736(05)67341-2
Summary of the 2007 European Society of Hypertension (ESH) and European Society of Cardiology (ESC) guidelines for the management of arterial hypertension (2007). *Vascular health and risk management, 3*(6), 783-795.
Surgeon General of the United States. (2006). *health consequences of involuntary exposure to tobacco smoke. A report of the Surgeon General, U.S. Department of Health and Human Services,*

Centers for Disease Control, National Center for Chronic Disease Prevention and Health Promotion, . Retrieved from Atlanta GA

Swanepoel, B., Schutte, A. E., Cockeran, M., Steyn, K., & Wentzel-Viljoen, E. (2016). Sodium and potassium intake in South Africa: an evaluation of 24-hour urine collections in a white, black, and Indian population. *Journal of the American Society of Hypertension, 10*, 829-837.

Swart, D., & Panday, S. l. (2003). *The Surveillance and Monitoring of Tobacco Control in South Africa.* Retrieved from

Swart, D., & Reddy, P. (1998). *Strengthening Comprehensive Tobacco Control Policy Development in SOuth Africa using Political Mapping*. Retrieved from Cape Town:

Swart, D., Reddy, P., & Pitt, B. (2001). *The prevalence and determinants of tobacco use among grade 8-10 leaners in South Africa. A Global Youth School-based Survey*. Retrieved from

Swartz, V. D. (2001). *The policy making progress: The case of South Africa's Tobacco Ammendment Act.* (Mater of Philosophy), Univerity of Stellenbosch, Cape Town.

Swinburn, B. A. (2008). Obesity prevention: the role of policies, laws and regulations. *Australia and New Zealand Health Policy, 5*, 12.

Takahashi, Y., Sasaki, S., Okubo, S., Hayashi, M., & Tsugane, S. (2006). Blood pressure change in a free-living population based dietary modification study in Japan. *J Hypertens, 24*, 451-458.

Tang, J. L., & Griffiths, S. (2009). Review paper: epidemiology, evidence-based medicine, and public health. . *Asia Pac J Public Health., 21*(3), 244-251.

Tasslimi, A., Wenger, P., Pentakota, S. R., Brimacombe, M., Burday, M., & Sinha, A. (2008). Invasive pneumococcal disease in an underimmunized, high HIV prevalence population. *The Journal of Infection, 56*(2), 99-102. doi:10.1016/j.jinf.2007.11.005

Taylor, R., Gumming, R., Woodward, A., & Black, M. (2001). Passive smoking and lung cancer: a cumulative meta-analysis. *Australia and New Zealand J Public Health, 25* (3), 203-211.

Taylor, R. S., Ashton, K. E., Moxham, T., Hooper, L., & Ebrahim, S. (2011). Reduced dietary satt for the prevention of cardiovascular disease: a meta-analysis of randomized controlled trials. CochraneR eview. *A m J Hypertens, 24*, 843-853.

Teo, K., Chow, C. K., Vaz, M., Rangarajan, S., & Yusuf, S. (2009). The Prospective Urban Rural Epidemiology (PURE) study: examining the impact of societal influences on chronic noncommunicable diseases in low-, middle-, and high-income countries. *American Heart Journal, 158*(1), 1-7. doi:10.1016

The World Bank. (1999). *Curbing the epidemic: governments and the economies of tobacco control*. Retrieved from Washington DC:

The World Bank. (2007). *Public Policy and the Challenge of Chronic Noncommunicable Diseases* Retrieved from Washington, DC http://siteresources.worldbank.org/INTPH/Resources/PublicPolicyandNCDsWorldBank2007FullReport.pdf

Thomas, S., Fayter, D., Misso, K., Ogilvie, D., Petticrew, M., Sowden, A., . . . Worthy, G. (2008). Population tobacco control interventions and their effects on social inequalities in smoking: systematic review. *Tobacco Control, 17*, 230–237. doi:doi:10.1136/tc.2007.023911

Thorogood, M., Connor, M. D., Lewando-Hundt, G., Tollman, S., & Ngoma, B. S. P. T., . (2004,). Secondary prevention of stroke – results from the Southern Africa Stroke Prevention Initiative (SASPI) study. *Bull World Health Organ., 82*, 503-508.

