The link between health and happiness in South Africa: A gender comparison

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As the candidate's supervisor, I acknowledge that the dissertation has been submitted for examination. I have also perused the Turn-it-in report for the final dissertation, and I am of the view that any similarities between the candidate's work and published or internet sources are incidental.

Date: 18 December 2024

Dr Ralitza Dobreva Date:

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I, **Bongeka Myende** , declare that:

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Date: 18/12/2024

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Abstract

Given the government's objective of increasing South Africans' quality of life (Camfield & Skevington, 2008; Street 2023), there is scope and clear motivation to establish the factors that contribute to well-being on a wider scale than the focus on income levels (Camfield & Skevington, 2008). It is important to analyse the relationship between health and life satisfaction not in isolation but as a part of a broader context of how it is impacted by other variables including the individuals' context, reflected in measures of social capital, such as crime and theft in the neighbourhood. This enables us to have an in-depth understanding of health dynamics and how to improve the quality of life for South Africans, which will, in turn, contribute towards encompassing health sector policies. When economists draw out instructive models on how healthcare should be improved, life satisfaction is included as one of the variables affecting health. Therefore, paying attention to subjective well-being as one of the variables affecting health should take centre stage.

The nationally representative panel data used in this study was taken from the five waves of the National Income Dynamics Study (NIDS). Individuals' self-rated health is the dependent variable, while happiness is reflected on a ten-scale of overall life satisfaction. Since the dependent variable health is ordinal in nature, the model used is the ordered logit model. This dissertation addresses the endogeneity problem caused by individual heterogeneity using a fixed effects model. Based on the results, the link between life satisfaction and health appears stronger for men. Looking at the relationship between social capital and health, it is expected that those who prefer to stay in the neighbourhood to report excellent health compared to those who prefer to leave the neighbourhood but in this case those who prefer to leave reported higher excellent health compared to those who prefer to stay for both men and women. The social capital variables were also used as the indirect channel, through which life satisfaction affects health. The results imply that life satisfaction works through religious practice to influence men's health more than women's. The link between life satisfaction and health is stronger for men, while social capital influences health outcomes differently by gender.

Keywords: Health; happiness; gender; logistic regression, panel data

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Abbreviations	Definition
SRH	Self-rated health
SDG	Sustainable Development Goals
IV	Instrumental variable
UN	United Nations
WHR	World happiness Report
NIDS	National Income Dynamic Survey
POL	Pooled Ordered Logit
REL	Random Effects Ordered Logit
FEL	Fixed Effects Ordered Logit

Chapter 1: Introduction and background

1.1 Introduction

In the vein of discussing the relationship between health and happiness at the individual level and in considering the Stiglitz-Sen-Fitoussi Commission's recommendations, a substantial body of literature in health economics considers how access to resources influences health (Stiglitz *et al*., 2009). However, there may also be a direct relationship between happiness (a broader measure of wellbeing than material wellbeing measures, such as income) and health, which has received much less attention. Given the government's objective of increasing South Africans' quality of life (Camfield & Skevington, 2008), there is scope and clear motivation to establish the factors that contribute to subjective well-being on a larger scale than income levels (Camfield and Skevington, 2008).

To understand health, a number of studies have used self-rated health. When people are asked to rate their health, they consider a wider range of factors that might affect their health, and these are factors that are not possible to know through surveys and medical examinations (Schnittker and Bacak, 2014). The focus of the surveys and medical examinations are mainly health that is physical, and the self-perceived health considers the overall health. This study used self-rated health to uncover the link between health and happiness in South Africa. For happiness, although there are many concepts and components of happiness that have been identified and researched, this study focused on life satisfaction, which is often referred to as a subjective well-being. Throughout this study, concepts such as happiness, subjective well-being, life satisfaction and quality of life are used interchangeably.

In light of the above, it is important to examine the link between health and happiness, not in isolation, but as part of a broader context of how it is impacted by other variables such as socioeconomic conditions. This will enable us to have an in depth understanding of health dynamics and how to improve the quality of life for South Africans, which will in turn contribute towards improving health sector policies. It is acknowledged that access to healthcare services is not the only factor that impacts health and improve health outcomes (Ataguba *et al*., 2015). Improved health results from a variety of factors, including socio-economic issues and environmental factors. The relationship between health and happiness is of interest because happiness is also a socio-economic factor that influences health, and in South Africa, it can be used to improve health outcomes. When economists draw out instructive models on how healthcare should be improved, subjective well-being is included as one of the

variables affecting health (Lopuszanska_Dawid, 2018). Therefore, paying attention to life satisfaction as one of the variables affecting health should take centre stage.

One aspect of the Sustainable Development Goals (SDGs) is universal health coverage: objective 3. The SDG 3's objective is to ensure that everyone, regardless of age, has a healthy life and fosters well-being. Even if there has been a lot of progress recently, there are still a lot of obstacles to face. Previously, the focus of improving health was mainly on physical health. However, instead of using physical health, most studies have used the self-rated health, which includes physical health and mental health. Globally, governments have started to take decisions of improving health based on evidence of subjective wellbeing measurements (Cubimolla *et al*., 2014).

Scientists began tracking the correlation between health and life satisfaction in 1938, through the Harvard Study of Health. Harvard researchers were able to assess the health of almost 270 undergraduates during the Great Depression (Mineo, 2017). Some of the study's findings revealed that 50-year-olds who enjoyed their relationships were more likely to maintain a healthy lifestyle than those with low satisfaction levels. Moreover, women who reported feeling secure in their relationships were less depressed two and a half years after the initial survey, and they also had better memory functions (Mineo, 2017).

Since then, more studies have paid attention to relationship between health and happiness. Siahpush *et al*. (2008) found that a positive correlation exists between subjective well-being and perceived health in Australia, while Sabatini (2014) found the same results in Italy. In South Africa, a literature on the link between health and happiness is limited. Adesanya *at al*. (2017) conducted a study in five countries, and South Africa was among those countries. The study sought to investigate the socioeconomic differences in self-rated health and happiness among these five countries. The results for South Africa showed low levels of life satisfaction and poor health. The study concluded that there is a positive relation between better health and happiness.

1.2 Research problem and research questions

Given South Africa's state of high levels of unemployment, poverty and inequality, it is important to comprehend the link between health and happiness. Being able to address this relationship could assist policies in improving the quality of life for South Africans. In order to improve living standards, we must be able to control for the factors affecting health. If

subjective wellbeing has a major impact on health, then more attention needs to be placed on it from a policy context in South Africa. In the determinants of subjective well-being, limited studies have included health as a determinant of subjective well-being (Ebrahim *et al*., 2013; Blaauw and Pretorious, 2013). Regarding the determinants of health, most research in South Africa have not paid much attention to life satisfaction as one of the factors that influences health (Ataguba *et al*., 2015; Scott *et al*., 2017; Omotoso and Steven, 2018). However, other global studies have found that life satisfaction is a significant factor on health outcomes (Lopuszanska-Dawid, 2018; Vinsalia and Handajani, 2021). Despite growing evidence of the health-happiness nexus, little is known about how social capital mediates gendered health outcomes in South Africa. This dissertation addressed this gap by looking at both health and happiness as determinants of each other. The challenge is that most previous studies used cross-sectional data, which could lead to heterogeneity issues in the results of these studies. Although the instrumental variable (IV) method has been used in some studies to address endogeneity issues, it is challenging to identify a suitable IV. Also, since cross sectional approaches do not monitor changes over time, they are unable to determine the direction of correlations between variables. This dissertation addressed the endogeneity problem caused by individual heterogeneity by using panel data from National Income Dynamics Study (NIDS) and a fixed effects ordered logit model. Another challenge is that the studies conducted on the connection between health and subjective wellbeing tend to ignore other variables that might affect health or subjective wellbeing such as social, economic and household factors. Thus, this study seeks to address the above mentioned problems through the research questions below.

1.3 Research questions

- What is the relationship between individual's health and subjective wellbeing in South Africa?

- How does the relationship between an individual's health and subjective wellbeing differ by gender?

- To what extent does social capital moderate the gendered relationships between health and subjective wellbeing? How are these relationships affected when social capital is considered as an indirect channel between subjective wellbeing and health?

1.4 Structure of the dissertation

This dissertation is made up of five chapters. Chapter 1 introduces the background of the study and explains the purpose of the study, it also presents the research questions and the structure of the dissertation. The remaining chapters are structured as follows: Chapter 2 presents the literature review of the study, and it looks at the theoretical literature and empirical studies on gender differences and the link between health and happiness. Chapter 3 presents the descriptive statistics, which highlight the data used for this study (NIDS). This chapter also outlines the variables of interest while defining them, and it provides the interpretation of the descriptive statistics. Chapter 4 presents the methodological approach, regressions, and discussion of the results. The last chapter is a conclusion of the dissertation and provides recommendations.

Chapter 2: Literature review

2.1 Introduction

The research on the link between self-rated health and happiness is extensive and interrelated, and it is based on studies from a corpus of fields of study, including economics, sociology, psychology, and philosophy. The focus on researching about the relationship between health and happiness have increased in the recent years. This chapter seeks to look at both the theory linking health, happiness and gender, and to analyse the empirical studies on gender differences in linking health and ha, piness. The chapter is made up of the following; firstly, section 2.2 provides valid reasons on why self-rated health is used as the variable for assessing the health status. Secondly, section 2.3 defines what measures happiness and how the definition of happiness is broken down by Steptoe. Empirical studies are also highlighted to support the explanations behind health and happiness discussions.

Thirdly, section 2.4 is the theoretical framework on the relationship between health and happiness. The section first explores the bidirectional relationship between health and happiness. This section has 2.4.1 which is health as a measure of happiness, and 2.4.2 which is happiness as a measure health, and 2.4.3 which is the indirect relationship between health and happiness. This section gives discussions on how other factors influence health and happiness. Section 2.5 is the relationship between health and happiness: gender perspective, and the section looks at gender difference studies that are linking health and happiness. Section 2.5 is made up of 2.5.1,2.5.2, and 2.5.3. Section 2.5 is the empirical studies on health, happiness, and gender, and it looks at international studies. Section 2.5.1 looks empirical studies on health, happiness, and gender at African countries. Section 2.5.2, on the other hand examines empirical studies on health, happiness, and gender by looking at limited studies in South Africa. The empirical studies in section 2.5 include both cross sectional studies and longitudinal studies.

Lastly, section 2.6 presents the conclusion of Chapter 2.

2.2 Health

To measure health status, most researchers have used a widely popular measure, which is self-rated health (Jylhä *et al*., 2001; Franks *et al*., 2003; Kawada, 2003; Eriksson *et al*., 2010). According to Eriksson (2010), self-rated health is one of the most commonly used measure of health assessments in epidemiological research. Other researchers have noted that, despite the self-rated health being mostly used, there is still no clear meaning of what it means, and it is

not clear if there is any significance in self-rated health (Mossey, 1982). The questions of the unclear meaning were based on whether the self-rated health provides the true health status of a person or whether it shows that it is correlated with other social capital variables or socio demographic variables (Kaplan *et al*., 1988).

Kaplan *et al*. (1988) provided three approaches to understand self-rated health, to provide validity on what it measures, and to explain why self-rated health can be regarded as a valid measure of health status. The first approach examines "the relationship between perceived health status and findings from physical examinations or physician ratings" p:4. The results have shown moderate but also a substantial link exists between self-rated health and physical examinations. Due to the fact that physical examination requires tests and evaluations in order for it to be regarded as valid, and for the correlation to be positive, means that the self-rated health can be used as a valid measure.

The second approach measures "the relationship between perceived health measures and various measures of functional ability" p:4, and the results provide a positive correlation between the two measures. For example, Idler and Kasl (1995) in their research paper found that self-rated health is associated with the changes in functional ability over time. Klapan *et al*. (1988) further explained that those who rank their health as poor may have restricted functional abilities than others. The positive correlation still does not make it a valid measure in this case because the ability of an individual to perform different tasks is not only a function of their physical health but also of their ability to cope with any coexisting medical conditions. The last approach focuses on "the multitude of factors that influence perceived health measures". This includes the social capital variables and socio demographic variables that influence the perceived health. For example, the individuals reporting excellent health also report to have high life satisfaction.

Based on the arguments of the above-mentioned approaches, conclusions on the importance of using self-rated measures can be based on the validity of self-rated measures, overall measure, social capital and socio demographic factors. The validity of self-rated measures originates from their association with physical examinations, morbidity and mortality indices, and this is what gives them their usefulness (Franks *et al*., 2003; Murata *et al*., 2006). Self-rated measures include a variety of elements that may not be included in the objective health measures on their

own, such as mental health, physical health, and socio-economic status, social support status, and lifestyle factors (Franks *et al*., 2003; Eriksson *et al*., 2010; Benyamini, 2011). Idler and Benyamini (1997) highlighted that self-rated health captures the whole range of disorders a person experiences, and maybe even the signs of a disease that has not yet been diagnosed but is present in the prodromal phases. The responses and interpretations of self-rated questions for each individual may differ based on their cultural norms and socio-economic factors. This dissertation mainly focuses on self-rated health as a variable that is influenced by the socioeconomic factor, which is life satisfaction and other socio-economic factors and social capital variables.

2.3 Happiness

One of the first attempts to crystalize the importance of measuring happiness in the field of economics was through the Stiglitz-Sen-Fitoussi commission in 2008 (Stiglitz *et al*., 2009). The report mentioned that, in order to successfully measure GDP, subjective wellbeing of individuals should also be considered (Kroll and Layard, 2011). The goal of this strategy was to offer more comprehensive knowledge of quality of life and societal wellbeing. After the recommendation to include happiness in measuring GDP to make it official, in 2011, the United Nations (UN) General Assembly requested that countries measure happiness with the World Happiness Report and use it to assist in guiding public policy (Adjaye-Gbewonyo *et al*., 2016). The United Nations General Assembly launched the World Happiness Report (WHR) that offers an annual ranking of happiness across counties (Steptoe, 2019).

According to common experience, when individuals are asked what they believe their important traits for a good life are, they typically respond with health, happiness, and life satisfaction, and as a result, governments have tried to improve subjective well-being by increasing public health services (Ngamaba *et al*., 2017). The term ‘well-being’ is connected with the emotions, feelings and life satisfaction, and it is concerned with how individuals perceive their lives, which might include assessments of their relationships, health statuses, or their work environment (Adjaye-Gbewonyo *et al*., 2016).

Steptoe (2019) provides an insightful breakdown of the constructs of happiness. The first construct is the effective well-being (feelings of joy and pleasure). According to Pancheva *et al*. (2021), Bradburn explained that the results of happiness are based on balancing between the positive and negative effects. Positive effects refer to when an individual experience joy and

pleasure, whereas negative effects refer to experiencing emotions such as anxiety, anger, sadness, and so on (Pancheva *et al*., 2021). The effective well-being mainly focuses on minimization of negative effects and maximization of positive effects. The second construct of happiness is eudaimonic well-being (sense of meaning and purpose in life). Unlike the effective well-being, which focuses on the pleasure that one is feeling at that time, the eudaimonic wellbeing focuses on the long-term pleasure (Steptoe, 2019). The eudaimonic well-being involves the evaluation of personal potential and achievement of life goals (Steptoe, 2019). This wellbeing is made up of six components: 'autonomy', 'environmental mastery', 'personal growth', 'positive relations with others', 'purpose of life' and 'self-acceptance' (Steptoe, 2019). An individual with high autonomy is a fully functioning individual that is portrayed as possessing an internal locus of evaluation, meaning they judge themselves according to their own criteria rather than seeking validation from others (Ryff, 2018). Knight *et al*. defines being an environmental mastery as "a sense of self-efficacy or master over environmental demands, which reflects a sense of control" (2011:871). Personal growth refers to the willingness to try new things in order to grow as a person and gain personal growth. Having positive relationship with others involves getting along with other people and having affection for other human beings. The purpose of life is having a clear self-direction on how one wants their lives to be or what they want to achieve in life, and self-acceptance includes accepting your past. The third construct of happiness is evaluative well-being (life satisfaction based on how individuals are satisfied with their lives) (Steptoe, 2019: 339). Evaluative well-being refers to experienced well-being, which describes the range of feelings that people encounter on a daily basis, both happy and sad.

