ESTIMATING THE RELATIONSHIP BETWEEN HEALTH STATUS AND LABOUR FORCE PARTICIPATION IN NAMIBIA

THESIS SUBMITTED IN PARTIAL FULFILMENT

OF THE REQUIREMENTS FOR THE DEGREE

OF

MASTER OF SCIENCE IN ECONOMICS OF THE UNIVERSITY OF NAMIBIA

BY

SAARI SIMON

201204987

APRIL 2024

SUPERVISOR: DR. AK MUKONG (UNIVERSITY OF NAMIBIA)

Abstract

The relationship between health and labour force participation is of policy interest due to the important role that health plays in economic development. Evidence suggests that there is a positive relationship between good health status and labour force participation. Using 2015/2016 Namibia Household Income and Expenditure Survey (NHIES), a nationally representative household and individual dataset, this thesis examines the relationship between health status and labour force participation in Namibia, a country where such evidence is scarce. The study employed the probit model to estimate the effect of health on the probability of participating in the labour market. The analysis was further disaggregated to assess the relationship between health status on labour force participation by gender. The results suggest that an increase in the prevalence of chronic illnesses such as diabetes, high blood pressure, joint inflammation, cancer, cardiac disease, epilepsy, respiratory disease, stomach ulcer, chronic kidney disease, and anaemia significantly reduces the probability of labour force participation in Namibia. In addition, disabilities such as difficulty with cleaning, difficulty with walking, difficulty with remembering, and difficulty with hearing significantly reduce the probability of participating in the labour market. The results also show that the effect of chronic illness and disabilities on the probability of labour force participation varies by gender, with the magnitude of the effect generally higher among men. Thus, strengthening current public health strategies or policies that promote good health practices and health outcomes (tobacco and alcohol control policies), thereby enhancing the probability of labour force participation in Namibia. In addition, the promotion of exercising through the establishment of community parks will foster health and labour force participation.

Keywords: Labour Force Participation, Health Status, Chronic Illnesses, Disabilities

Declaration

I, Saari Simon, hereby declare that this study is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution. No part of this thesis may be reproduced, stored in any retrieval system, or transmitted in any form, or by means (e.g. electronic, mechanical, photocopying, recording or otherwise) without the prior permission of the author, or The University of Namibia in that behalf.

I, Saari Simon, grant The University of Namibia the right to reproduce this thesis in whole or in part, in any manner or format, which The University of Namibia may deem fit.

Saari Simon		April 2024
…….	……	.. ……
Name of Student	**Signature**	**Date**

Acknowledgements

Undertaking this master's programme has truly been a life-changing experience that would not have been possible without the support and guidance of many people. I would like to extend my gratitude to my supervisor, Dr Alfred Kechia Mukong; because of your high standards, you have pushed me to do better. Thank you for all the advice, sharp criticism, patience, and overall guidance throughout the thesis-writing process.

I am also deeply grateful to my family who serves as my biggest source of strength; I appreciate the hardships they had to bear throughout my master's programme. I have great pleasure in acknowledging my fiancé, Ms Ester Nakathingo for always staying up late with me and giving me moral support.

Finally, I would like to thank my colleagues at Omaheke Regional Council for their moral support, especially, Ms Elizabeth Tjipetekera who always gave me time off from work to focus on my thesis. Thank you for being an understanding work supervisor which made the burden lighter and more enjoyable.

List of abbreviations and Acronyms

2SLS	2-Stage Least Squares
ARDL	Autoregressive Distributed Lag
GMM	General Methods of Moments
HIV/AIDS	Human Immuno Virus and Acquired Immune Deficiency Syndrome
IV	Instrumental Variable
LFP	Labour Force Participation
MoHSS	Ministry of Health and Social Services
NCDs	Non-Communicable Diseases
NDHS	Namibia Demographic and Health Survey
NHIES	Namibia Housing Income and Expenditure Survey
NHSs	National Health Surveys
NSA	Namibia Statistics Agency
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
RHS	Right Hand Side
SSA	Sub Saharan Africa
TB	Tuberculosis
USA	United States of America
WHO	World Health Organization