Tobacco Institute. (1998). *The tax burden on tobacco: historical compilation.* . Retrieved from Washington DC:

Trieu, K. (2015). Salt Reduction Initiatives around the World - A Systematic Review of Progress towards the Global Target. . *PloS One, 10*.

Tsugane. (2005). Salt, Salted food intake and risk of gastric cancer . epidemiology evidence. *Cancer Science, 96*(1), 1-6.

Tuomilehto , J., Lindström , J., Eriksson , J. G., Valle , T. T., Hämäläinen , H., Ilanne-Parikka , P., . . . Uusitupa , M. (2001). Prevention of Type 2 Diabetes Mellitus by Changes in Lifestyle among Subjects with Impaired Glucose Tolerance. *New England Journal of Medicine, 344*(18), 1343-1350. doi:10.1056/nejm200105033441801

U.S Department of Health and Human Services. (2004). The health consequences of smoking: a report of the Surgeon General. Atlanta, Georgia.

U.S Department of Health, E., and Welfare,. (1964). *Smoking and Health: Report of the Advisory Committee to the Surgeon General of the Public Health Service* , . Retrieved from Washington, DC: https://profiles.nlm.nih.gov/ps/retrieve/ResourceMetadata/NNBBMQ

U.S. Department of Health and Human Services. (2010). How Tobacco Smoke Causes Disease: What It Means to You.

U.S. Department of Health and Human Services. (2014). *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*. Retrieved from Atlanta GA: https://www.surgeongeneral.gov/library/reports/50-years-of-progress/exec-summary.pdf

Ucko, P. (2015). *History of tobacco control legislation in South Africa and tactics of the tobacco industry in undermining, delaying, weakening, subverting and abusing*. Paper presented at the Emerging Researchers Program, University of Cape Town.

UK Health Policy and National Health Service. (2010). UK Health Policy and National Health Service (NHS) News–Politics www.politics.co.uk.

Unal, B., Critchley, J. A., & Capewell, S. (2004). Explaining the decline in coronary heart disease mortality in England and Wales between 1981 and 2000. *Circulation, 109*(9), 1101-1107. doi:10.1161/01.cir.0000118498.35499.b2

United Nations General Assembly. (2011). *Political declaration of the high-level meeting of the general assembly on the prevention and control of non-communicable diseases.* (24 January 2012). Retrieved from http://www.un.org/ga/search/view_doc.asp?symbol=A66/L.1

Uyei, J., Coetzee, D., Macinko, J., & Guttmacher, S. (2011). Integrated delivery of HIV and tuberculosis services in sub-Saharan Africa: a systematic review. . *Lancet Infect Dis., 11*(11), 855–867. . doi:doi: 10.1016/S1473-3099(11)70145-1.

van Niekerk, D., Van der Waldt, G., & Jonker, A. (2001). *Governance, politics and policy in South Africa*. Retrieved from Cape Town. South:

van Raaij, J. (2008). Potential for improvement of population diet through reformulation of commonly eaten foods. *Public Health Nutrition, 12(3):*, 325–330.

van Walbeek, C. (2001). Recent Trends in Smoking Prevalence inn South Africa: Some evidence form AMPS data.

van Walbeek, C. (2002). Recent trends in smoking prevalence in South Africa--some evidence from AMPS data. *S Afr Med J, 92*(6), 468-472.

Van Walbeek, C. (2005). [Tobacco control in South Africa]. *Promot Educ, Suppl 4*, 25-28, 57.

Van Walbeek, C. P. (2003). *Tobacco excise taxation in South Africa. Published report for the Tobacco Free Initiative of the World Health Organisation*. Retrieved from

van Zyl, S., van der Merwe, L. J., Walsh, C. M., Groenewald, A. J., & van Rooyen, F. C. (2012). Risk-factor profiles for chronic diseases of lifestyle and metabolic syndrome in an urban and rural setting in South Africa. *African Journal of Primary Health Care & Family Medicine, 4*(1), 346. doi:10.4102/phcfm.v4i1.346

Vartiainen, E., Laatikainen, T., & Peltonen, M. (2010). Thirty-five-year trends in cardiovascular risk factors in Finland. *Int J Epidemiol, 39*(2), 504-518.