These are important distinctions that this research sought to adopt. There are many overlaps between the three constructs of happiness, for example, one's satisfaction with life can have a lot to do with whether one experiences joy and pleasure. Also, one may be experiencing pain in their life but view their suffering as that which gives meaning to their life. It is, therefore, crucial to identify the differences and overlaps between the three types of well-being that Steptoe (2019) gave.

2.4 The relationship between health and happiness.

It is this interdependency of an individual's health and well-being that makes the causal relationship between these variables bi-directional, such that those who express a high level of

happiness scores generally report being in better health than those with lower life satisfaction, and that people who have strong well-being scores have better health outcomes than those with lower scores (Angner *et al*., 2013; Lu *et al*., 2020). Ngamaba *et al*. (2017) conducted a survey in 29 countries, and the findings demonstrated a favourable and statistically significant correlation between a person's health and well-being.

However, there are thinkers who are sceptical of the claim that there could be a relationship between happiness and physical health. The most vocal thinker among these opponents is Barbara Ehrenreich, the author of *smile or die,* who presents a vehement criticism against 'positive psychology' (Steptoe, 2019:340). According to Steptoe (2019), the only intuitive relationship that we recognize between physical health and happiness is the one where physical illness leads to impaired well-being (2019: 340). Angner *et al*. (2013) reviewed numerous studies that investigated ways in which physical impairment leads to decrease in life satisfaction. They concluded that there is a substantial relationship between perceived health and subjective well-being. However, there is little confidence that there could be anything more beyond that relationship. For example, there are studies that are doubting that happiness can positively influence self-rated health. Nevertheless, there is some concession that unhappiness may lead to certain bodily ailments. Liu *et al*. (2016) argued that health can affect happiness in a sense that an unhealthy person is more likely to be unhappy. They, however, deny that happiness can lead to health. Therefore, according to Liu *et al*. (2016), the only meaningful way of addressing the relationship between health and happiness is to focus on health inducing mechanisms, which will lead to happiness and not vice versa.

In contrast to the above, Steptoe (2019) reviewed studies conducted in 2017, which involved more than 1 250 000 participants, and they found that the subjective well-being can function as a protective factor in relation to all causes of mortality. The more the people scored higher on subjective well-being the lower was their mortality rate. Sabatini corroborates this by citing studies that argue that positive outlook in life can induce longevity (Sabatini, 2014: 178). However, it is crucial to identify that, although these studies produce attractive results, they have been associated with publication bias, which means that the studies that had results that opposed the desired link between subjective well-being and mortality were less likely to be published (Steptoe, 2019). Nonetheless, despite their weaknesses, they do provide insightful factors that could help enrich the study of health and well-being.

Other studies have showed that a combination of eudaimonic and affective well-being can be linked with reduced risk of stroke, diabetes and other cardiometabolic illnesses to those who are more to exposed to them (Steptoe 2019). Another study that involves participants from eleven countries reported reduced vulnerability to arthritis for people with higher eudaimonic well-being (Steptoe, 2019:345). One study measuring disability within the broader research of physical capability and disability reported that individuals with higher affective well-being have a reduced risk of incidences of impeded everyday living activities (Angner *et al*. (2013). All these mechanisms suggest that the relationship between health and subjective well-being likewise moves in the direction from well-being to health. This means that the link between health and happiness can be direct and indirect.

2.4.1 Health as a measure of happiness

As mentioned above, the self-rated health refers to an individual's overall health and life satisfaction. The conceptualization of self-rated health is made up of two components, the latent health status and reporting behaviour (Layes *et al*., 2012). The latent variable is defined as the value assigned to life expectancy as altered by disabilities, functional states, perceptions, and social possibilities that are impacted by illness, injury, therapy, or policy (Patrick and Erickson, 1993 cited in Layes *et al*., 2012. Reporting behaviour is defined as the systematic measurement error between the self-rated health and the latent health. When a person is asked to evaluate their health, reporting behaviour acts as a filter that allows latent health to flow (Layes *et al*., 2012). The difference between the latent health and reporting behaviour is further explained by providing an example that indicates that people could have the same injury but will be experiencing pain differently, which means the same injury could lead to different health outcomes. People could report their health based on the knowledge of the latent health. The above is proof that the relationship between physical health and happiness may be negative, but if one has knowledge or has accepted their physical health, they might report high life satisfaction, even if they are experiencing physical pain.

A person's physical, social, and emotional well-being are greatly impacted by health difficulties, and in this instance, reporting behaviour may reflect these variations. (Jylha, 2019 cited in Nkhoma, 2020). Numerous studies have demonstrated the direct impact of health on happiness. According to Helliwell (2003 cited in Acosta-González and Marcenaro- Gutiérrez 2021), subjective well-being rises by 0.61 points for every unit improvement in health on a scale of 1

to 5. Through socioeconomic characteristics, self-rated health also indirectly affects subjective well-being.

2.4.2 Happiness as a pathway to health

At this juncture, it may be important to explain the different pathways relating to health and well-being, what Sabatini (2014) refers to as transmitting mechanisms. That is the way in which a person's subjective well-being can influence their health. The first pathway is cited by Sabatini as the autonomous nervous system, a severely stressful event that can affect the functioning of the nervous system, which in turn increases the likelihood of death (Sabatini, 2014: 178). Dfarhud (2014) posits that there is a close connection between the brain regions that regulate emotions and cognitive processes and those that control weight and metabolism. This suggests that obesity can be induced by depression and stress. Dfarhud (2014) further argues that endogenic factors are the basis of subjective well-being, and they deserve much more scholarly attention. Another biological pathway includes one's innate disposition towards emotions (Dfarhud, 2014), for example, some individuals are more resilient to tragic events than others.

The second pathway is what Steptoe calls 'behavioural processes', which simply means that individuals with happier lives tend to lead a healthier lifestyle, which improves their health (Sabatini, 2014; Steptoe, 2019;). Sabatini (2014) delves deeper into the behavioural process that can affect health and looks at the way in which social capital can impact one's health.

Social capital is divided into two, with the first one being 'structural dimension', which describes a person's use of relational goods, involvement in social networks, and volunteer activity. (Sabatini, 2014: 179). The second one is called 'cognitive dimension', and it refers to one's shared beliefs, reciprocity and trust. According to Sabatini, social capital can influence one's access to healthcare, knowledge about health care, enhance the probability of adopting healthy behaviours (2014). It is not hard to imagine what this means. For example, a person who lives alone is likely to be sad and resort to harmful practices like drinking, and with no social network of individuals to care for them, they are less likely to quit the harmful behaviours on their own. Michael Argyle identified many confounding factors that affect health and subjective well-being such as social capital, leisure, personality, work, and social class, to name a few.

The underlying insight that needs to be fleshed out so far is that there are two types of factors influencing health and subjective well-being. There are the endogenous factors such as one's genetic makeup and hormones and exogenous factors such as one's social capital (Liu *et al*. (2016). However, there is a very subtle relationship between these two factors that need to be further investigated. A person born with depression is less likely to form large social capitals or even participate in social events. Therefore, endogenous factor of happiness seems to also influence the exogenous factors of happiness. A grief over a loss of a loved one, which can affect one's ANS, can also be alleviated by participation in social activities like hiking or choir groups. The relationship between endogenous factors and exogenous factors can be so entangled such that it is difficult to know which causes the other (Sebatini, 2014).

2.4.3 Indirect relationship between health and happiness

The correlation between health and happiness is multi-layered. As mentioned above, there is a direct link between self-rated health and happiness, which is linked through mental health and physical health and physical, social, and emotional well-being. There is also an indirect relationship between health and happiness that is influenced by socioeconomic factors (Sebatini, 2014), social capital, and lifestyle choices (Lu *et al*., 2020). Some of the factors that influence this relationship are age and income. A number of studies conducted by several researchers show that older people have high levels of well-being from both developing and developed countries (Puvill *et al*., 2016; Gildner *et al*., 2019; Lu *et al*., 2020. Some of the reasons for high well-being in old people are due to low levels of stress and having no responsibilities in their households (Angner *et al*., 2013; Mogilner *et al*., 2018). It is also because of the fact that older people view negative factors and stressful life events through a wider lens, for example, they tend to have a milder, more balanced evaluation. A study by Angner *et al*., (2013) on health status and happiness concluded that the individuals that are less than 65 years old have low levels of life satisfaction. On the levels of income, Ball and Chernova (2008) cited on Weech-Maldonado *et al*. (2017) argued that while having money can purchase a certain degree of happiness (for instance, being above the poverty threshold), the perception of wealth in relation to others might have a greater influence on happiness, and that perception can indirectly increase one's health.

Social capital factors include social relationships and marital status. Support from social networks has been linked to reduced rates of morbidity, mortality, better oral health, less stress,

and increased psychological well-being (Berkman *et al*., 2000). On marital status, the Healthy Marriage Initiative acknowledges that positive relationships within marriages are beneficial to both partners' and children's health (Umberson and Karas Montez, 2010), and that indirectly increases happiness. Based on the existing literature, there are suggestions that postulate that happiness is significantly impacted by physical fitness, and the exercise is significantly correlated with health (Li *et al*., 2023). It can also be assumed that if an individual prefers to stay in the neighbourhood, and has a high life satisfaction, they are likely to report excellent health. However, that is not the only case, as some studies have found that some people have deep attachments with their communities, and being within their communities makes them happy, even if their health declines (Brown *et al*., 2021).

The indirect relationship between health and happiness is further explained by several theoretical models, namely, biopsychosocial model and socioecological model. These models have been developed and are used to explain how other factors that are mentioned above influence and regulate the link between health and happiness. The biopsychosocial model is used for understanding the relationship between health and wellbeing, and it shows this relationship by highlighting three dimensions: biological, psychological, and social dimension (Wade and Halligan, 2017; Lehman *et al*.,2017). The biopsychosocial model suggests that health and wellbeing are impacted not solely by biological variables like genetics but are also influenced by psychological factors such as feelings and thoughts, as well as social factors (Lindau *et al*., 2003). The socioecological models are explained as models that are visual representatives of the dynamic interactions between people, communities, and their environments (including physical, political, and social mechanisms) (Golden *et al*., 2015; Pierce and Kealey, 2015). The socioecological models further explain that to improve health or happiness, the focus must not be the influence of individual level only, but it must also be based on other factors such as relationships with people that are close to their surroundings, local norms, and cultural values. For instance, the longitudinal studies of United States veterans of the Vietnam War cited by Pierce and Kealey (2015) revealed that social norms can impact a person's ability to overcome an addictive habit. According to the socioecological model, the Centers for Diseases and Prevention have updated its health promotion programs to include the realms of interpersonal, organizational, community, and policy (Pierce and Kealey, 2015). By using these models, the biopsychosocial model and socioecological, this dissertation looks at

how social capital moderates the link between health and subjective well-being, emphasizing how the wider structural factors interact to shape the research findings.

2.5 The relationship between health and happiness: Gender perspective

One of the focus areas of this study is how gender plays a role in the correlation between health and happiness. That is, ways in which differences in gender lead to differences in ways health affect well-being. The variables mentioned in the preceding paragraphs can have different effects on men and women. Factors such as employment, education, and marital status have varying effect on health and subjective well-being when studied comparatively between men and women. (Maharlouei *et al*., 2020). For example, an American study discovered that males who report the same health condition as women had lower life satisfaction levels than women. This is because women are more honest or nuanced about their emotions. (Hutson-Comeaux and Kelly, 2002; Maharlouei *et al*., 2020). Another study cited by Sabatini (2014) found that men within a month of losing their loved have a lower mortality rate, whereas women who lost their loved one seems to have doubled mortality rate. There are many ways that happiness and health can manifest differently between women and men, especially if one considers that one of the main factors of health is social capital. In a patriarchal society, men have more access to health care and health care knowledge. Also, men may be less likely than women to drop harmful practices that are detrimental to their health if it is considered 'manly' by their social group. Therefore, social capital may play lesser role to men in terms of improving their health than women.

Some studies have found that religiosity is one of the factors that has a positive impact to life satisfaction (Witter *et al*., 1985; Kortt *et al*., 2015; Lim *et al.,* 2010). Religious individuals tend to have eudaimonic well-being, and they are much more resilient to tragic life events. Moreover, some religious people tend to avoid harmful practices like drinking and smoking, which means they tend to live a healthier lifestyle. This is interesting because statistics show that women are more religious than men. Therefore, women will tend to have more eudaimonic well-being than men. These are a few of the suggested health and well-being disparities between men and women. It is crucial to remember that religion is not the only source of eudaimonic well-being. Some people may find such sense of purpose and meaning in philosophy or work. All of these philosophies instil a sense of eudaimonic well-being to their proponents. There are relatively more male philosophers than there are female philosophers,

due to history of structural injustice against women and other minorities. Therefore, while there are differences in the sources of eudaimonic well-being, there is little confidence in saying that one gender has more eudaimonic well-being than the other. Instead, this leads us to investigate the ways in which different life factors influence different dimensions of well-being, and the extent to which gender plays a role.

Other studies have found that the relative standing can have far reaching consequences on subjective well-being. People who believe they have achieved upward mobility tend to be much more satisfied than individuals who do not perceive themselves to have gained upward mobility, regardless of the objective results (Casale and Posel, 2010). This has a potential of affecting men and women differently if one considers latest debates on gender pay gap and other factors that women feel keep them immobile in the corporate world. It therefore seems logical to assume that the subjective well-being of women will be different to that of men as far as relative standing is concerned, and this will have different consequences for health.

2.6 Empirical studies on health, happiness, and gender: Global perspective

Most research carried out in developing and developed countries have examined the connection between subjective well-being and health using various models and under different faculties, as mentioned above. There is quite a number of studies focusing on the relationship between health and happiness, but studies on gender differences focusing on the link between health and happiness are limited. Some of the empirical studies have found the relationship between health and happiness to be positive, and these studies are provided below.

A study "the relationship between happiness and health: Evidence from Italy" conducted by Sebatini (2014) sought to investigate the link between self-reported health and happiness after controlling for a number of social and economic variables, including education, work position, and economic wellbeing. A sample of 817 people was utilized to reflect the population of the Italian Province of Trento. The dependent variable was self-rated health, and it was measured using this question "In general, would you say that your health is very good, good, fair, poor, or very poor?", and the question was then coded to a binary variable. Happiness was measured using a scale of 1 to 10 through this question, "considering all aspects of your life, how happy would you say you are?". The models used in this study were probit, ordered probit, and instrumental variables. The results showed a strong positive correlation in linking happiness to

health, and they revealed that happiness is the greatest predictor of health in all phases of the investigation.

Another study was conducted by Chopik and O'Brien in 2017, and the name of the study is "Happy You, Healthy Me? Having a Happy Partner Is Independently Associated with Better Health in Oneself". The purpose of this study was to investigate the environment of interpersonal interactions in order to expand on the association between happiness and health. For their methodology Chopik and O'Brien (2017) used a panel survey, which is the Health and Retirement Study, and the sample used consisted of 1981 couples or 3962 people. The multilevel modelling procedure was used, and happiness was measured using a scale of 1 to 7, and health was measured through self-rated health. The findings demonstrated that more happiness was linked to better self-rated health, fewer physical illnesses, and reduced rates of chronic disease. Furthermore, it was shown that happier people were more physically active than unhappy people. According to Chopik and O'Brien (2017), having a happy spouse also improved health outcomes.