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Health is an essential form of human capital that plays a significant role in defining the work effort and the ability of individuals to participate in the labour market by enhancing physical capacity and mental capabilities (Cai, 2010). However, the prevalence of chronic diseases, disabilities, and related morbidity in many developing countries reduces life expectancy, increases premature retirement, and affects the rate of labour force participation (Schofield *et al.,* 2008; Zhang *et al.,* 2009; Oksanen and Virtanen, 2012). Thus, poor health reduces labour force participation, diminishes productivity, and results in output loss (OECD, 2012; Bubonya *et al.,* 2016). This forms part of the traditional view of the influence of health improvement on the pace of income growth through various pathways: A health improvement directly enhances labour market participation and labour productivity (Bloom *et al.,* 2019; Weil 2014; Barro, 2013); an increase in life expectancy encourages innovation and human capital investment (Pocas, 2013; Blackstone *et al.,* 2013); and better health transition economies towards better income sustainable growth (Bloom *et al.,* 2015). These pathways underline the importance of health as a contributing factor to economic growth.

Despite successful efforts in reducing mortality rates from chronic diseases among some developing countries in the past years, the burden of diseases still significantly affect labour force participation (Schofield *et al.,* 2008; Zhang *et al.,* 2009). Hence, poor health leads to less participation in the labour market, and diminishing productivity due to the inability to work (OECD, 2012; Bubonya *et al.,* 2016), with

productivity loss estimated to be greater (Garcia-Gomez *et al.*, 2011). While the direct cost of illness can be routinely evaluated, the indirect cost of productivity loss due to ill health and premature mortality may be greater than the direct costs of morbidity (Bates *et al.*, 2018). The effects of health in determining the retirement period of workers are equally significant and those 45 years or older who have been diagnosed with a chronic health condition are more likely to exit the labour force earlier compared to their counterparts with better health (Oksanen and Virtanen, 2012; Schofield *et al.*, 2013). Therefore, improved health remains a significant factor in determining an individual's life expectancy, productivity, and labour force participation (Bushnik *et al.*, 2018; Bor *et al.*, 2013). As a result, there is a need to understand the impact of health on labour force participation, especially in countries where such evidence is scarce.

Several studies have investigated the impact of health status on labour force participation, with the majority of these studies focusing on chronic illnesses such as diabetes, cancer, and heart diseases (Husain, 2010; Levinsohn *et al.*, 2013; Novignon *et al.*, 2015; Schofield *et al.*, 2013; Fu *et al.*, 2019). These studies have found a positive association between good health and labour force participation, citing that those with poor health spend some of their productive time seeking healthcare services (Varekamp *et al.*, 2013). It has also been argued that poor health in childhood is one of the essential mechanisms for explaining the inter-generational transmission of education and economic status. For instance, the health conditions of children are important for their educational attainment and future earnings (Case *et al.*, 2005, Victora *et al.*, 2008; Nwosu and Woolard, 2017). Evidence also suggests that labour force participation is an important determinant of health outcomes; for instance, being employed can provide substantial benefits to both physical and mental health.

However, employment may also negatively affect both physical and mental health, especially in toxic working environments (Waenerlund *et al.,* 2014), and thus, a possibility of an endogenous relationship between health and labour force participation. While some researchers have addressed the potential endogeneity bias (Gathergood, 2013; Hanandita and Tampubolon, 2014; Frijters *et al.,* 2010), it has been ignored by many (Anson and Anson 1987; Novignon *et al.,* 2015; Schofield *et al.,* 2008; Garcia-Gomez *et al.,* 2011; Fu *et al.,* 2019; Bates *et al.,* 2018; Pawlowska-Cyprysiak *et al.,* 2015). However, the argument put forward is that the endogenous relationship is particularly important when self-assessed health is used than when chronic diseases are used as measures of health status. While there is a growing burden of communicable diseases and non-communicable diseases in Namibia (Ndishishi, 2014; Guariguata *et al.,* 2015), there is limited empirical evidence on how this has affected people's participation in the labour market.

While vast evidence on the relationship between health status and labour force participation in developed countries exists, there is very little evidence in many less developed countries, specifically in Africa. The scarcity of empirical data in Namibia regarding the impact of prevalent communicable diseases like HIV/AIDS and Tuberculosis (TB), along with non-communicable diseases such as heart disease, stroke, cancer, and diabetes, on labor force participation, presents an intriguing research opportunity. As such, it is important to understand how the growth burden of diseases has affected its labour market participation. Thus, this study contributes to this body of literature by analyzing the link between long term health status and labour force participation in Namibia, with particular focus on chronic illnesses and disabilities. The study sought to test the hypothesis that there is a significant relationship between health and labour force participation in Namibia.