Verhave, J. C., Hillege, H. L., Burgerhof, J. G., Janssen, W. M., Gansevoort, R. T., & Navis, G. J. (2004). Sodium intake affects urinary albumin excretion especially in overweight subjects. ; . *J Intern Med, 256*, 324–330.

Wakefield, M. A., Durkin, S., Spittal, M. J., Siahpush, M., Scollo, M., Simpson, J. A., . . . Hill, D. (2008). Impact of Tobacco control Policies and mass media campaigns on monthly adult smoking prevalence. *American Journal of Public Health, 98*(8), 1443-1450. doi:10.2105

Wakefield, M. A., Durkin, S., Spittal, M. J., Siahpush, M., Scollo, M., Simpson, J. A., . . . Hill, D. (2008). Impact of Tobacco Control Policies and Mass Media Campaigns on Monthly Adult Smoking Prevalence. *American Journal of Public Health, 98*(8), 1443-1450. doi:10.2105/ajph.2007.128991

Walt, G., & Gilson, L. (1994). Reforming the health sector in developing countries: the central role of policy analysis *Health Policy Plan, 9*(4), 353-370.

Walt, G., Shiffman, J., Schneider, S., Murray, S. F., Brugha, R., & Gilson, L. (2008). 'Doing' health policy analysis: methodological and conceptual reflections and challenges. *Health Policy and Planning, 23*, 308–317.

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

Wang, L., Kong, L., Wu, F., Bai, Y., & Burton, R. (2005). Preventing chronic diseases in China. *Lancet, 366*(9499), 1821-1824. doi:10.1016/s0140-6736(05)67344-8

Wang, L., Yang, G., Ma, J., Rao, C., Wan, X., Dubrovsky, G., & Lopez, A. D. (2007). Evaluation of the quality of cause of death statistics in rural China using verbal autopsies. *Journal of Epidemiology and Community Health, 61(6), 519–526., 61*(6), 519–526. . doi:http://doi.org/10.1136/jech.2005.043927

Wang, X. Q. Q., Terry, P. D. D., & Yan, H. (2009). Review of salt consumption and stomach cancer risk: epidemiological and biological evidence. *World J Gastroenterol, 15*. doi:10.3748/wjg.15.2204

Ware, L. J., Charlton, K., Schutte, A. E., Cockeran, M., Naidoo, N., & Kowal, P. (2017). Associations between dietary salt, potassium and blood pressure in South African adults: WHO SAGE Wave 2 Salt & Tobacco. *Nutrition, Metabolism & Cardiovascular Diseases, 27*, 784-791.

Watkins, D. A., Olson, Z. D., Verguet, S., Nugent, R. A., & Jamison, D. T. (2016). Cardiovascular disease and impoverishment averted due to a salt reduction policy in South Africa: An extended cost-effectiveness analysis. . *Health Policy Plan, 31*(1), 75-82 doi:http://dx.doi.org/10.1093/heapol/czv023

Watt, G. C. M., Eedwards, C., Hart, J. T., Hart, M., Walton P., & Foy, C. J. W. (1983). Dietary sodium restriction for mild hypertension in general practice. *Br Med J (Clin Res Ed). 286*, 432-435.

Webster, J. (2009). *Reformulating food products for health: Context and key issues for moving forward in Europe*. Retrieved from Brussels, Belgium:

Webster, J. (2014). Cost-effectiveness of reducing salt intake in the Pacific Islands: protocol for a before and after intervention study. . *BMC Public Health, 14* 107

Webster, J., L. , Dunford, E., K. , Hawkes, C., & Nea, l. B. (2011). Salt reduction initiatives around the world. . *Journal Hypertens, 29*, 1043-1050

Webster, J., Trieu, K., Dunford, E., & Hawkes, C. (2014). Target salt 2025: A global overview of national programs to encourage the food industry to reduce salt in foods. . *Nutrients., 6*(8), 3274-3287. doi:http://dx.doi.org/10.3390/nu6083274

Webster, J., Trieu, K., Dunford, E., Nowson, C., Jolly, K., Greenland, R., . . . Bolam, B. (2015). Salt reduction in Australia: from advocacy to action. *Cardiovascular Diagnosis and Therapy, 5*(3), 207-218.