A study called "the effects of Happiness on All-Cause Mortality During 15 Years of Follow-Up: The Arnhem Elderly Study", which was by Koopmans *et al*. (2010) aimed to investigate the connection between lifespan and experiences of subjective happiness. The study used a sample of 1012 individuals aged 65-85. The study discovered that among 861 men and women, reduced death rates throughout the follow-up period were linked to high levels of perceived happiness. The study also found that, compared to happier respondents, individuals who were reported to have low levels of happiness experienced a higher prevalence of chronic disorders and diseases. These findings suggest a positive connection between health and happiness.

Another interesting longitudinal study that was conducted by Kim *et al.* (2014) was looking at "Life satisfaction and Frequency of Doctor Visits". The sample of the study was 6379 adults, and it was taken from the Health and Retirement study. The participants of the study were monitored for 4 years. The models used were generalized linear model, with a gamma distribution and log link. The results showed a negative association between life satisfaction and doctor visits. One can conclude that the likeliness of visit to the doctor is associated with a higher life satisfaction.

As stated above that studies on gender differences are limited, there are few interesting studies on the same issue. Among these studies is a study called "Gender Difference in the Relationship

of Physical Activity and Subjective Happiness Among Chinese University Students" which was conducted by Jiang *et al*. (2021). A cross-sectional survey was used in this study, and this was done through an online anonymous questionnaire. The sample consisted of 1512 individuals, and the researchers did the regressions using backward stepwise multiple models, and they regressed using STATA software. The study indicated that there is a gender difference in the degrees of stress, anxiety, and depression, and that male students scored higher than female students on the dependent variable of happiness. It also came to the conclusion that pleasure, and physical activity varies significantly by gender.

Another cross-sectional study called "With Health and Good Food, Great Life! Gender Differences and Happiness in Chilean Rural Older Adults" was conducted by Lobos et al (2016) to investigate how gender differed in the factors influencing older people's subjective satisfaction in rural settings. The sample used included 389 seniors, and the model used was the ordered logit model. The results showed that women reported fair or poor health compared to men, and for happiness, there was no statistical difference in gender. Another similar study on gender difference, which had opposite results was conducted by Namanzi (2022). The study was titled "Gender differences in general health and happiness: a study on Iranian engineering students", and the results of the study showed that there is gender difference for happiness, as the happiness mean was high for women compared to men, and the difference in gender for health was statistically insignificant.

2.6.1 Empirical studies on health, happiness, and gender: Africa

There are studies that have been conducted by researchers on gender differences in health and happiness in African countries. Abdullahi *et al*. (2019) conducted a study called "Gender, Age and Subjective Well-Being: Towards Personalized Persuasive Health Interventions". The goal of this study was to explore how gender differences and different age groups relate to the subjective wellbeing dimensions, in order to investigate ways to improve health. The hypothesis was that, for the subjective wellbeing, the gender difference is statistically significant. A sample of 732 individuals was used. The results of the study regarding gender difference showed that men are more satisfied with their lives compared to women. In comparing gender and emotional wellbeing, it was found that women reported high levels in emotional wellbeing compared to men.

Another study that was conducted in Egypt by EI Ansari and Stock (2016), with the aim of

"Explaining the gender differences in self-rated health among university students", found that men were likely to report excellent health compared to women, and women were most likely to report fair/poor health compared to men. These findings were also found discovered that women were more likely to report fair or poor health than men, while men were more likely to claim great health. Another research by Duboz et al. (2017) likewise found these results, highlighting gender as one of the common drivers of self-rated health and showing that women reported being in worse condition than men.

2.6.2 Empirical studies on health, happiness, and gender: South Africa

Khumalo *et al*. (2011) conducted a study to investigate the impact of socio-economic factors (gender, age, employment, social capital, education, and marital status). The study was then referred to as "Socio-Demographic Variables, General Psychological Well-Being and the Mental Health Continuum in an African Context". It was a cross-sectional study with a sample of 459 individuals. The results highlighted that there was no gender difference in positive mental health and general psychological well-being. Another interesting South African study was conducted by Schatz *et al*. (2012), and the aim the study was to find out if gender mattered in the impact of pensions on health and wellbeing in rural South Africa. The findings revealed that there are gender differences in reporting well-being among older individuals, with women reporting worse health compared to men.

Another study that was aimed at examining the factors that are associated with happiness was conducted by Chirinda and Phaswana-mafuya (2019), and self-rated health was used as one of the factors that influence happiness. This was a cross-sectional study that used the Study on Ageing and Adult Health Survey. For their analysis, the researchers used the multivariate linear regression to assess the correlation between self-rated health and happiness. In analysing their data, the researchers used STATA software. They did different regressions for men and women, and the results showed that the effect of self-rated health is significant, and it had a positive effect on happiness for both men and women. The study further showed that women were happier compared to men. Another study with similar results, but which did not look at gender differences, was conducted by Botha and Booysen (2013). This study used life satisfaction and happiness as two different terms. Botha and Booysen (2013), used data from 2011 South African Social Attitudes and did their econometric analysis using multivariate linear models

and the ordered logit model. Self-rated health was found to be significant at all levels of significance, and it positively correlated with both life satisfaction and happiness.

An additional study that showed an indirect correlation between health and happiness was conducted by Blaauw and Pretorius (2013). The data used for the study was from the National Income Dynamic Study. The analysis was done using OLS and the ordered probit. One of the variables that were used as the determinant of subjective well-being is the body mass index (BMI). Based on their results, the association between the BMI and happiness is significant and negative. The study further highlighted that the negative correlation was expected because lower BMI is associated with good health, which then increases happiness.

2.7 Conclusion

Numerous investigations have revealed that the connection between health and happiness is significant and positive. The link between health and happiness is bidirectional, meaning that people who report high life satisfaction scores generally report being in better health than those with lower life satisfaction, and that people who have strong well-being scores have better health outcomes than those with lower scores (Angner *et al*., 2013; Lu *et al*., 2020). The link between health and happiness can be direct and indirect. There are theories that clarify how indirect relationship works, and these are biopsychosocial model and socioecological model. From the literature and empirical studies, it is seen that there is gender difference in the link between health and happiness. Numerous studies show that women report fair/poor health compared to men, and for most studies the difference in gender is low for happiness.

It is important to stress that, according to Casale and Posel (2010), the happiness of individuals is how individuals perceive their lives to have progressed; it has little or nothing to do with how their lives actually are. For example, it is possible that someone may be satisfied with their upward mobility when in reality they have not progressed as much as they assume themselves to have progressed. The literature on health and happiness in South Africa leans heavily on research from other countries. Most studies have utilised cross-sectional studies, and according to Veenhoven (2008), cross sectional surveys are done using one wave and carries no information because cross section survey is a single snapshot in time. The research on the relationship between health and happiness needs a panel survey that will clearly show the impact of life choices as time goes on (Veenhoven, 2008). Several authors have conducted studies about the relationship between health and happiness in South Africa (Chirinda and

Phaswana-Mafuya, 2019). However, due to the lack of empirical studies in South Africa, no authors have used the panel survey and looked at gender differences for the association of health and happiness. This study will be conducted using South African data from the National Income Dynamic Study, and by using the panel survey to fill in the gap.

Chapter 3: Data and descriptive statistics

3.1 Introduction

The data used for this study is secondary data collected by the National Income Dynamic Survey (NIDS). Secondary data refers to "information that has already been collected by someone else, and which is available for you, the researcher, to use" (Clark, 2005: 57). NIDS is a reliable survey because of its advantages, for example, it represents the whole of South Africans, it uses panel data, which means data is collected over time and every time the observations are done, it uses the same people, and the data is available to everyone (Gaya, 2019). This section provides the background of the NIDS, definitions of variable names and how they are coded, and the descriptive statistics. The descriptive statistics show the statistical significance between men and women. It further shows the relationship between health and life satisfaction, and the relationship between health and social capital variables, comparing women to men.

3.2 Data

The NIDS is a panel survey which started in 2008 following the lives of South African individuals and their families (Ardington and Case, 2010), and this was the fifth survey in a set of longitudinal surveys of families and individuals residing in South Africa's nine provinces (Ajaero *et al*, 2023). The data collection of NIDS study was implemented by the South African Labour and Development Research Unit (Adjaye-Gbewonyo *et al*., 2016) and data collection is funded by the government's Department of Planning, Monitoring, and Evaluation, and it is conducted by the University of Cape Town (Brophy *et al*., 2018). In choosing the sample to represent households in all nine provinces, NIDS used a two-stage cluster sample design (Leibbrandt *et al*., 2009). The Statistics South Africa had a master sample of 3000 primary sampling units (PSU), from which 400 PSUs were chosen (Leibbrandt *et al*., 2009; Lau, 2014).

A sample of more than 28 000 people living in 7 300 households are interviewed every two years to keep records of the changes that might have happened (Ardington and Case, 2010). Data collection of the latest NIDS was done in 2017, and this makes it five waves since 2008. The same households chosen in wave 1 (2008) were interviewed every two years until the last wave 5 (in 2017) (Ajaero *et al*., 2023). NIDS includes four questionnaires, namely household, adult, child, and proxy questionnaires (Botha and Booyse, 2012). For this dissertation, the data focuses on two questionnaires, the adult questionnaire starting from 15 years of age and the

household questionnaire, which includes the relevant questions needed for measuring individual health and subjective well-being. These questionnaires also include variables related to social capital, as well as other demographic and socioeconomic characteristics at the individual and household level.

The aim of the NIDS was to have a balanced panel, but because some of the individuals who were part of the NIDS dropped out of the survey, and other new households were added due to different reasons, and they do not appear in all five waves of the NIDS. This has caused an unbalanced panel (Mbokazi, 2022). In this study, all the observations that did not appear in all five waves were taken out, and the observations were restricted to those appearing in all waves. If there is attrition, which causes unbalanced panel, the NIDS recommends the use of panel weighting to control for it (Zizzamia and Ranchhod, 2019). For this dissertation the listwise deletion approach was used to handle missing data for all the variables used.

3.3 Dependent and independent variables

Health is the dependent variable, and the question used to measure health was extracted from section J, and the question used question J1 which is: "how would you describe your health at present? Would you say it is excellent, very good, good, fair, or poor?". Other options were 'don't know', 'refused', and 'missing', and all these three options were set to missing. This concept of health is called self-rated health (or self-assessed health), and it has been used widely in research as a measure of overall health by several different researchers (d'Hombres *et al*., 2010; Sabatini, 2014; Lau, 2014). The dependent variable 'health' is ordinal in nature, and it is recorded in four categories, namely excellent, very good, good, fair (poor and fair).

The question used for subjective wellbeing or happiness was taken from section M, which is the wellbeing and social cohesion. The question used to measure the subjective wellbeing is M5, which is "on a scale of 1 to 10, where 1 means 'very dissatisfied' and 10 means 'very satisfied', how do you feel about your life as a whole?" (Ingle and Mlatsheni, 2017). The options ranged from "very dissatisfied" to " very satisfied". The other options were set to missing. In the NIDS life, satisfaction is used as a measure for subjective wellbeing. According to Kahneman and Kreuger (2005), there are many measures of subjective well-being, but life satisfactions provide an accurate feeling by an individual through the experience they went through. "These perceptions may be distorted – but are arguably the best measure of how an individual's experience of the world at a given point in time is translated into well-being"

(Kannemeyer, 2016: 3). The variable was recoded as a binary variable 1 to 5 equal 0 (unsatisfied) and 6 to 10 equal 1 (satisfied).

The study aims to find the relationship between individual health and subjective wellbeing, and in doing so, other control variables are added to better explain the relationship. The control variables were chosen to represent the social capital indicators, socio demographic and economic characteristics. The term 'social capital' was firstly tested empirically in 1990 by Coleman after it was differentiated from cultural and economic capital by Bourdieu in 1977 (d'Hombres, 2010). Several researchers have used social capital as a variable that determines health (Kawachi, 1999; Rocco and Suhrcke, 2012; Muckenhuber *et al*., 2013). There are four indicators of social capital that were chosen for this study, and they are taken from NIDS adult questionnaire. These variables were constructed using questions from different sections. These social capital questions focus on the relationship within the respondents' households and in their vicinity. In studies on community health and social ecology, the causal links between neighbourhood environment and health have been postulated most explicitly (Ellen and Dillman, 2001).

The first question 'M1' is from section M, which is the preference to stay in the neighbourhood, and there are five options to choose from, ranging from 'strong preference to stay' to 'strong preference to leave'. In this study, the responses are recoded to be 2-point scale (prefer to stay and prefer to leave), strong preference to leave and moderate preference to leave equal 0 (prefer to leave) and strong preference to stay, moderate preference to stay, and unsure equal to 1 (prefer to stay). The second question is 'M7', which is "how important are religious activities in your life?". The ratings were 'not important at all', 'unimportant', 'important', and 'very important'. This variable was created into a binary variable (not important vs important), with 'not important at all' and 'unimportant' equal to 0 (not important) and 'important', and 'very important' equal to 1 (important).

The third question is about crime in the neighbourhood, and since the study is using five waves, in the first wave in 2008, the question on neighbourhood crime was asked in the household questionnaire as "how common is burglary and theft in your neighbourhood?" with five response options "never happens, very rare, not common, fairly common, very common, and don't know", and in the following waves from wave 2 to wave 5, the question was changed and asked as "frequency of theft and burglary in the neighbourhood", with the same options as the

question from the first wave. For this study, these two similar questions were then concatenated to be one question. Furthermore, the responses of this question were recorded as a binary variable (common =0) and (uncommon =1). The last question used is about trust and the question is "likeliness of neighbour returning wallet containing R200" with responses recorded as "very likely, somewhat likely, and not likely at all". For this study, the variable was then recoded to be a binary variable with options "unlikely" equal to 0 and "likely" equal to 1.

3.3.1 Socio demographic and economic characteristics

The several socio demographic and economic characteristics that were taken from the adult NIDS questionnaire were used as control variables in this study, and these are children, age, race, employment status, geo-type, education, marital status and income. To show how these variables were coded, table 1 provides a list of socio demographic and economic characteristics variables (Lua, 2014).

Table 3. 1 Definition of socio demographics and economic characteristics variables

Variable	Type of variable	Original form:	New coded as:
Number of Children	Continuous	N/a	Number of household residents who are aged below 15 years.
Age	Categorical	Age 1 to 65 years.	Age 16-35=0, 36-49=1, 50-64=2, 65 and above=3 and 15 and below = missing.
Race	Categorical	African=1, Coloured=2, Asian/Indian=3, White=4	African=1, Coloured=2 Asian/Indian=3, white=4

Employment status	Categorical	Not economically active =1, unemployed discouraged=2, strictly/searching unemployed =3, employed= 4	Not Economically Active=0, unemployed (discouraged& strict) =1, employed=2
Geo-type	Categorical	Traditional=1, urban=2, rural=3	Urban=0, traditional=1, rural=2
Education	Categorical	Grade 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, NTC 1, NTC 2, NTC 3, certificate with less than grade 12, diploma with less than grade 12, certificate with grade 12, diploma with grade 12, bachelor's degree and diploma, honours degree, masters and PHD, others, no schooling, and don't know.	No schooling/incomplete primary=0, completed primary & some secondary=1, completed secondary & some tertiary=2, completed tertiary=3, others and don't know set to missing.
Marital status	Categorical	Married=1, living with partner =2, widowed=3, divorced=4, and never married=5.	Living with partner (married & living with partner) =0, separated (widow & separated) =1, never married=2
Income	Continuous	Household income with full imputations	Household income divided by household size

Note: Own table using questions from National Income Dynamic Study

3.3.2 Gender difference between variables.

The study focuses on gender comparison. In the NIDS, gender is self-reported with two options: 1 if you are male and 2 if you are female, and for those who refused to respond to this question, option -8 was set to missing. The variable 'gender' was then recoded to a variable with option 0 if the respondent is female and 1 if male.