1.2 The institutional context

Namibia is ranked as an upper middle-income country with a population of over 2.5 million and it has one of the most unequal income distribution countries in the world, with a Gini coefficient of 0.55 in 2017 (Namibia Statistics Agency, 2017). The disparities in income per capita came as a result of the skewed Namibian economy since its independence in 1990. The economically active population (population in the labour force) was 71.2% of the total population while the population outside the labour force was 28.2 % in 2017 (Namibia Statistics Agency, 2017). According to the 2018 Namibia Labour Force Survey, Namibia is one of the countries with the highest broad unemployment rates in the world; currently standing at 33.4%, from 34% in 2016. This means that more than half of the country's economically active population is unemployed. This causes major economic and social instability such as crime, deterioration of health, depression, and low economic welfare.

According to the 2016 and 2018 labour force surveys, total employment increased from 657 584 people in 2016 to 725,742 people in 2018 in Namibia. Despite the increase in employment between 2016 and 2018, data shows that total unemployment increased from 19% in 1993 to 33.4% in 2018, which is a consequence of a high number of jobs lost in the informal sector as compared to the formal sector. This employment decline was attributed to sluggish growth in the country's economy due to relatively low quality of productivity and a high level of government expenditure on unproductive investments (Nakale, 2016). On the contrary, Namibia's informal employment rate is below that Sub-Saharan Africa and other countries with similar income levels (Novignon *et al*., 2015). Table 1 and figure 1 compares Namibia to some of the upper middle-income countries in the world in terms of labour force

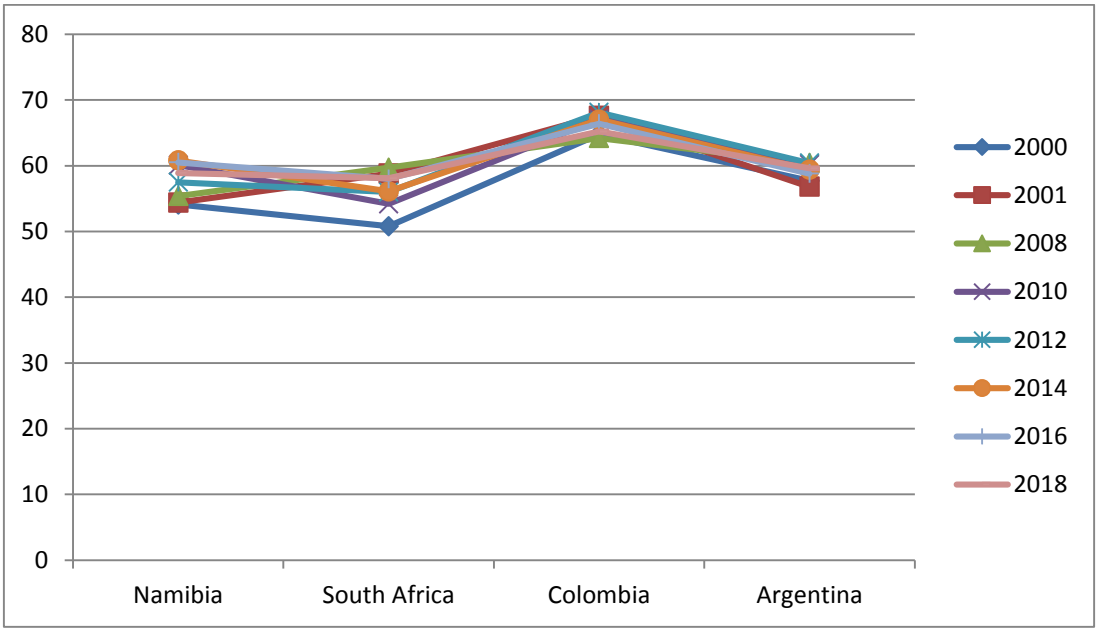
participation rate. Based on the table, it is evident that Namibia has a similar labour force participation rate pattern when compared with some middle-income countries.