Wentzel-Viljoen, E., Laubscher, R., & Kruger, A. (2011). Using different approaches to assess the reproducibility of a culturally sensitive quantified food frequency questionnaire. *S Afr J Clin Nutr, 24*(4), 143-148.

Wentzel-Viljoen, E., Steyn, K., Ketterer, E., & Charlton, C. E. (2013). Use salt and foods high in salt sparingly": a food-based dietary guideline for South Africa. *South African Journal of Clinical Nutrition, 26*(3), S105-S113.

Wentzel-Viljoen, E., Steyn, K., Lombard, C., De Villiers, A., Charlton, K., Frielinghaus, S., . . . Mungal-Singh, V. (2017). Evaluation of a Mass-Media Campaign to Increase the Awareness of the Need to Reduce Discretionary Salt Use in the South African Population. *Nutrients, 9*(11), 1238. doi:10.3390/nu9111238

Whincup, P. H., Gilg, J. A., Emberson, J. R., Jarvis, M. J., Feyerabend, C., Bryant, A., . . . Cook, D. G. (2004). Passive smoking and risk of coronary heart disease and stroke: prospective study with cotinine measurement. *BMJ, 329*(7459), 200-205. doi:10.1136/bmj.38146.427188.55

WHO European Region. (2015). *Review of national Finnish health promotion policies and recommendations for the future*. Retrieved from Venice:

WHO Forum and Technical Meeting. (2006). *Reducing salt intake in populations: report of a WHO forum and technical meeting; 2006 October 5–7; Paris.* Paper presented at the WHO Forum on Reducing Salt Intake in Populations, Paris, France.

WHO/AFRO. (2014). *Social determinants of noncommunicable diseases and other public health issues in Seychelles: evidence and implications*. Retrieved from Republic of Congo:

Wilson, L. M., Avila Tang, E., Chander, G., Hutton, H. E., Odelola, O. A., Elf, J. L., . . . Apelberg, B. J. (2012). Impact of tobacco control interventions on smoking initiation, cessation, and

prevalence: a systematic review. *J Environ Public Health, 2012*, 961724. doi:10.1155/2012/961724
Wimbush, E., Young, I., & Robertson, G. (2007). Wimbush E, Young I, Robertson G. Developing effective policy and practice for health promotion in Scotland. *Promot Educ, 14* 228-232.
Wlodarczyk, A., Raciborski, F., Opoczynska, D., & Samolinski, B. (2013). Daily tobacco smoking patterns in rural and urban areas of Poland - the results of the GATS study. *Annals of Agricultural and Environmental Medicine, 20*(3), 588-594.
Wolmarans P, D. N., Dalton A, Rossouw K, Schönfeldt H. . (2010). *Condensed Food Composition Tables for South Africa.* Retrieved from Cape Town, South Africa. :
Woolard, I., Leibbrandt, M., & De Villiers, L. (2010). The South African National Income Dynamics Study : design and methodological issues. *Studies in Economics and Econometrics, 34*(3), 7-24.
Woolery, T., Asma, S., & Sharp, D. (2000). *"Clean Indoor-Air Laws and Youth Access." In Tobacco Control in Developing Countries, :* . Oxford, U.K.: Oxford University Press.
Wordl Health Organisation. (2011). WHO maps noncommunicable disease trends in all countries: country profiles on noncommunicable disease trends in 193 countries. *Cent Eur J Public Health, 19*(3), 130 -138.
Worl Health Organisation. (2017). Noncommunicable diseases. Fact sheet *Fact sheet*
World Health Assembly. (2008). *World Health Assembly. Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases (NCDs).* . Retrieved from Geneva:
World Health Assembly. (2013). *Sixty-Sixth World Health Assembly: Follow-up to the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-Communicable Diseases. http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R10-en.pdf* Retrieved from Geneva: http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R10-en.pdf
World Health Organisation. (2000). *The Global strategy for prevention and control of noncommunicable diseases*. Retrieved from Geneva: http://www.who.int/nmh/publications/wha_resolution53_14/en/
World Health Organisation. (2002). *Innovative care for chronic conditions: building blocks for action.* . Retrieved from Geneva: Available: www.who.int/chp/about/integrated_cd/en/indexl.html
World Health Organisation. (2003a). *Treating 3 million by 2005: making it happen: the WHO strategy—the WHO and UNAIDS global initiative to provide retroviral therapy to 3 million people with HIV/AIDS in developing countries by the end of 2005,* . Retrieved from Geneva
World Health Organisation. (2003b). *WHO Framework Convention on Tobacco Control* Retrieved from Geneva:
World Health Organisation. (2004a). *Risk factor estimates for 2004*. Retrieved from www.who.int/healthinfo/global_burden_disease/risk_factors/en/index.html
World Health Organisation. (2004b). *WHO Global Strategy on Diet, Physical Activity and Health*. Retrieved from Geneva:
World Health Organisation. (2005). *STEPS Surveillance manual: the WHO StpWise approach to chronic disease risk factor surveillance.* Retrieved from Geneva:
World Health Organisation. (2006). *Reducing salt intake in populations. WHO Forum and Technical Meeting on Reducing Salt Intake in Populations.* . Retrieved from Geneva: http://www.who.int/dietphysicalactivity/reducingsalt/en/index.html
World Health Organisation. (2008). *International Statistical Classification of Diseases and Related Health Problems 10th Revision*: World Health Organisation.
World Health Organisation. (2008). *2008–2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases. Resolution of the Sixty-First World Health Assembly (WHA 61.14).* . Retrieved from Geneva:
World Health Organisation. (2009a). *Global Health Risks: Mortality and Burden of Disease Attributable to Selected Major Risks*. Geneva: World Health Organization.
World Health Organisation. (2009b). History of WHO Framework Convention on Tobacco Control. .
World Health Organisation. (2011a). *Global status on Noncommunicable diseases*. Retrieved from Geneva:
World Health Organisation. (2011b). Non-communicable diseases country profile.