3.4 Descriptive statistics

This section provides descriptive statistics of all the variables used for the regression in chapter 4. Individuals who are part of this study are 16 and above. Table 3.2shows the values of the mean for each variable and how they differ from each other for women and men. The data is weighted at the level of the sample, and the sample is restricted to a sub population. For women, there are 51077 observations, which is equal to 76196488 of individuals in the population, and for men, there are 35208 observations, which is 64772005 of the population. For some variables, the mean is the same, while for others it differs. Using these descriptive statistics, a significance test was done using the linear combination command to test whether the means are equal for men and women. The test provides the value, which is the difference between two values, and that is the standard error around the difference of the mean. It gives the p values as levels of significance.

Table 3. 2: Descriptive statistics

VARIABLES	Women	Men
Respondent's perceived health status		
1, fair or poor	0.13 ***	0.09
	(0.00)	(0.00)
2, good	0.26 ***	0.23
	(0.00)	(0.00)
3, very good	0.29***	0.30
	(0.01)	(0.01)
4, excellent	0.31***	0.38
	(0.01)	(0.01)
Life satisfaction (2-level)		
0, unsatisfied	0.55	0.56
	(0.01)	(0.01)
1, satisfied	0.44	0.44
	(0.01)	(0.01)
Preference to stay in neighbourhood		
0, prefer to leave	0.11***	0.12
	(0.00)	(0.00)
1, prefer to stay	0.89 ***	0.88

	(0.00)	(0.00)
Importance of religion		
0, Unimportant	0.06 ***	0.15
	(0.00)	(0.00)
1, Important	0.94***	0.85
	(0.01)	(0.01)
Theft & burglary in neighbourhood		
0, Common	0.45	0.44
	(0.01)	(0.01)
1, Uncommon	0.56	0.56
Trust/Likeliness to return wallet	(0.01)	(0.01)
0, unlikely	0.67	0.67
	(0.01)	(0.01)
1, likely	0.33	0.33
	(0.01)	(0.01)
Number of children in the household	4.75 ***	3.87
	(0.11)	(0.11)
Age in years		
0, age 16-35	0.51 ***	0.56
	(0.01)	(0.01)
1, age 36-49	0.24	0.24
	(0.00)	(0.01)
2, age 50-64	0.16 ***	0.15
	(0.01)	(0.01)
3, age 65 and over	0.09 ***	0.06
	(0.00)	(0.00)
Population group		
1, African	0.79 **	0.80
	(0.02)	(0.02)
2, Coloured	0.09	0.09
	(0.02)	(0.02)
3, Asian/Indian	0.02 **	0.03
	(0.01)	(0.01)
4, White	0.10 *	0.10
	(0.01)	(0.01)
Education		
No education	0.17 ***	0.15
	(0.01)	(0.01)
1, Primary	0.50 *	0.51
	(0.01)	(0.01)
2, Secondary	0.29	0.29
	(0.01)	(0.01)
3, Tertiary	0.04	0.04
	(0.01)	(0.01)
Employment status		

0, Not economical active	0.47 ***	0.32
	(0.01)	(0.01)
1, Unemployed	0.16 ***	0.13
	(0.00)	(0.00)
2, Employed	0.37 ***	0.54
	(0.01)	(0.01)
Geographical area		
0, Urban	0.62 ***	0.65
	(0.03)	(0.03)
1, Rural	0.38 ***	0.35
	(0.03)	(0.03)
Marital status		
0b, living with partner	0.36 **	0.37
	(0.01)	(0.01)
1, separated	0.14 ***	0.07
	(0.00)	(0.01)
2, never married	0.50 ***	0.58
	(0.01)	(0.01)
HH monthly income per capita in R'000	2.70 ***	3.72
	(0.20)	(0.30)
Sample	51077	35208

Note: Own calculations from NIDS waves 1-5. This data is weighted. People who are 15 and below are categorized as children. This study is restricted to individuals who are 16 and above. The p-values are for the tests of significance, whether the mean differs between women and men, where the significance levels are ranked this way: p<0.01*** (significant at all levels), p<0.05** (significant at 5%), p<0.1*(significant at 10%). Standard errors are in parenthesis.

For both women and men, the largest proportion of individuals report excellent SRH, compared to the categories reflecting worse health. Nevertheless, a bigger percentage of men report higher excellent health and lower bad health than women. This seems to prove the hypothesis provided in the literature by other researchers, which says women tend to report to have poor health more often than men (Case and Paxson, 2005; Ardington and Gasealahwe, 2012; Alfers and Rogan, 2015). This is expected as it is known that women face more morbidity issues than men. For all the options, the mean difference is fair (0.04), good (0.03), very good (-0.01), and excellent (-0.64), and all these differences in the mean are significant at all levels of significance.

For life satisfaction, there are no significant differences between the mean values for those who are satisfied and those who are not satisfied for both men and women. According to the

literature, there are still arguments on the self-rated life satisfaction for men and women (Della Giusta *et al*., 2011), and this is caused by the fact that studies have found different outcomes. In some studies, there is no gender difference in life satisfaction (Bourque *et al*., 2005; Della Giusta *et al.,* 2011). There are different factors influencing life satisfaction for both men and women, and these factors include household chores, education, health, caring for children/adults and so on. For the social capital variables, the variables with the same mean values for men and women, are theft and burglary in neighbourhood, and the likeliness that a neighbour returns the wallet, and this shows that there is no statistical difference in all levels of significance. However, other variables on social capital show differences by gender at all levels of significance.

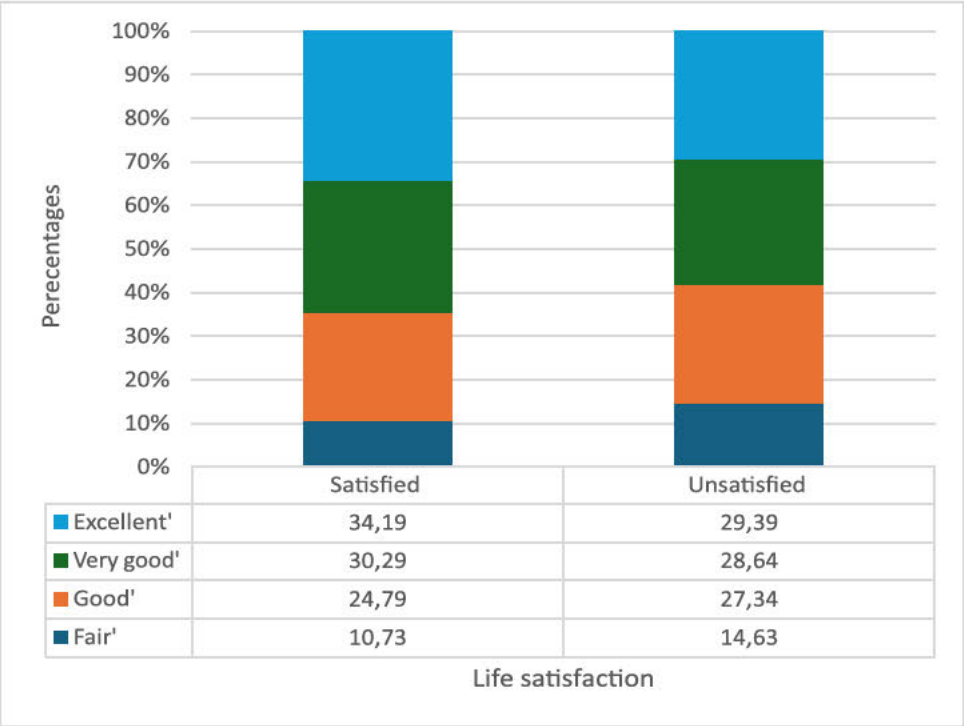
For the socio demographic variables, on average, women live in households with a larger number of children in the household than men. The population group for African and Asians are significant at 5% significant levels, and for coloured, they are significant at 10% significant level, while there is no significant difference in the proportion of people who are white for men and women. The differences in the proportion of men and women for the African and Asian population groups may have to do with some gender difference in response rates (Branson and Witternberg, 2019).

For education, there are no gender differences for individuals with primary, secondary, and tertiary education, while there is a small gender gap for individuals with no education. For all ranks of employment status, there is a gender gap, and as expected, there is a high number of men who are economically active than women, and this is because most women tend to stay at home and do households chores. For marriage status, women are more likely to be married, while men are more likely to be never married, because women are more pressurised by the families and society to get married. Marriage status could also be associated with employment status, and married women are more likely to be not economically active, while taking care of children at home and men working. The household income for men is higher than that for women because more men are employed and earn wages, while women do not receive an income because household chores are not perceived as being employed.

One of the objectives mentioned above is to find the relationship between health and life satisfaction. Figure 3.1 shows the percentage of individuals who have a life satisfaction that is

0 (unsatisfied) and life satisfaction that is 1(satisfied) with health that is fair, good, very good, and excellent. The data is weighted at the sample level, and the sample is restricted to a sub population of individuals who are 16 and older. There is a higher percentage of individuals who reported that their health is excellent for both the 'satisfied' and 'unsatisfied' groups. Out of the individuals who reported high levels of life satisfaction, 10,73% were in fair health, and out of individuals with low satisfaction rates, there were 14,63%. This is expected as most people who have poor health tend to be unsatisfied with their lives because of pain. The table further shows that, out of those who were satisfied with their lives overall, 34,19% were in excellent health, and among those who were not satisfied with their lives, 29,39% were in excellent health. The gap between the unsatisfied and the satisfied is very small, and this proves that life satisfaction is not the only variable that causes excellent health. Based on the hypothesis that those with excellent health are also satisfied with their lives, the results below show that it does not apply for everyone.

Figure 3.1: Overall relationship between health and subjective well-being.



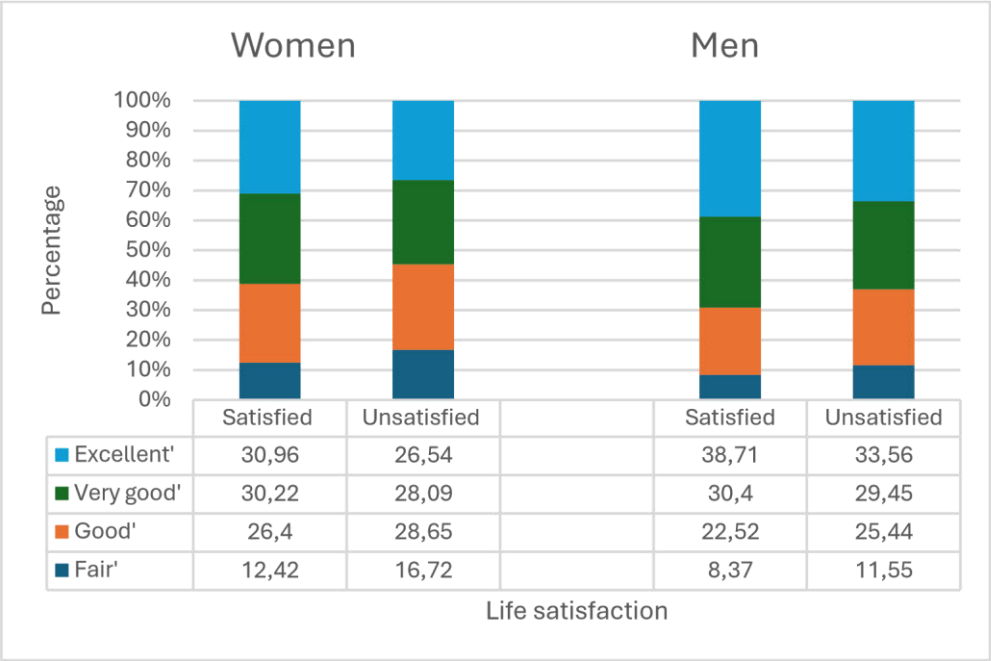
Note: Own calculations using the National Income Dynamic Study 2008-2017. The data is weighted at the level of the sample, and the sample is restricted to a sub population.

We further looked at the relationship between health and well-being by comparing women and men. Figure 3.2 is for both women and men. From the group of 'satisfied' women, 12,42% reported being in fair or poor health, while from the group of satisfied men, 8,37% reported fair or poor health. Women have higher percentage in reporting poor health, and this could be caused by the fact that women are great at expressing their emotions, or that those who reported fair or poor health do not find their life satisfaction being influenced by their health. From the overall figure, there is also a higher percentage of individuals who reported fair or poor health from the group of 'unsatisfied' individuals for both women and men compared to the group of 'satisfied' individuals who reported fair or poor health. When comparing women and men, from the group of individuals with low life satisfaction, women who reported fair health have a higher percentage of 16,72 compared to men, which is 11,55%.

There is a higher percentage of women who reported their health to be good and are satisfied with their lives compared to men with good health and are satisfied with their lives, and a higher

percentage of women with good health and are not satisfied with their lives compared to men with good health and not satisfied with their lives. For the category of very good health, having very good health and being satisfied with life is the same for men and women. Women have low percentage of very good health for those who are not satisfied with their lives compared to men with good health and are not satisfied with their lives. In the last category, women have low percentage of individuals who reported excellent health and are satisfied with their lives compared to men who reported excellent health and satisfied with their lives. Women have low percentages of individuals who have excellent health and are not satisfied with their lives compared to men with excellent health and are not satisfied with their lives. In the below figures, men report good health and high life satisfaction compared to women, and this proves what other studies have found (Von dem Knesebeck and Geyer, 2007; Chung and Kim, 2015).

Figure 3.2: Relationship between health and subjective well-being for women and men

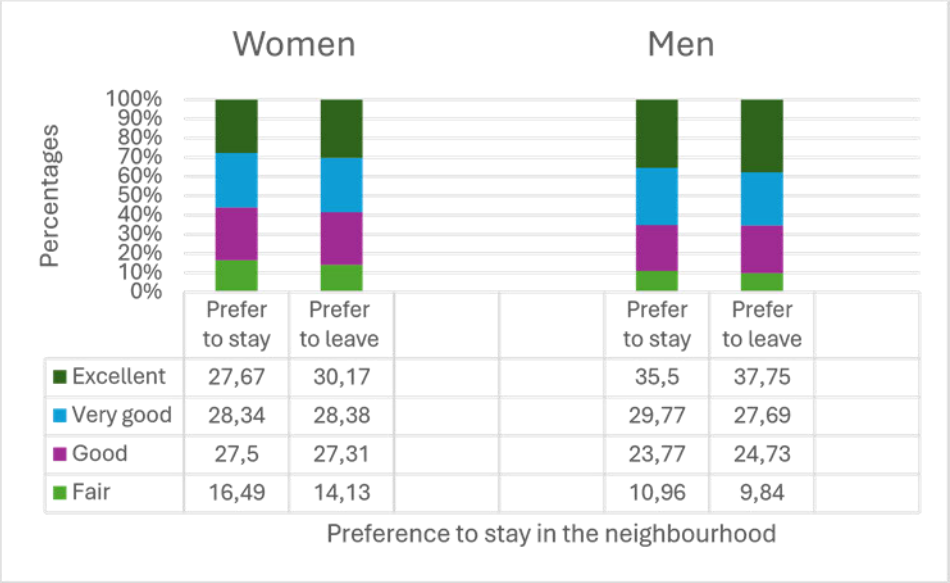


	Satisfied	Unsatisfied	Satisfied	Unsatisfied
Excellent'	30,96	26,54	38,71	33,56
Very good'	30,22	28,09	30,4	29,45
Good'	26,4	28,65	22,52	25,44
Fair'	12,42	16,72	8,37	11,55

Note: Own calculations using the National Income Dynamic Study 2008-2017. The data is weighted at the level of the sample, and the sample is restricted to a sub population.