Table 1: Labour Force Participation rate comparison

Comparison of Labour Force Participation Rate								
	2000	**2001**	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**
Namibia	54.1	54.4	55.4	60.1	57.5	60.8	60.5	58.9
South Africa	50.8	58.8	59.7	54.2	56	56.1	58	58.1
Colombia	64.8	67.6	64.2	67.1	68.1	67	66.4	65.2
Argentina	57.7	56.8	60.4	60.2	60.4	59.4	58.8	59.6

Source: ILO 2000, 2001, 2008, 2010, 2012, 2014, 2016 and 2018

Figure 1: Labour Force Participation rate comparison



Chronic illnesses are among the most costly and prevalent health conditions in Namibia. Approximately 11.8 % of the total population suffers from one or more chronic illnesses (Kalomo and Liao, 2018). Globally, Health and quality of life have been greatly affected by chronic illnesses which also impacted the ability of people to fully participate in the labour market. According to the 2016 Namibia Household

Income and Expenditure Survey report, high blood pressure was the most prevalent chronic disease with 6.1% of the total population suffering from high blood pressure as compared to other chronic illnesses, with higher rates found in urban than in rural areas. The disparity in job losses, air pollution, and depression explain the observed disparity in high blood pressure among rural and urban dwellers (Moreira *et al.*, 2013; Chow *et al.*, 2013; Bâ *et al.*, 2018). Other chronic illnesses that affect the population are asthma, joint inflammation, diabetes, and heart or cardiac conditions that are emerging as threats to the health system that are already weakened by communicable diseases such as HIV and AIDS, Malaria, and TB. Recent evidence shows that most illnesses are not limited to certain age groups, but vary across all age groups (Namibia Statistics Agency, 2016). However, evidence suggests that chronic illnesses are more prevalent among older people than younger people (Slopen *et al.*, 2014; Prasad *et al.*, 2012; Kim, 2011; Botes *et al.*, 2018).

Like in other parts of the world, chronic illnesses are a major public health problem, and Namibia has seen a significant increase in deaths related to chronic illnesses over the past years. In 2018, Non-Communicable diseases (NCDs) were one of the leading factors responsible for deaths and injuries, accounting for 41% of the 19,000 total deaths reported in Namibia (World Health Organisation, 2018). To be specific, about 17% of the total deaths were due to cardiovascular diseases, 5% due to cancer, 5% due to diabetes, 4% due to chronic respiratory diseases, and 10% due to other NCDs (World Health Organisation, 2018).

In Namibia, a document named the National Multisectoral Strategic Plan was introduced in 2017 with the sole purpose of prevention and control of NCDs. Under this plan, the country committed to establishing multisectoral national policies and plans, including the prevention and control of NCDs through reducing exposure to

risk factors and boosting health systems as well as to developing national targets and indicators in line with the global health targets set for 2025. This is expected to reduce high burden of mortality and economic loss due to NCDs and subsequently, improve the labour participation rate. In May 2013, the country further adopted the World Health Organization Global Action Plan for the Prevention and Control of NCDs. The government through the Ministry of Health and Social Services (MOHSS) developed its document called the National Multisectoral Strategic Plan on NCDs control in 2017; however, implementation remains a challenge due to insufficient health facilities, lack of medical technological advancement and lack of capacity required to enforce the strategic framework (Dlodlo and Hamunyela, 2017). According to Kalomo and Liao, (2018) and Jonkman *et al., (*2020), more efforts are required to strengthen both the public and private health sectors to be able to successfully implement strategies put in place for the prevention and control of NCDs. This study seeks to inform policymakers about the benefits of preventing or treating chronic diseases in the labour market.

1.3 Problem Statement

In both developed and developing countries, chronic illnesses have proven to significantly affect the ability of individuals to fully participate in the labour force (Devaux and Sassi, 2015; Silvaggi *et al.,* 2020; Schofield *et al.,* 2014; Schofield *et al.,* 2013; Varekamp *et al.,* 2013). However, the impact is expected to be higher in less developed countries due to poor living conditions and inadequate health facilities for the treatment of these diseases. Namibia is experiencing a growing burden of communicable diseases such as HIV/AIDS and Tuberculosis (TB) as well as non-communicable disease such as heart diseases, stroke, cancer, and diabetes (Ndishishi, 2014; Guariguata *et al.,* 2015). However, there is limited empirical evidence on how

this has affected labour market participation. In Namibia, the labour force participation rate increased from 54.1% in 2000 to 60.1% in 2010 and then started decreasing from the year 2014 until the year 2018 (International Labour Organization, 2023).