World Health Organisation. (2012a). *A comprehensive global monitoring framework including indicators and a set of voluntary global targets for the prevention and control of noncommunicabale diseases. Second who discussion paper.* Retrieved from Geneva: http://www.who.int/nmh/events/2012/discussion_paper2_20120322.pdf
World Health Organisation. (2012b). *Guideline. Sodium intake for adults and children*. Geneva.: WHO (World Health Organization).
World Health Organisation. (2012c). *WHO global report. Mortality to tobacco*. Retrieved from Geneva: http://www.who.int/tobacco/publications/surveillance/rep_mortality_attributable/en/
World Health Organisation. (2012d). *Zero draft: Global action plan for prevention and control of noncommunicable disease 2013-2020*. Retrieved from Geneva:
World Health Organisation. (2013a). *Final Comprehensive Global Monitoring Framework and targets for the prevention and control of noncommunicable diseases*. Retrieved from Geneva:
World Health Organisation. (2013b). *Global Action Planfor the prevention and control of NCDs 2013-2020*. Retrieved from Geneva:
World Health Organisation. (2013c). *WHO report on the global tobacco epidemic 2013*. Retrieved from Geneva: http://www.who.int/tobacco/global_report/2013/en
World Health Organisation. (2014a). Global status report on noncommunicable diseases.
World Health Organisation. (2014b). *Guideline: Potassium intake for adults and children*. Retrieved from Geneva: http://www.who.int/nutrition/publications/guidelines/potassium_intake/en/
World Health Organisation. (2015). *Assessing national capacity for the prevention and control of noncommunicable diseases*. Retrieved from Geneva:
World Health Organisation. (2017a). *Global Health Observatory (GHO) data*. Retrieved from Geneva:
World Health Organisation. (2017b). *Monitoring Tobacco Use and prevention policies*. Retrieved from Geneva: http://www.who.int/tobacco/surveillance/policy/country_profile/zaf.pdf?ua=1
World Health Organisation. (2017c). Noncommunicable diseases [Press release]
World Health Organisation Regional Office for Europe. (2008). Nutrition and food security. Action networks. .
World Health Organization. (1990). *Diet, Nutrition, and the Prevention of Chronic Diseases. Report of a WHO Study Group. Technical Report Series 797*. Retrieved from Geneva:
World Health Organization. (2002). *Innovative care for chronic conditions: building blocks for action. Geneva: World Health Organization, Available: www.who.int/chp/about/integrated_cd/en/indexl.html* Retrieved from Geneva:
World Health Organization. (2003). *Diet, nutrition and the prevention of chronic diseases. Report of a Joint WHO/FAO Expert Consultation.* . Retrieved from Geneva, :
World Health Organization. (2006). Sodium intakes around the world. Background document prepared for the Forum and Technical meeting on reducing salt intake in populations (Paris 5-7th October 2006). http://www.who.int/dietphysicalactivity/Elliot-brown-2007.pdf (2006). Accessed 11th Jan 2016: World Health Organization.
World Health Organization. (2007). *Reducing salt intake in populations: report of a WHO Forum and Technical Meeting*. Retrieved from Geneva: http://www.who.int/dietphysicalactivity/Salt_Report_VC_april07.pdf.
World Health Organization. (2008). *Commission on Social Determinants of Health. Closing the Gap in a Generation- Health equity through action and the social determinants of heal*. Retrieved from Geneva:
World Health Organization. (2009a). *Interventions on diet and physical activity. What works? Summary report. (http://www.who.int/dietphysicalactivity/summary-report-09.pdf,* . Retrieved from Geneva:
World Health Organization. (2009b). *WHO report on the global tobacco epidemic 2008: the MPOWER package.* . Retrieved from Geneva:
World Health Organization. (2010). *Global recommendations on physical activity for health,World Health Organization*. Retrieved from Geneva:
World Health Organization. (2011). *Creating an enabling environment for population-based salt reduction strategies.* . Retrieved from Geneva:
World Health Organization (2011). WHO report on the global tobacco epidemic, 2011 warning about the dangers of tobacco.