As mentioned above, health is not only influenced by life satisfaction, but other control variables were also included. In Table 3.2, we saw variables that were significant and those that were not significant. The figures below from 3.3 to 3.6 show the relationship between selfrated health and social capital variables. Figure 3.3 is the relationship between health and preference to stay in the neighbourhood. For those with stronger social ties and those who have access to resources, for example healthcare services, it is expected that they prefer to stay in the neighbourhood and report excellent health compared to those who prefer to leave the neighbourhood. According to Kemppainen *et al*. (2020), preference to leave the neighbourhood is strongly associated with low levels of self- rated health. In this case, there are those who prefer to leave being more likely to report being in excellent health compared to those who prefer to stay for both men and women. Preference to leave the neighbourhood for some is not related to health, but to other factors such as job opportunities and lifestyle preferences. From the overall figure of those who prefer to leave the neighbourhood, men report excellent health compared to women.

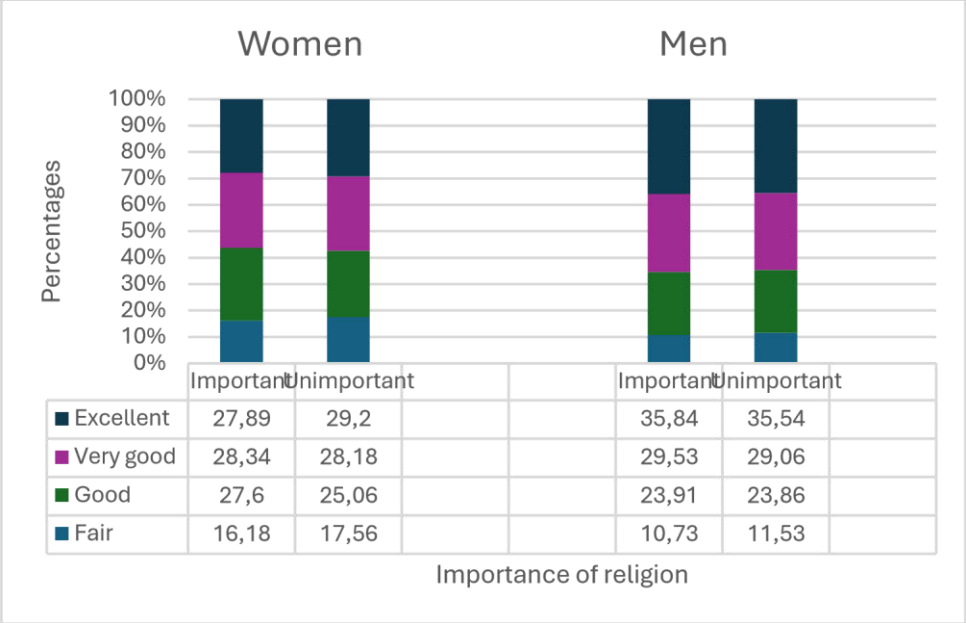
Figure 3.3: Relationship between health and preference to stay in the neighbourhood for women and men.



Note: Own calculations using the National Income Dynamic Study 2008-2017. The data is weighted at the level of the sample, and the sample is restricted to a sub population.

For the importance of religion in figure 3.4, in both men and women, a greater proportion of those who considered religion as not important were in poor health than those for whom religion was meaningful. This might be caused by different health behaviours. The individuals who do not think religion is vital could partake in unhealthy habits like smoking. On the other hand, people who find significance in religion might follow its precepts in order to lead healthier lives. Another reason might be based on psychological factors, as people's mental health can benefit from having a feeling of meaning, purpose, and optimism that religion can give them. On the other hand, those who do not find religion important could be more stressed, anxious, or depressed, and these conditions can lead to negative consequences for their physical health. From the group of individuals who said religion is not important, 35.54% that reported being in excellent health were men, and percentage of women who reported excellent was 29.69%.

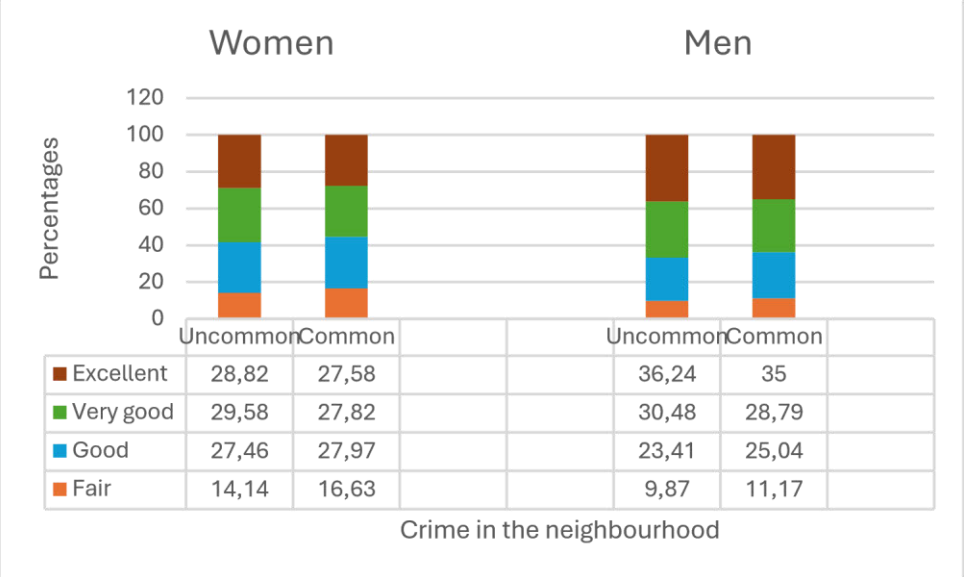
Figure 3.4: Relationship between health and the importance of religion for women and men.



Note: Own calculations using the National Income Dynamic Study 2008-2017. The data is weighted at the level of the sample, and the sample is restricted to a sub population.

The results on the level of crime in the neighbourhood are expected as common crime is associated with poor health in both men and women. Residents of high-crime neighbourhoods may feel frightened to leave their houses or participate in outside activities. This can lead to a decline in physical activities, which raises the risk of obesity and other related health issues. There is also evidence that those with unsafe neighbourhoods tend to have poor health outcomes (Subramanian *et al*., 2006; Abdullah *et al*., 2020). In the proportion of individuals with common and uncommon crime in their neighbourhoods, more women report to have poor or fair health outcomes compared to men. Caregiving for children and elderly family members may fall overwhelmingly on women, particularly mothers. Elevated crime rates have the potential to worsen these responsibilities by restricting child-safe play areas or necessitating increased caution to protect family members, resulting in more physical stress and pressure on women's well-being. In the case of excellent health for both men and women who reported that crime is not common, women reported higher excellent health compared to where crime is common, and men reported higher excellent health when crime is common and not common compared to women.

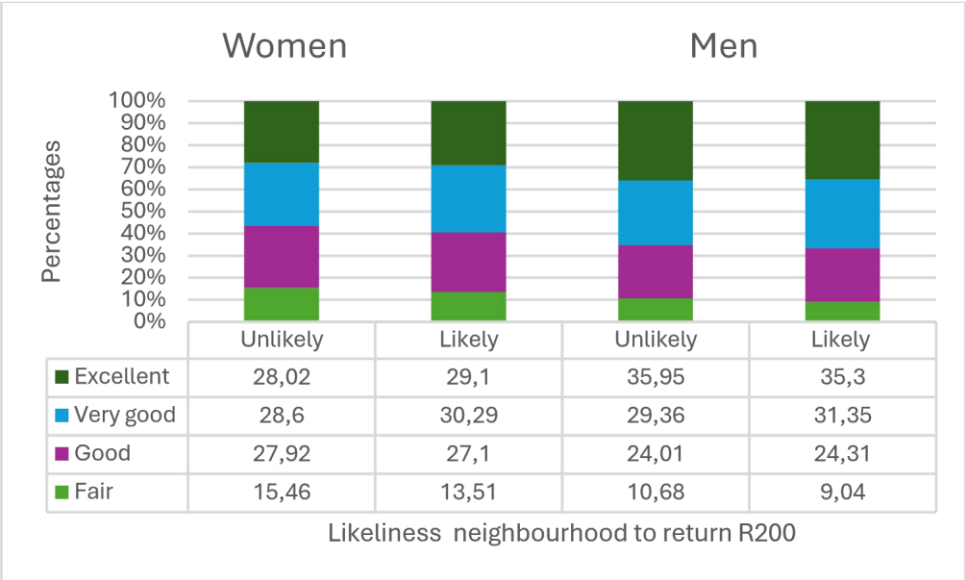
Figure 3.5: Relationship between health and crime in the neighbourhood for women and men.



Note: Own calculations using the National Income Dynamic Study 2008-2017. The data is weighted at the level of the sample, and the sample is restricted to a sub population.

For the likeliness of neighbourhood returning wallet containing R200, both men and women who reported that it is likely also reported a higher percentage of excellent health compared to those who said it was unlikely. The results show what is expected, and that living in a community with high levels of social cohesiveness and trust is frequently a sign of a kind and helpful atmosphere. Individuals living in these kinds of communities are more likely to watch out for one another, which reduces stress and increases feelings of security, both of which are beneficial to general health. Women also reported high levels of poor health compared to men for both unlikely to return wallet and likely to return wallet. Compared to men, women often experience socioeconomic inequalities, such as employment opportunities and increased caregiving responsibilities. Regardless of whether one trusts his or her neighbours, these variables can lead to lower overall health.

Figure 3.6: Relationship between health and the likelihood of neighbourhood returning R200 for women and men.



	Women		Men	
	Unlikely	Likely	Unlikely	Likely
Excellent	28,02	29,1	35,95	35,3
Very good	28,6	30,29	29,36	31,35
Good	27,92	27,1	24,01	24,31
Fair	15,46	13,51	10,68	9,04

Note: Own calculations using the National Income Dynamic Study 2008-2017. The data is weighted at the level of the sample, and the sample is restricted to a sub population.

3.5 Conclusion

This chapter provided description of the dependent variable 'health', and the main variable of interest, subjective wellbeing, the control variables that will be used empirically in Chapter 4. It firstly presented the dataset (NIDS) that will be used and gave an overview of the dataset. Table 3.2 showed all the variables and whether the gender difference is statistically significant in each variable. The results show that for some variables, such as life satisfaction, the differences are not significant, meaning there is no difference in the mean for men and women. The figures above show the relationship between health and subjective well-being using the self-rated health and life satisfaction variables. Figure 3.1 presented the overall relationship and figure 3.2 was used for gender comparisons. It was found that higher proportions of women report higher levels of poor health compared to men, whether they are unsatisfied or satisfied, and they are less likely to perceive their health as excellent health than men. Figure 3.3 to figure 3.6 showed the relationship between health and the social capital variables. Some of the social capital variables, such as importance of religion, crime in the neighbourhood, and the likeliness to return R200 show expected results found by other researcher that low levels of social capital are associated with poor or fair health outcomes for both men and women. Preference to stay

in the neighbourhood shows the opposite for both men and women. The relationship between self-reported health outcomes and social capital may not necessarily be directly causal but rather be indicative of broader societal and cultural factors.

Chapter 4: Methodology and results

4.1 Introduction

In Chapter 3, the descriptions of the key variables, graphs and figures, and summary statistics were presented. In attempting to understand the gender differences in an individual's health and subjective wellbeing, Chapter 4 will measure the extent to which social capital moderates the gendered relationships between health and subjective wellbeing; and how these are affected when social capital is considered as an indirect channel between health and subjective wellbeing. As stated in the previous chapter, this study uses panel data , which is analysed using several models, the most common model being the pooled Ordinary Least Squares (Zulfikar and STp, 2018; Adekeye *et al*., 2021; Devi, 2022) but due to the fact that the dependent variable is ordinal, the assumption used in linear regressions (of which OLS is a part) are violated (Fullerton, 2009). Since, for this study, the dependent variable is ordinal in nature, a suitable models to use would be ordered probit or ordered logit (Peel *et al*., 1998; Rifaat and Chin, 2007; Güneri *et al*., 2022), this dissertation uses ordered logit. The dependent variable is self-reported health status, which has five categories in the data, but has been recoded to 4 categories, namely: fair (poor and fair), good, very good and excellent. There was no attempt to test for the goodness of fit. Since health is an immensely complex concept, the research does not aim to predict the individual's health. The aim is to estimate the likelihood of each category of the health variable based on the independent variables. While the objective of the random and fixed effects was to choose the most appropriate model between the two and further assess how well it accounts for the unobserved heterogeneity.

The structure of this chapter is made up of the following. Section 4.2 contains the methodology, explaining the ordered logit model used in 4.2.1 and further highlights the model specification in 4.2.2, and the building and reporting models in 4.2.3. These subsections are followed by the analysis strategy in 4.3 which clarifies how the regression models are analysed. Section 4.4 presents the results and the discussion of the results. Lastly, section 4.5 concludes chapter 4.

4.2 Methodology

This section's objective is to outline the empirical approaches this paper employed in answering the above-stated questions. The approach is primarily quantitative, using data from the five

waves of the National Income Dynamic Study (NIDS). The reason for using the five waves is to analyse the process and dynamics of change over time, especially from an individual perspective (Andreß, 2017). With the outcome variable of the study being categorical, the paper uses the ordinal class of models to estimate relationships under observation, which are optimal for this type of variable (Fok *et al*., 2012).

4.2.1 Ordered logit model

The ordered logit model, also known as the proportional odds model, is a type of regression used for modelling ordinal dependent variables (Fullerton, 2009; Grilli and Rampichini, 2014; Williams, 2016;). These variables have a natural order, but the intervals between the values are not necessarily equal. An ordered logit regression is "concerned with the accumulative probabilities rather than probabilities for discrete categories" (Agresti, 2010: iv). Unlike the Pooled OLS, which assumes a one-unit change in the independent variable has a constant impact on the dependent variable, for ordinal outcomes, this interpretation is illogical because a "one unit" change between ordinal categories lacks a consistent, interpretable across the scale (Agresti, 2010). For example, the difference between "fair health" and "good health" for an individual, may differ from that between "very good health" and excellent health". The ordered logit model helps in assessing the impact of various independent variables on these ordinal health outcomes. When analysing survey data where responses are on a Likert scale (e.g., 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree), the ordered logit model is appropriate because the responses have a natural order but the intervals between them may not be equal. The notion behind an ordered logit model is that the observed ordinal outcomes are determined by an unobserved (latent) continuous variable. According to Williams (2016), people's values on the observed ordinal variable Y change as thresholds on this underlying variable are crossed. For instance, the dependent variable used in this study, self-rated health, has four possible ordered options, but individuals must choose which level best reflects their own health perception.

4.2.2 Model Specification

The assumption underlying the ordered logit model is the proportional odds assumption, meaning the relationship between each pair of outcome groups is the same - i.e., the odds ratios are constant across categories (Grilli and Rampichini, 2014).