Recent labor force market trends in Namibia indicate a significant increase in unemployment rates, particularly among young people. The labor force participation rate is relatively low when compared to other countries with a similar economic setup, apart from South Africa. The recent decline in the labour force participation rate could be explained by a skills mismatch between the available workforce and the required skills demanded by employers. These trends are indicative of an unbalanced labor market that fails to create sufficient employment opportunities, match skilled workers with available jobs, and promote fair compensation practices. Addressing these trends requires implementing labor policies that promote workforce development, encourage entrepreneurship, and tackle gender-based discrimination.

The prevalence of chronic illnesses and disabilities is a growing concern in Namibia, with a significant increase in the number of people affected by conditions such as diabetes, hypertension, cancer, and mental health disorders. According to Christians (2020), the prevalence rate of ill health among individuals aged 15 and 60 reduces the quality of life, posing a significant challenge to the country's healthcare system and labour productivity. Estimates show that chronic conditions are among the leading causes of early deaths in Namibia, accounting for about 21% of all mortalities between the years 2012 and 2017 Ministry of Health and Social Services, 2018). The inability to participate in the labour market negatively impacts the individual, overall household well-being and the economy (Levinsohn *et al.,* 2013). Poor health due to illness, pain, and disability reduces work productivity, and future employment

opportunities and causes premature retirement (Oksanen and Virtanen, 2012). While Namibia has registered an increase in labour force participation over the years, the unemployment rate of 33.4% (Namibia Statistics Agency, 2018) is still relatively high. This suggests the need to understand the factors that affect labour force participation of individuals in the country.

1.4 Objectives of the Study

The main objective of the study is to analyze the relationship between long-term health status and labour force participation in Namibia. Specifically, the study seeks to:

- Estimate the effect of chronic diseases and disabilities on labour force participation in Namibia
- Analyze the disaggregated effect of chronic diseases and disabilities by gender labour force participation.

1.5 Hypotheses of the Study

H_0: chronic diseases and disabilities have no significant effect on labour force participation in Namibia

H_1: chronic diseases and disabilities do not significantly explain gender differences in labour force participation in Namibia

1.6 Significance of the Study

While there is growing literature on the burden of health-related diseases on labour force participation in the world (Remi *et al.,* 2020; Lawana *et al*., 2020), there is insufficient empirical evidence in the African continent. In Namibia there is no formal empirical evidence on the role of chronic diseases in labour force participation. This

study is one of the few to examine the relationship between health status and labour force participation in Namibia. Thus, the study is crucial for more effective private and public policy formulation and does not only benefit Namibia, but also countries with similar interests. Specifically, the study is significant to policy makers in 3 ways. First, the study identifies critical health problems arising from long term illnesses. Second, data is analyzed and evidence of findings is discussed. Lastly, recommendations that can be used to formulate effective policies are provided. The study is also significant for academic research, especially for future researchers who would like to extend this analysis. Future researchers can use this study to build on and conduct further research on how other illnesses (apart from chronic illnesses) affect labour force participation in Namibia. Future studies can also use the results of this study to compare the trends of the impacts of chronic illnesses on labour force participation in Namibia in the coming years.

1.7 Limitation

The study acknowledges the possible presence of endogeneity due to the simultaneity of health status and labour force participation. Self-reported health status is sensitive to measurement errors which are unlikely to be random. The study, therefore, relies on objective measures of health to mitigate this limitation. While an instrumental variable approach could be used to address the potential endogeneity between self-assessed health status and labour force participation, the current study did not explore this opportunity since the data has no information on self-assessed health. It is, therefore, recommended that future surveys should collect information on self-assessed health to enable researchers to explore this relationship.

1.8 Delimitation

This study uses the Namibia Household Income and Expenditure Survey (NHIES), a cross-sectional data collected between 2015 and 2016. The analysis is further disaggregated to identify the effect of health on labour force participation by gender and focus on individuals between the ages of 15 and 64 years.

1.9 Organization of the Study

The remainder of the study is organized as follows: Literature review which discusses relevant literature, including both theoretical and empirical review is presented in chapter two. Chapter three discusses research methods used which include sources of data used, the economic theory that guides the empirical specifications as well as ethical considerations. Chapter four discusses results from empirical analysis and discussions of the study. The final chapter summarizes the findings of the study in terms of what it sought to achieve, what it found, and how it relates to existing evidence. It also makes recommendations and suggestions for future research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews related literature on the relationship between health status and labour force participation. In this chapter, theoretical and empirical evidence on the relationship between health status and labour force participation are reviewed.