World Health Organization. (2012). *WHO Guideline: Sodium intake for adults and children. http://apps.who.int/iris/bitstream/10665/77985/1/9789241504836_eng.pdf?ua=1&ua=1 (2012). Accessed 11th Jan 2016*. Retrieved from Geneva: http://apps.who.int/iris/bitstream/10665/77985/1/9789241504836_eng.pdf?ua=1&ua=1

World Health Organization. (2013a). *2008-2013 Action plan for the global strategy for the prevention and control of noncommunicable diseases.* Retrieved from Geneva:

World Health Organization. (2013b). *Mapping salt reduction initiatives in the WHO European Region*. Retrieved from Copenhagen: http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/publications/2013/mapping-salt-reductioninitiatives-in-the-who-european-region.

World Health Organization. (2015a). *MPOWER Brochures and Other Resources.*, . Retrieved from Geneva: p. 2015http://www.who.int/tobacco/mpower/publications/en/

World Health Organization. (2015b). *Reducing the use of salt in the food industry to lower sodium consumption*. Retrieved from

World Health Organization. (2015c). *WHO global report on trends in prevalence of tobacco smoking 2000-2025*. (978 92 4 156492 2). Retrieved from Geneva:

World Health Organization, & World Economic Forum. (2011). *From Burden to "Best Buys": Reducing the Economic Impact of Non-Communicable Diseases in Low- and Middle-Income Countries*. Retrieved from

Yach, D., & Townsend, G. S. (1988). *Smoking and health in South Africa: the Need for Action*. Retrieved from Cape Town:

Yang, Y., Wang, J. J., & Wang, C. X. e. a. (2011). Awareness of tobacco-related health hazards among adults in China. *Biomed. Environ. Sci., 23*, 437–444.

Zhang, Z., Cogswell, M. E., Gillespie, C., Fang, J., Loustalot, F., Dai, S., . . . Yang, Q. (2013). Association between usual sodium and potassium intake and blood pressure and hypertension among U.S. adults: NHANES 2005-2010. *PloS One*, *8*(10), e75289-e75289. doi:10.1371/journal.pone.0075289

Zhou, B. F., Stamler, J., Dennis, B., Moag-Stahlberg, A., Okuda, N., & Robertson, C. (2003). Nutrient intakes of middle-aged men and women in China, Japan, United Kingdom, and United States in the late 1990s: the INTERMAP study. . *J Hum Hypertens, 17*, 623–630.