The latent variable formulation of the model can be stated as in the following equation:

$$y_{it}^{*} = \boldsymbol{X_{it}\beta} + u_{it} \qquad (4.1)$$

Where y_{it}^{*} is the latent variable (which is the real health) of individual *i* at time *t*, $\boldsymbol{X_{it}}$ is the vector of explanatory variables, $\boldsymbol{\beta}$ is a column vector of explanatory variables, and u_{it} is the error term with a normal distribution and a mean of zero. The latent variable is assumed to be continuous, but it is separated by cut points also known as thresholds (Hirao and Okajima, 2023). The Y variable being a latent variable, meaning it cannot be observed, therefore in order to observe the unknown latent variable (y_{it}^{*}), the thresholds are observed (y_{it}), that is the way individuals have categorised their health. Self-rated health has four categories from 1(fair/poor health), 2(good health), 3 (very good health), 4 (excellent health): y_i (i=1,…, 4) is associated with the y_{it}^{*} through the three cut points ε_i.

$\mathbf{y_{it}} = 1$ if $y_{it}^{*} \leq \varepsilon_1$

$\mathbf{y_{it}} = 2$ if $\varepsilon_1 < y_{it}^{*} \leq \varepsilon_2$

$\mathbf{y_{it}} = 3$ if $y_{it}^{*} > \varepsilon_2$

Hence, the estimated equation is given by (4.1).

$$y_{it}^{*} = \boldsymbol{X_{it}\beta} + u_{it} \qquad (4.1)$$

The coefficients β in equation (4.1) are estimated using Maximum Likelihood Estimation (MLE). The interpretation of β is that for a one-unit increase in the predictor X, the odds of being in a higher category versus all lower categories are multiplied by $e^{\beta i}$, holding all other variables constant. The ordered logit model has been utilised in various disciplines; specifically, in the social sciences and medical research, health outcomes often have ordered categories (e.g., 1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent) (Bender and Grouven, 2007).

4.2.3 Building and Reporting Models

The dependent variable used in this study, perceived health status (or self-rated health), is an ordinal categorical variable, therefore the analysis focuses on building and assessing the ordered logistic model. The analytical strategy is done in two stages, firstly a normal panel ordered logistic model is regressed without accounting for the panel structure of the data to observe the relationships between the ordinal dependent variable and the explanatory variables. Secondly, the panel structure of the data is taken into account, as it is known that studying self-rated health status presents issues since individuals with the same actual health condition may

report varying levels of health (Muris and Vandoros, 2020). Due to this challenge, there might be unobserved heterogeneity. It is likely to be present because individuals differ in ways that are difficult to measure, and hence, these influences are omitted from the models. Some reasons why unobserved heterogeneity might arise in this context include the following factors, which are likely to be time-invariant and to influence both an individual's health and their subjective well-being: genetic differences, personality traits (such as resilience, optimism, or stress sensitivity), lifestyle and behavioural factors (such as diet and exercise habits, sleep patterns, and substance use), life history (such as trauma, chronic stress, or past health events). These factors are usually unobservable and add unique variability to each individual's health outcomes.

The formulation of the equation for the panel random and fixed effect models:

$$y_{it}^{*} = x_{it}\beta + \alpha_i + U_{it} \qquad (4.2)$$

When Y_{it}^{*} is the latent variable (the extent self-reported health) of individual i at time t, $\boldsymbol{X_{it}}$ is the vector of explanatory variables, $\boldsymbol{\beta}$ is a column vector of explanatory variables, α_i refers to the error term of the unobserved heterogeneity and u_{it} is the error term with a normal distribution and a mean of zero.

To address the issue of unobserved heterogeneity, the proposed solutions are to use the random effect or fixed effect models. One of the assumptions of the random effects model is that the unobserved heterogeneity and the error term must not be correlated with the independent variables in the model Cov $(a_i, x_i) = 0$ and treats such individual specific effects as random variables drawn from a common distribution using generalised least squares to estimate the coefficients (Moundigbaye *et al*., 2018). The assumption of the fixed effects is that the unobserved heterogeneity can be correlated with the independent variables Cov $(a_i, x_i) \neq 0$ (Moundigbaye *et al*., 2018) and estimation in this model focuses on the variation within individuals over time, effectively controlling for latent individual differences.

Due to the difficulty of using diagnostic tests, such as the Hausman test, for non-linear models, such as the ordered logit panel model, there was no attempt made to test whether the assumptions behind the RE model were met. The assumptions underlying the modelling approaches for the random-effects estimator and the within-variation estimator for the fixed

effects model (Bell and Jones, 2015) were applied to analyse differences in the behaviour of the predictors. Specifically, the random-effects model assumes no correlation between unobserved heterogeneity and the predictors, while the fixed-effects model accounts for the presence of unobserved heterogeneity. Results from both approaches are reported. Utilising both models would enable an evaluation of the implication of the two assumptions underlying these models on the response variable, hence providing a richer understanding of the dynamics of perceived health status over time, when compared to utilising only a single model. Given the nature of the dependent variable, subjective health status, a non-zero correlation between the explanatory variables, and the error term is likely. This probably correlation is due to the presence of unobserved heterogeneity, as explained above. Hence, in this dissertation, the focus is on the fixed effects estimators as they are likely to represent the relationships of interest better. In this dissertation focus is paid to the implication of the fixed effects estimator and comparison with existing theory on predictors of subjective health (Veenstra and VanzellaYang,2020; Xin and Ren, 2021; Davillas *et al*., 2022; Dobreva and Posel, 2023; Coustaury *et a*l., 2023). One of the analysis's main strengths is the employment of both fixed and random effects models, which enables a sensitivity analysis that improves the findings' robustness reliability. The consistency of the link between variables and accounting for the potential biased that are caused by unobserved heterogeneity can be assessed by comparing both fixed and random effects models.

This study implements the Stata command *feologit*, which was developed by Baetschmann *et al*. (2020) with the aim of estimating panel fixed effects logistic regression (logit) models. This command accommodates the unobserved time-invariant heterogeneity in the non-linear logit fixed effect models (Cyrenne and Chan 2022). Baetschmann *et al*. (2020) further explain that the *feologit* estimator is differentiated into two hypothesises; namely, the "blow up and cluster" (BUC) estimator, and the BUC-τ estimator, which assumes that the thresholds are constant for all the individuals (Baetschmann *et al*., 2020; Hagiwara, 2023).

4.3 The analysis strategy

Based on the methodology presented in Section 4.2.1, this section presents the fixed effects ordered logit models that are used in this dissertation. The equations are based on equation (4.2) above, self-rated health is the dependent variable:

$$True\ health^{*}_{it} = \beta_0 + \beta_1 Life\ satisfaction_{it} + \beta_2 age_{it} + \alpha_i + u_{it} \qquad (4.3)$$

This is the equation for the relationship between self- rated health (SRH) and happiness (subjective wellbeing), excluding other independent variables. Below is the ordered logit equation including all the independent variables:

$$True\ health^{*}_{it} = \beta_0 + \beta_1 Life\ satisfaction_{it} +$$
$$\beta_2 preference\ to\ stay\ in\ the\ neigbhourhood_{it} + \beta_3 importance\ of\ religion_{it} +$$
$$\beta_4 theft\ \&\ burglary\ in\ neighbourhood_{it} + \beta_5 likeliness\ to\ return\ wallet_{it} +$$
$$\beta_6 number\ of\ chidren_{it} + \beta_7 age_{it} + \beta_8 population\ group_{it} +$$
$$\beta_9 education_{it} + \beta_2 employment\ status_{it} + \beta_2 geotype_{it} + \beta_2 marital\ status_{it} +$$
$$\beta_2 Income_{it} + \alpha_i + u_i \qquad (4.4)$$

SRH has four outcome categories that can be observed: fair/poor health ($y_i = 1$), good health (y_i=2), very good health(y_i=3), or excellent health(y_i. =4). In the next section, the results are presented in the regression form and the results presented in the models do not establish causality between health and subjective well-being.

4.4 Results

This section presents the regression models based on the above equations. The regressions that are in this dissertation are as follows; the basic regression models of health by gender, the full regression models of health by gender, which control for other variables, and lastly there are margins plot graphs for the interaction terms where social capital variables are shown as the indirect link between life satisfaction and health. In each regression, three models are presented, and these models are the pooled ordered logit models (POL), random effects ordered logit models (REL), and fixed effects ordered logit models (FEL). The results of the random effects are only shown for comparison; when interpreting, the focus is on the pooled ordered logit and the chosen model to control for unobserved heterogeneity which is the fixed effects ordered logit. The random and fixed effects models were calculated separately for men and women to understand the gender differences in the relationships of interest. The regression in
Table 4.1 assesses how the basic relationship between an individual's health and subjective well-being differs by gender without including other explanatory variables.

Table 4. 1: Basic regression models of health by gender

Self-rated health	Pooled ordered Logit (POL)		Random Effects Logit (REL)		Fixed Effects Logit (FEL)	
Variables	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**
Life Satisfaction						
Satisfied	1.523***	1.424***	1.396***	1.439***	1.245***	1.262***
	(0.046)	(0.050)	(0.025)	(0.031)	(0.027)	(0.035)
Age group						
Age 36-49	0.539***	0.530***	0.455***	0.448***	0.994	0.961
	(0.021)	(0.025)	(0.011)	(0.014)	(0.057)	(0.070)
Age 50-64	0.230***	0.278***	0.182***	0.200***	1.011	0.944
	(0.010)	(0.017)	(0.005)	(0.007)	(0.087)	(0.109)
Age 65 and over	0.130***	0.133***	0.092***	0.100***	1.139	0.933
	(0.009)	(0.010)	(0.003)	(0.005)	(0.140)	(0.153)
Waves						
wave 2	1.973***	1.683***	2.149***	1.876***	1.928***	1.653***
	(0.087)	(0.091)	(0.067)	(0.070)	(0.064)	(0.068)
wave 3	1.410***	1.211***	1.482***	1.225***	1.200***	0.996
	(0.061)	(0.066)	(0.044)	(0.045)	(0.039)	(0.041)
wave 4	1.303***	1.097*	1.422***	1.197***	1.028	0.865***
	(0.055)	(0.059)	(0.041)	(0.042)	(0.035)	(0.036)
wave 5	1.448***	1.170***	1.520***	1.273***	0.964	0.848***
	(0.060)	(0.058)	(0.044)	(0.045)	(0.035)	(0.038)
cut1	0.125***	0.076***	0.0570***	-2.728***		
	(0.006)	(0.004)	(0.056)	(0.038)		
cut2	0.622***	0.410***	-0.891***	-0.869***		
	(0.025)	(0.019)	(0.047)	(0.033)		
cut3	2.351***	1.573***	0.453***	0.627***		
	(0.091)	(0.072)	(0.045)	(0.023)		
Observations	54,637	37,600	54,730	37,659	75,989	47,319

Number of pid	20 717	15 637	20,749	15,654

Source: Own calculations from National Income Dynamics Survey waves 1-5.
Note: The coefficients are reported as odds ratios. The data are weighted. People who are 15 and below are categorized as children. This study is restricted to individuals who are 16 and above. The p-values are for the tests of significance where the significance levels are ranked this way: $p<0.01$*** (significant at all levels), $p<0.05$** (significant at 5%), $p<0.1$*(significant at 10%). Standard errors are in parentheses.

The results presented in Table 4.1 show that there are gender differences in the link between SRH and life satisfaction; they also suggest a positive strong correlation in both the POL and FEL models. Across the POL and FEL models moving from dissatisfied towards satisfied, the odds of being in the higher categories of perceived health status versus other lower categories increases, holding age constant. According to the POL model, the likelihood of reporting better health is higher for women compared to men and these outcomes differ in the FEL model as the coefficient is slightly higher for men, it appears that adjusting for unobserved heterogeneity diminishes the estimated effect of life satisfaction on health. Nonetheless, these findings clearly support the hypothesis that SRH and high life satisfaction is positively correlated (Lu et al., 2020; Angner *et al*., 2013; Sebatini, 2014; Ngamaba *et al*., 2017). As expected, regardless of gender the impact of age on SRH varies by age groups with the younger group consistently reporting better health than older individuals. In both the POL and FEL models, in the categories of age there is an indication of decreasing trend in the odds of individuals reporting better health as age increases in each age group.

Lastly, individuals are more likely to report better SRH in the future waves and on the POL models all the waves are positive and statistically significant compared to wave one. Comparing wave two to wave one, for example, women were more likely to report better health. Women continuously showed greater gains in SRH than males did in the following waves continuing this trend. These findings point to an increasing pattern in SRH over time, which could be a result of improvements in real health or changes in how people view their health. In FEL after controlling for the influence of unobserved heterogeneity the waves are only positive and significant in the early waves for women and for men in the later waves, they are significant and negative.

Table 4.2 presents the full models, which reflect the relationships between individual health and life satisfaction including other predictors and highlight the differences in the relationship for men and women. Adding other variables into the regressions strengthens the research as it gives a better understanding of the link between SRH and life satisfaction, while accounting for a wider variety of variables. Model 1 represents the pooled ordered logit, Model 2 representing random effects ordered logit, and Model 3 represent the fixed effects ordered logit.

Table 4. 2 Full regression models of health by gender

SELF-RATED HEALTH	POOLED ORDERED LOGIT (POL)		RANDOM EFFECT LOGIT (REL)		FIXED EFFECTS LOGIT (FEL)	
VARIABLES	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN
Life satisfaction						
Satisfied	1.315***	1.277***	1.283***	1.345***	1.227***	1.256***
	(0.038)	(0.045)	(0.024)	(0.030)	(0.028)	(0.037)
Preference to stay in neighbourhood						
Prefer to stay	1.249***	1.229***	1.194***	1.222***	1.194***	1.286***
	(0.057)	(0.066)	(0.034)	(0.041)	(0.043)	(0.055)
Importance of religion						
Important	1.104	1.107*	1.016	1.009	0.988	0.958
	(0.081)	(0.057)	(0.040)	(0.031)	(0.051)	(0.040)
Theft & burglary in the neighbourhood						
Uncommon	1.102***	1.164***	1.161***	1.138***	1.161***	1.010***
	(0.033)	(0.413)	(0.202)	(0.025)	(0.028)	(0.032)
Trust/Likeliness to return wallet						
Likely	1.033	1.022	1.057***	0.972	1.045*	0.965
	(0.032)	(0.037)	(0.020)	(0.023)	(0.025)	(0.029)
Number of children in the household	1.001	0.998	1.006**	1.001	0.990*	0.994
	(0.005)	(0.006)	(0.003)	(0.004)	(0.006)	(0.008)
Age group						
Age 36-49	0.585***	0.505***	0.517***	0.448***	0.997	0.968
	(0.026)	(0.030)	(0.014)	(0.016)	(0.060)	(0.075)
Age 50-64	0.293***	0.297***	0.255***	0.236***	1.026	0.969
	(0.016)	(0.022)	(0.008)	(0.010)	(0.093)	(0.119)
Age 65 and above	0.192***	0.178***	0.154***	0.146***	1.093	0.968