2.2 Theoretical Literature

The concepts of labour supply theories as well as that of the health-labour supply relationship have been well documented. The wage-labour supply relationship in past studies was found to be ambiguous, particularly in constrained optimization models (which come as a result of income and substitution effects in wage variants) (Aaberge and Colombino, 2014). One of the earlier studies that tested this wage ambiguity statement, Stern (1986) established that there is a general relative inelastic elasticity of working hours concerning wages in the United States of America (USA). Related work includes that of Sienaert (2008) and Gutiérrez-i-Puigarnau and van Ommeren (2010) . The model of the determinants of labour supply as uncovered by Hicks (1946) is the root of most of the early work as well as later studies conducted after the 20th century on the labour supply concept.

A standard static labour supply model suggested a theoretical analysis of the relationship between health status and labour force participation (Blundell and MaCurdy 1999). The framework suggested by Hicks (1946) has been closely followed by recent researchers (Nwosu, 2015; Dogrul, 2015; Trevisan and Zantomio, 2016; Clark *et al*., 2017; Le *et al*., 2019). In this approach, the labour supply is derived from the basic consumer theory where an individual is assumed to have a quasi-concave utility function

$$U_i = U(C_t, L_t, X_t)$$

[2.1]

That is, C_t represents within period consumption, L_t leisure hours, and X_t and is individual attributes including health status in the period t.

Subject to the following budget constraint;

$$C_t + W_t L_t = Y_t + W_t T \qquad [2.2]$$

Where W_t is the wage rate per hour, Y_t represents non-labour income, and T is the total available time in hours. The total available time T is divided into two measures namely work hours (r) and leisure time (l) which yields the following time constraint, $T = r + l$. The right-hand side (RHS) of equation 2.2 includes a fixed endowment of time as well as all different sources of time. Therefore, we can simplify it by denoting the RHS as M_t so that

$$M_t = Y_t + W_t T, \qquad [2.3]$$

which is defined as full income (which includes that of labour and non-labour) that the consumer uses to purchase commodities and leisure. The measurement of non-labour income can be solved by maximizing equation 2.1 subject to 2.3 to get the following first-order conditions;

$$U_C(C_t, L_t, X_t) = \gamma_t \qquad U_L(C_t, L_t, X_t) \geq \gamma_t W_t \qquad [2.4]$$

Where γ is the marginal utility of income. In the static model, if the inequality in equation 2.4 holds, then the individual forms part of the non-labour category and leisure hours equate the total time available in a single consumption good that is taken as a numeraire, $L_t = T$. However, if the inequality does not hold given the individual's reservation wage, W_{Rt} such that $U_L(Y_t, T, X_t) = \gamma_t W_{Rt}$, meaning that the

market wage falls below the reservation wage, an indication that the individual will not work. In short, the individual's participation and non-participation decision can be summarised as follows;

$$W_m > W_R \rightarrow Participate \quad [2.5]$$

$$W_m < W_R \rightarrow Do\ not\ participate \quad [2.6]$$

Where the individual participates when the market wage (W_m) exceeds the reservation wage W_R , otherwise, no participation at all. Even when $W_m > W_R$, individuals' decision to participate in the labour market still depends on other factors including the health status.

The conditions in 2.4 and 2.6 indicate that amongst many, including an individual's health status, the determinants of labour force participation include non-labour income, tastes, wage rate, observed and unobserved characteristics. The reservation wage is determined by personal characteristics such as gender, family size, age and ethnic race (Michael, 2011). Equally important, the market wage (W_m) is said to depend on the age, education, health, and labour market experience which are all part of human capital characteristics (Michael, 2011).

Although the foregoing approach has been widely used in demonstrating labour force participation, labour supply in particular, as a function of personal and human capital characteristics; individuals' health can be included in the well-behaved utility function as part of the X vector. As the component of the X vector, health will likely increase an individual's reservation wage due to a possible increase in taste for leisure. On the other hand, good health is likely to increase latent productivity at the expense of leisure, thus, increasing the opportunity cost of leisure; and, enhancing labour market participation (Nwosu, 2015).