SELF-RATED HEALTH	POOLED ORDERED LOGIT (POL)		RANDOM EFFECT LOGIT (REL)		FIXED EFFECTS LOGIT (FEL)	
VARIABLES	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN
	(0.016)	(0.017)	(0.007)	(0.009)	(0.142)	(0.170)
Population group						
Coloured	1.122*	0.901	1.037	0.886***		
	(0.068)	(0.059)	(0.032)	(0.032)		
Asian/Indian	0.968	0.872	1.049	0.845		
	(0.126)	(0.117)	(0.094)	(0.088)		
White	1.115	0.774***	1.275***	0.973		
	(0.114)	(0.076)	(0.076)	(0.065)		
Education						
Primary	1.558***	1.518***	1.707***	1.702***	1.137	1.203
	(0.074)	(0.085)	(0.049)	(0.060)	(0.133)	(0.140)
Secondary	2.060***	1.831***	2.250***	2.085***	1.182	1.405**
	(0.119)	(0.121)	(0.079)	(0.088)	(0.154)	(0.188)
Tertiary	2.564***	2.661***	2.601***	2.672***	1.177	1.596*
	(0.342)	(0.398)	(0.191)	(0.243)	(0.236)	(0.393)
Employment status						
Unemployed	1.055	1.214***	1.079***	1.176***	1.008	1.104**
	(0.044)	(0.065)	(0.028)	(0.040)	(0.035)	(0.050)
Employed	1.070*	1.228***	1.071***	1.183***	0.910***	1.003
	(0.040)	(0.050)	(0.024)	(0.032)	(0.029)	(0.041)
Geotype						
Rural	1.138***	1.021	1.135***	1.075***	1.031	1.060
	(0.037)	(0.040)	(0.025)	(0.028)	(0.067)	(0.073)
Marital status						
Separated	0.878**	0.772***	0.864***	0.765***	0.977	0.869
	(0.049)	(0.072)	(0.028)	(0.044)	(0.059)	(0.091)
Never married	1.125***	0.957	1.049**	0.946*	1.030	0.942
	(0.044)	(0.051)	(0.025)	(0.031)	(0.052)	(0.064)

SELF-RATED HEALTH	POOLED ORDERED LOGIT (POL)		RANDOM EFFECT LOGIT (REL)		FIXED EFFECTS LOGIT (FEL)	
VARIABLES	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN
HH monthly income per capita R'000	1.021***	1.012***	1.015***	1.011***	0.988	1.008
	(0.006)	(0.004)	(0.003)	(0.003)	(0.009)	(0.006)
hhinc000sq	0.996***	0.998***	0.998***	0.999***	1.027	0.998
	(0.001)	(0.001)	(0.000)	(0.000)	(0.020)	(0.004)
Wave (year 2)	1.978***	1.736***	2.208***	1.978***	1.977***	1.753***
	(0.094)	(0.101)	(0.070)	(0.076)	(0.071)	(0.078)
Wave (year 3)	1.396***	1.217***	1.516***	1.274***	1.260***	1.061
	(0.064)	(0.071)	(0.046)	(0.047)	(0.044)	(0.047)
Wave (year 4)	1.275***	1.103*	1.429***	1.204***	1.078**	0.891**
	(0.057)	(0.062)	(0.042)	(0.043)	(0.040)	(0.041)
Wave (year 5)	1.401***	1.139**	1.478***	1.231***	1.034	0.863***
	(0.060)	(0.062)	(0.043)	(0.044)	(0.042)	(0.044)
cut1	0.302***	0.148***	-1.465***	-2.025***		
	(0.032)	(0.017)	(0.065)	(0.073)		
cut2	1.586***	0.831*	0.392***	-0.133***		
	(0.168)	(0.092)	(0.064)	(0.072)		
cut3	6.194***	3.281***	1.924***	1.379***		
	(0.654)	(0.363)	(0.065)	(0.072)		
Observations	51,077	35,208	51,077	35,209	38 984	25 308
Number of pid	20 216	15 193	20,216	15,194	10 995	7584

Source: Own calculations from National Income Dynamics Survey waves 1-5.

Note: The coefficients are reported as odds ratios. The data are weighted. People who are 15 and below are categorized as children. This study is restricted to individuals who are 16 and above. The p-values are for the tests of significance where the significance levels are ranked this way: p<0.01*** (significant at all levels), p<0.05** (significant at 5%), p<0.1*(significant at 10%). Standard errors are in parentheses.

In the table above, the results of the full ordered logit models are presented. The results of the POL model for both women and men show that some of the independent variables are highly statistically significant in predicting health. The model further highlights that some variables have very large p-values showing that they have no contribution in explaining the variation in perceived health status. These variables include: the importance of religion (women), the likeliness of a neighbour returning a wallet, number of children, population group —Coloured (men), Indian (men), white (women), and employment status —unemployed (women). Based on the FEL model, examining the model broadly and focusing on individual predictors of perceived health status among men, it can be observed that the importance of religion, perceived neighbour trust, number of children, education, employment status — unemployed, geotype, marital status, and income (men) are not significant predictors of health.

For both men and women, health is positively and consistently significantly predicted by life satisfaction across the POL and FEL models. The odds ratios show that those who are more satisfied with their lives are more likely to have better health than those who are less satisfied. While in the FEL model the odds ratios have decreased for both men and women, for women they are dropping significantly and even lower than for men. This change implies that although life satisfaction is associated with better health, its effects on an individual basis for women are not as strong as they are for men. The decline also suggests that the unobserved heterogeneity accounts for a large portion of the effect of life satisfaction on SRH. Across all the models, a preference to stay in the neighbourhood is significantly (at all levels) and positively associated with better health, suggesting that neighbourhood attachment is important for SRH. In the FEL model, the odds ratio for women decreases while for men it increases. This may suggest that the direct impact of people's preference to stay in their spatial location over time is lessened in women's SRH due to other unobserved factors, such as family responsibilities. Literature also suggests that women are frequently sensitive to emotional and social elements of their surroundings that may affect their health outcomes, such as the quality of their neighbourhood (Stafford and McCarthy, 2006).

The likelihoods of being in better health rise significantly for both men and women in neighbourhoods where crime is uncommon than in neighbourhoods where crime levels are higher, holding other factors fixed, and even after controlling for unobserved heterogeneity. This suggests that over time, increased levels of crime are negatively associated with perceived

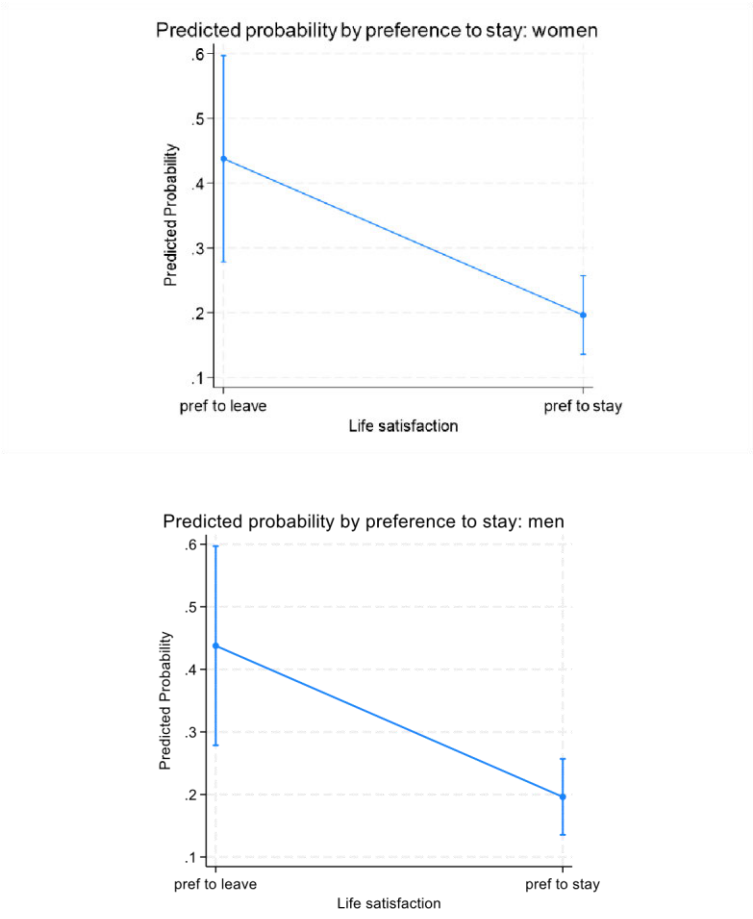
health status. In the context of the POL, men are substantially more likely than women to report having better self-reported health in communities with consistently low crime rates than in regions with high crime rates. After accounting for unobserved heterogeneity through the fixed effects, men have lower odds compared to women. For women, the coefficient of the likeliness to return a wallet is statistically significant at the 10 percent level, while it is not statistically significant for men. Better health outcomes for women are positively correlated with high levels of trusting neighbours. These results support the theories that health is strongly and directly influenced by social capital factors such as trust in the relationships with people that are close to their surroundings, local norms, and cultural values (Yip *et al*., 2007). The results suggest that for women, having more children may lower the likelihood of reporting good health, as the number of children is adversely correlated with better health outcomes.

Younger people regularly report greater health than older people, irrespective of gender, and the impact of age on health varies between age groups. Within each age group, the POL models show significance at all levels and a decreasing trend in the likelihood of reporting improved health with age. After using fixed effects to control for the unobserved variables, the direct correlation with age diminishes. In the POL model, the results also suggest that compared to Africans, Coloured women have a weak positive connection with good health, while white men are negatively associated with better health. From the fixed effect model, it can be observed that time-invariant variables such as ethnicity are dropped from the model. Based on the POL model education is positively associated with good health, and there is an increasing trend. This indicates that individuals with higher levels of education have significantly higher odds of reporting better health, compared to those with lower levels of education. This is in line with the literature that people with higher levels of education take greater precautions and manage risks (Cutler and Lleras-Muney, 2010). The influence of education is less pronounced when unobserved factors are taken into consideration. Higher per-capital household income is a significant predictor of perceived health for both men and women only in the POL model such that it is positively associated with health, holding other variables constant.

The models demonstrate the existence of differential experiences in factors influencing perceived health status among women when compared to men. Throughout all the models and among genders, the coefficients of wave 1 to wave 5 are significant and positive. This suggests that health improves with time compared to wave 1. Comparing gender differences in all models, women consistently display higher improvements than men.

In order to determine how the level of one independent variable affects the dependent variable depending on another independent variable, researchers often estimate interaction terms to examine how the effect of one explanatory variable on the dependent variable changes depending on the level of another explanatory variable. (Lee, 2013). The interaction terms treat social capital as an indirect channel, through which life satisfaction affects health. The effects of the interaction terms are presented using marginal plots below, with the full regression results included below in Table 4.3 The marginal effects plots are based on the fixed effects logit model, which controls for unobserved heterogeneity.

Figure 4. 1: Life satisfaction interacted with preference to stay in the neighbourhood, by gender



The above marginal effect graph shows the interaction between life satisfaction and preference to stay in the neighbourhood on the anticipated possibilities of better SRH. For both men and women, the interaction suggests a similar influence on health. Individuals who prefer to leave their surrounding areas have higher predicted probabilities of falling into a better SRH group, especially if they are happy with their lives. The results are further defined by the downward sloping line, this shows that a preference to stay moderates/dampens the positive association

between life satisfaction and health. The negative association can be caused by that some individuals prefer to stay in their neighbourhood because of being strongly attached to their neighbourhoods and this attachment causes satisfaction because they get to be with their neighbours, families, and close to the things they are familiar with. As much as this strong attachment brings joy to them it can also be associated with poor health, if the neighbourhood is overcrowded and have limited access to healthcare services, their physical health will be affected as a result. This highlights that those who desire to leave the neighbourhood and are satisfied with their lives are more likely to report better health. This effect is difficult to explain in the context of the literature.

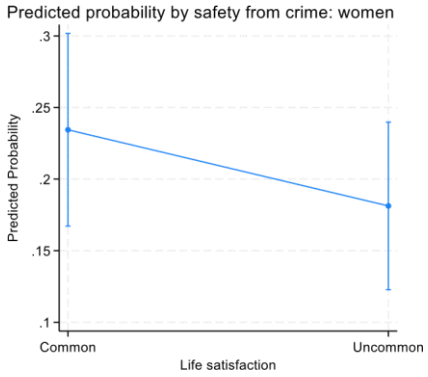
Figure 4. 2: Life satisfaction interacted with importance of religion, by gender

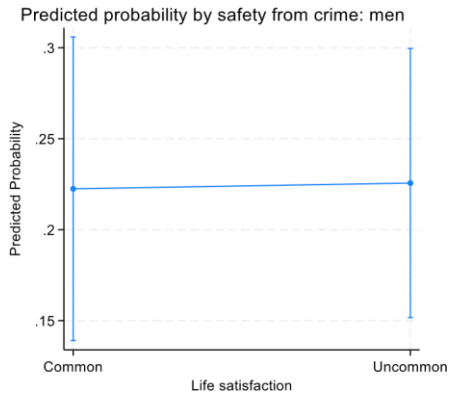
The graph highlights that for both men and women moving from viewing religion as not important to being important and having high life satisfaction increases the probability of being in better health. The importance of religion amplifies the strength of the relationship between life satisfaction and health. The confidence intervals indicate higher certainty in predicted

probabilities when religion is important, but predictions for unimportant are more flexible, with broader ranges going to negative values across men and women. Comparing women to men, women have wider intervals when religion is unimportant and when life satisfaction is low in such that they extend to more negative values showing a significant uncertainty in the predicted probabilities.

The findings also show that both men and women have different relationship with regards to the significance of religion, life satisfaction, and their anticipated outcome with men consistently having greater projected probability of better health in both categories of religious significance. This data implies that life satisfaction works through religious practice to influence men's health more than women's. The results are supported by literature that the impact of religious activities is greater for men than women in the improvement of health and well-being (Maselko and Kubzansky, 2006; McFarland, 2009). One of the reasons why religion is important for men compared to women are cultural expectations and coping strategies for men. For instance, in most cultures, men are supposed to be self-contained and tough without showing emotions of how they feel. Without going against these social norms of independence, religious activities might provide an indirect means of asking for assistance through prayer.

Figure 4. 3: Life satisfaction interacted with neighbourhood crime, by gender





The link between life satisfaction and health is stronger for women living in high-crime neighbourhoods and there are smaller confidence intervals for the two predicted probabilities. The interaction term for men is not statistically significant, which implies that safety from crime is not an indirect channel of influence between life satisfaction and health for men.

4.5 Conclusion

The empirical estimation methodology and results were presented in this chapter, in order to find the link between health and happiness in South Africa and to compare this relationship between men and women. Based on the results, it can be concluded that life satisfaction is significantly associated with better health across all models. The results are similar even after controlling for other variables, which provides support to the literature that life satisfaction is strongly associated with good health. The difference between men and women is weakly significant, with women reporting better health than men. As expected, regardless of gender, the impact of age on SRH varies by age group, with the younger group consistently reporting better health than older individuals.

In the full model preference to stay in the neighbourhood and neighbourhood trust have a statistically significant and positive direct relationship with health. Importance of religion is not significant for women in the POL model and only has a weak significant positive relationship for men. The two models POL and FEL demonstrate the existence of differential experiences in factors influencing perceived health status among women when compared to men. This chapter also considered the social capital variables as the indirect channels associated with life satisfaction in the influencing on health. Margins plots were used to simplify the interpretations of the interacted terms, given the non-linear nature of the logit models. Preference to stay in the neighbourhood weakens the link between life satisfaction and health. The importance of religion for those with high life satisfaction amplifies the link with better health for men, but not for women.

Chapter 5: Conclusion

5.1 Introduction

Globally, governments have started taking decisions of improving health based on evidence of subjective wellbeing measurements (Cubi-molla *et al*., 2014). Based on common experience, where are people are asked what they think their key characteristics for a good life are, people tend to list health, happiness and life satisfaction as good characteristics, and accordingly, governments have tried to improve subjective well-being by improving the public health service (Ngamaba *et al*., 2017). These findings are also part of the reasons why, in recent years, the focus of researching about the relationship between health and happiness has increased.

The main objective of this dissertation was to investigate the link between health and happiness in South Africa, by comparing men to women. In Chapter 2, Kaplan *et al*. (1988) provided three approaches to understanding self-rated health, to provide validity on what it measures, and to explain why self-rated health can be regarded as a valid measure of health status. The first approach investigates "the relationship between perceived health status and findings from physical examinations or physician ratings". The second approach examines "the relationship between perceived health measures and various measures of functional ability". The last approach measures "the multitude of factors that can influence perceived health measures". Based on the arguments of these approaches, conclusions on the importance of using self-rated health measures can be based on their validity, overall capacity to capture different aspects. In defining happiness, the constructs of happiness by Steptoe (2019) were reviewed and adopted, and these include the effective well-being (feelings of joy and pleasure), eudaimonic well-being (sense of meaning and purpose in life), evaluative well-being (life satisfaction based on how individuals are satisfied with their lives).

Chapter 2 further reviewed theoretical and empirical studies associated with the link between health and happiness. A number of studies have found that the relationship between health and happiness is significant and positive, such that people who report high life satisfaction scores generally report being in better health than those with lower life satisfaction (Angner *et al*., 2013; Sabatini, 2014; Dfarhud, 2014; Adesanya *at al*., 2017; Steptoe, 2019). Research also highlights that there is a bidirectional link between health and happiness (Angner *et al*., 2013; Lu *et al*., 2020). Empirical studies further found that this relationship is not direct but there is also an indirect link, which is through other socioeconomics factors and demographic factors, such as age, income, marital status, and social capital (Sebatini, 2014; Weech-Maldonado *et*

al., 2017; Kesavayuth *et al*., 2022). The study looks at the gender difference in the link between health and happiness. Some studies showed that there are gender differences in levels of reported health and happiness, such that women are likely to report poorer health and lower levels of life satisfaction compared to men (Hutson-Comeaux and Kelly, 2002; Maharlouei *et al*., 2020; Abdullahi *et al*., 2019; Maharlouei *et al*., 2020).

Chapter 3 presented the summary of statistics, descriptions of variables, graphs and figures. This dissertation used five waves of the National Income Dynamics Study (NIDS) from 2008 to 2017. The dissertation also used data from two questionnaires: the adult questionnaire starting from 16 years of age, and the household questionnaire, which consists of the relevant questions needed to measure the individual health and subjective well-being. These questionnaires also include variables related to social capital, as well as other demographic and socioeconomic characteristics at the individual and household level. All the observations that did not appear in all five waves were taken out, and the observations were restricted to those appearing in all five waves. The self-rated health (SRH) used the question "How would you describe your health at present? Would you say it is excellent, very good, good, fair, or poor?". The summary of statistics presented in chapter 3 were values of the mean for each variable. And they explain how values differ from each other for women and men. The results show that women report to have poor health more often than men. The results also show no significant differences between the mean values for those who are satisfied and those who are not satisfied for both men and women.

This dissertation addresses two research gaps. It addresses the first the gap by looking at both health and happiness as determinants of each other. In South Africa, most studies have focused on health as a determinant of subjective well-being (Ebrahim *et al*., 2013; Blaauw and Pretorious, 2013), but there are limited studies that pay attention to life satisfaction as one of the factors that influence health (Ataguba *et al*., 2015; Scott *et al*., 2017; Omotoso and Steven, 2018). However, other global studies have found that life satisfaction is a significant factor on health outcomes (Lopuszanska-Dawid, 2018; Vinsalia and Handajani, 2021). Secondly, the dissertation addresses the endogeneity problem caused by individual heterogeneity using panel data and fixed effects model. Most previous studies used cross-sectional data, which could lead to heterogeneity issues in the results of these studies. Although the instrumental variable (IV) method has been used in some studies to address endogeneity issues, it is difficult to find an IV that is appropriate.

The first research question was addressed in Chapter 3, where the question was "what is the relationship between individual's health and subjective wellbeing in South Africa?". The results showed a positive link between good health high life satisfaction. The aim of this paper was to investigate how the relationship of individual's health and subjective wellbeing differ by gender. The graphs showed that men report good health and high life satisfaction compared to women.

The aim of the study was further addressed in Chapter 4 using the pooled ordered logit and fixed effect logit regressions. The last aim of this dissertation was to measure the extent to which social capital moderates the gendered relationships between health and subjective wellbeing, and how these are affected when social capital is considered as an indirect channel between health and subjective wellbeing. The fixed effect logit model was used to address unobserved heterogeneity, and because the Hausman test could not be used, the model used was chosen based on support from the theoretical framework. The scholars who have researched self-rated health have mainly used fixed effect model to control the unobserved heterogeneity (Veenstra and Vanzella-Yang,2020; Xin and Ren, 2021; Davillas *et al*., 2022; Dobreva and Posel, 2023; Coustaury *et al*., 2023).

The estimation results in Chapter 4 represented three regression models. The first set of regression is the basic model used to assess how the relationship between an individual's health (age-adjusted) and subjective well-being differs by gender without including other explanatory variables. The results suggested that there are gender differences in the link between SRH and life satisfactions, and they illustrated a strong positive correlation in both the pooled ordered logit and fixed effects logit models. The second regression is the full models, which is the relationship between individual health and life satisfaction, including social capital variables and other independent variables. These models showed that preference to stay in neighbourhood and safety from theft & burglary in the neighbourhood had a positive relationship with health, and the preference to stay in the neighbourhood was associated with good health for both men and women.

The third regression is the full models of health by gender, with life satisfaction and social capital variables as interacted terms. People who prefer to leave their neighbourhoods, particularly if they are happy with their lives, are more likely to report better health, according to the interaction between life satisfaction and neighbourhood preferences. However, this positive association may be explained by neighbourhood attachment. Religion has a significant

impact on the association between health and life satisfaction; men and women have a larger correlation, but women are less assured of their expected health results. Furthermore, life satisfaction has a stronger impact on health for women living in low-crime areas, whereas neighbourhood safety does not seem to be a significant moderating effect for men.

5.2 Limitations

Longitudinal datasets like the National Income Dynamic Study can be affected by attrition, which may bias regression results when using more than one wave. When using SRH, attrition arises because of individuals dropping out of the survey, possibly due to health issues. Removing the individuals with bad health affects the sample, and this causes biased estimations. Another limitation of this dissertation is that the regression models only show the associations, not the causality. The models used in this study cannot measure the causality. Although the results in the model may present a statistically significant association between SRH and life satisfaction, they do not prove that high life satisfaction causes good health outcome. An additional limitation of this study is caused by some of the variables, for instance self-rated health individuals. Lastly, although this study offers insightful information, the variables included in the analysis have certain limitations. Health and happiness are based on self-reported variables which might be biased. Furthermore, even if the study takes into account a variety of social capital variables, there could be additional elements that were overlooked but could have an impact on health and well-being, such cultural or psychological aspects.

5.3 Contributions

This study contributes to the literature by providing insights on the social determinants of health, health inequalities, and the link between health and socio-economic issues. Based on the background of the research problem of this dissertation, which is to improve quality of life, there is a need to understand the factors affecting health. There is also a need to determine if subjective wellbeing has a major impact on health, so that more attention can be placed on it from a policy context in South Africa. The findings of this dissertation can assist policymakers in addressing the social determinants of health, including measures that can facilitate improved life satisfaction and social capital formation. This study also contributes to the field from the South African context. This study does not only examine gender differences on subjective wellbeing as a factor that influences health, but it also looks into how men and women are affected differently by various aspects of social capital, including preference to stay in the neighbourhood, and socioeconomic factors, such as education, and age. For future research

areas that could be investigated are the Longitudinal analyses of causal pathways linking health and happiness. Exploration of how cultural norms shape gender differences. For policy recommendations, encourage the incorporation of subjective well-being measures into South African health policy frameworks to address gender disparities. Individuals are frequently inspired to stay in their communities because of the availability of healthcare services. As a result, improving access to healthcare may contribute to increased happiness and overall health outcomes for individuals.

Appendix

Table 4. 3: Full regression models of health by gender with life satisfaction and social capital variables as interacted terms

Self-rated health	Pooled Ordered Logit (POL)		Random Effects Logit (REL)		Fixed Effects Logit (FEL)	
Variables	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**
Life satisfaction						
Satisfied	1.300	1.150	1.442***	1.350***	1.220	1.398***
	(0.227)	(0.164)	(0.141)	(0.118)	(0.154)	(0.155)
Preference to stay in neighbourhood						
Prefer to stay	1.369***	1.331***	1.303***	1.334***	1.285***	1.416***
	(0.079)	(0.090)	(0.048)	(0.057)	(0.058)	(0.077)
Life satisfaction#prefer to stay	0.784***	0.811*	0.801***	0.801***	0.824***	0.785***
	(0.071)	(0.090)	(0.047)	(0.055)	(0.060)	(0.068)
Importance of religion						
Important	1.001	0.998	0.989	0.928*	0.942	0.915*
	(0.085)	(0.062)	(0.049)	(0.036)	(0.058)	(0.046)
Life satisfaction#religion importance	1.304*	1.327***	1.084	1.266***	1.174*	1.149*
	(0.196)	(0.136)	(0.089)	(0.081)	(0.125)	(0.097)
Theft & burglary in the neighbourhood						
Uncommon	1.010***	1.121***	1.117***	1.136***	1.186***	1.093**
	(0.0431)	(0.053)	(0.027)	(0.032)	(0.035)	(0.040)
Life satisfaction#crime_safety	0.989	1.104	1.010	0.998	1.055	1.003
	(0.057)	(0.076)	(0.036)	(0.043)	(0.047)	(0.055)
Trust/Likeliness to return wallet						
Likely	1.058	1.024	1.055**	0.989	1.038	0.986

Self-rated health	Pooled Ordered Logit (POL)		Random Effects Logit (REL)		Fixed Effects Logit (FEL)	
Variables	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**
	(0.040)	(0.048)	(0.026)	(0.030)	(0.033)	(0.039)
life satisfaction#likeliness_neighbour	0.946	0.999	1.002	0.962	1.013	0.950
	(0.059)	(0.073)	(0.038)	(0.045)	(0.049)	(0.057)
Number of children	1.001	0.998	1.006**	1.001	0.990*	0.994
	(0.005)	(0.006)	(0.003)	(0.004)	(0.006)	(0.008)
Age group						
Age 36-49	0.584***	0.503***	0.517***	0.448***	0.998	0.968
	(0.026)	(0.030)	(0.014)	(0.016)	(0.060)	(0.075)
Age 50-64	0.293***	0.297***	0.255***	0.236***	1.027	0.970
	(0.016)	(0.022)	(0.009)	(0.010)	(0.093)	(0.119)
Age 65 and over	0.192***	0.178***	0.154***	0.146***	1.096	0.972
	(0.016)	(0.017)	(0.007)	(0.009)	(0.142)	(0.170)
Population group						
Coloured	1.118*	0.899	1.036	0.882***		
	(0.068)	(0.059)	(0.032)	(0.032)		
Asian/Indian	0.971	0.871	1.051	0.846		
	(0.127)	(0.118)	(0.094)	(0.088)		
White	1.127	0.779**	1.282***	0.978		
	(0.116)	(0.077)	(0.077)	(0.065)		
Education						
Primary	1.558***	1.520***	1.708***	1.701***	1.140	1.196
	(0.074)	(0.085)	(0.049)	(0.060)	(0.133)	(0.139)
Secondary	2.062***	1.835***	2.252***	2.084***	1.188	1.393**
	(0.119)	(0.121)	(0.079)	(0.088)	(0.155)	(0.186)

Self-rated health	Pooled Ordered Logit (POL)		Random Effects Logit (REL)		Fixed Effects Logit (FEL)	
Variables	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**
Tertiary	2.577***	2.661***	2.604***	2.681***	1.181	1.589*
	(0.345)	(0.400)	(0.191)	(0.244)	(0.236)	(0.391)
Employment status						
Unemployed	1.057	1.217***	1.080***	1.176***	1.008	1.106**
	(0.044)	(0.065)	(0.028)	(0.040)	(0.035)	(0.050)
Employed	1.069*	1.230***	1.071***	1.184***	0.910***	1.006
	(0.040)	(0.050)	(0.024)	(0.032)	(0.029)	(0.041)
Geotype						
Rural	1.137***	1.020	1.134***	1.076***	1.032	1.060
	(0.037)	(0.040)	(0.025)	(0.028)	(0.067)	(0.073)
Marital status						
Separated	0.878**	0.773***	0.863***	0.764***	0.977	0.872
	(0.049)	(0.073)	(0.028)	(0.044)	(0.059)	(0.092)
Never married	1.126***	0.958	1.049**	0.947	1.031	0.943
	(0.044)	(0.050)	(0.025)	(0.031)	(0.053)	(0.064)
HH monthly income per capita in R'000	1.021***	1.013***	1.015***	1.011***	0.988	1.008
	(0.006)	(0.004)	(0.003)	(0.003)	(0.009)	(0.006)
hhinc000sq	0.996***	0.998***	0.998***	0.999***	1.026	0.998
	(0.001)	(0.001)	(0.000)	(0.000)	(0.019)	(0.004)
Waves						
Wave 2	1.970***	1.728***	2.203***	1.965***	1.973***	1.744***
	(0.093)	(0.100)	(0.070)	(0.076)	(0.071)	(0.078)
Wave 3	1.395***	1.215***	1.516***	1.271***	1.260***	1.058
	(0.064)	(0.071)	(0.046)	(0.047)	(0.044)	(0.047)

Self-rated health	Pooled Ordered Logit (POL)		Random Effects Logit (REL)		Fixed Effects Logit (FEL)	
Variables	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**
Wave 4	1.274***	1.098*	1.428***	1.200***	1.078**	0.888**
	(0.057)	(0.062)	(0.042)	(0.043)	(0.040)	(0.041)
Wave 5	1.399***	1.137**	1.475***	1.227***	1.034	0.858***
	(0.060)	(0.062)	(0.043)	(0.044)	(0.042)	(0.043)
cut1	0.302***	0.143***	-1.263***	-1.887***		
	(0.036)	(0.018)	(0.734)	(0.799)		
cut2	1.582***	0.803*	0.594***	0.046***		
	(0.188)	(0.095)	(0.073)	(0.0787)		
cut3	6.183***	3.173***	2.126***	1.517***		
	(0.736)	(0.377)	(0.739)	(0.792)		
Observations	51 077	35 208	51 077	35 209	68 170	42 543
Number of pid	20 216	15 193	20 216	15 194	10 995	7 584

Source: Own calculations from National Income Dynamics Survey waves 1-5.
Note: This data is weighted. People who are 15 and below are categorized as children. This study is restricted to individuals who are 16 and above. The p-values are for the tests of significance where the significance levels are ranked this way: p<0.01*** (significant at all levels), p<0.05** (significant at 5%), p<0.1*(significant at 10%). Standard errors are in parenthesis. The coefficients are reported as odds ratios.

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UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

07 March 2024

Miss Bongeka Promise Myende (217038230)
School Of Acc Economics&Fin
Westville

Dear Miss Bongeka Promise Myende,

Original application number: 00018774
Project title: Research topic: The link between health and subjective well-being in South Africa: a gender comparison
Amended title: The link between health and happiness in South Africa: A gender comparison

Exemption from Ethics Review

In response to your **amendment** application received on05 March 2024 , your school has indicated that the amendment has been granted **EXEMPTION FROM ETHICS REVIEW.**

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:
Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,

[redacted]----------

Prof Claire Lauren Vermaak
Academic Leader Research
School Of Acc Economics&Fin