2.3 Empirical Literature

The challenges posed by an unhealthy population due to illness in both countries include low-income and household levels. At the household level, low income is associated with low labour force participation which comes as a result of illness (mostly chronic), disability, forced premature retirement, and premature death. Thus, it eventually leads to an overall reduction in living standards (Garcia-Gomez *et al.* 2011; OECD, 2012; Oksanen and Virtanen, 2012; Bor *et al.,* 2014; Bubonya *et al.,* 2016; Bushnik *et al.,* 2018). In addition, there is foregone productivity, saving and investment as the resources available to boost economies in terms of growth are diverted to health care expenditure (Bubonya *et al.,* 2016). Consequently, national budgets may be strained due to heavy reliance on health care expenditure as a result of an unhealthy economically active population.

A study done by Nwosu (2015) analyzed the relationship between health and the labour market in South Africa using the 2008 and 2012 National Income Dynamics Study (NIDS). Self-assessed health was used as a measure of health status. Making use of instrumental variables, censored quantile regression and Blinder-Oaxaca decomposition for data estimation, the study supports the findings in the literature that there is a significant positive effect of health on labour force participation of between 20 percent and 33 percent depending on the gender. Further, males were found to have a higher labour force participation probability than females. Dogrul (2015) found similar evidence in Turkey using a two-stage approach that was applied separately for working age groups of males and females.

Devaux and Sassi (2015) highlighted the potential impact of health on the labour market using data from OECD countries. The study examined the labour market impacts of some risky lifestyle factors such as obesity, smoking, alcohol use, and related chronic diseases. Although the study made use of survey methods instead of econometric analysis, the study asserted, non-communicable diseases and associated risk factors harm the labour force participation of both males and females, but with assorted findings in a few areas. For example, obesity, smoking as well as chronic diseases such as cardiovascular diseases and diabetes are found to harm employment opportunities, wages, and productivity. However, there was no convincing evidence found that link alcohol use, cancer, and high blood pressure with increased work absenteeism due to illness. Another study done by Burdorf *et al., (2023)* used descriptive analysis to study the relationship between health and inclusive labour force participation in low income and middle income countries. The study introduced the concept of working life expectancy as a metric to capture the expected number of years in employment among different working age groups. The findings show that disadvantaged workers with chronic diseases and impairing disabilities influence participation in the labour market. For example, labour force participation has been found to be lower among individuals with heart disease, chronic pulmonary disease and breast or lung cancer. These findings suggest that lower labour force participation is usually due to disease related functional limitations that determine whether an individual is able to work or not. These studies were descriptive and did not account for the possible problem of self-reported data. They also failed to account for possible endogeneity of health on labour supply which may lead to biased estimation.

Given these limitations, subsequent studies have used more robust methodological approaches to analyse the relationship between health status and labour force participation (Harris, 2009; Schofield *et al*., 2013; Mufune, 2013; Nwosu, 2015; Dogrul, 2015; Nwosu and Woolard, 2017; Remi *et al.*, 2020). These studies suggested that there is a positive and significant relationship between good health and labour force participation. The studies further found a more negative impact of poor health on labour force participation for men relative to women. However, Mufune's (2013) findings showed that the negative effect was stronger for women than men which concludes that women still lag behind men in various facets of labour participation. The studies by Nwosu and Wollard (2017), and Ahuru and Akpojubaro (2020) were the latest to empirically estimate the relationship between health and labour force participation, making use of instrumental variables, censored quantile regression, and Blinder-Oaxaca decomposition for data estimation and binary logistics regression respectively. The findings from Nwosu and Wollard (2017) suggest a positive and significant effect of good health on labour force participation, while Ahuru and Akpojubaro (2020) also found a significant positive relationship between health status and labour force participation among Nigerian households. Dogrul (2015), using data from the 2008 and 2012 National Income Dynamics Survey in Turkey, revealed that there is a positive and significant association between good health and labour force participation.

Osundina (2020) studied the the impact of improvement in health and education on employment opportunities for females in Nigeria over the period 1990–2016, using up to date econometric techniques. The empirical findings show a positive and significant relationship between health status and labour participation rate of females in Nigeria. The findings also show a positive and significant relationship between

education level and labour force participation rate of females in Nigeria. The results conclude that females with higher level of education and good health statuses are more likely to participate in the labour force. The results are consistent with existing literature that highlights female labour force participation (Mohammed *et al*., 2020; Egoda, 2021; King *et al.*, 2021; Manthorpe, 2021; Mussida & Patimo, 2023; Ekholuenetale *et al*., 2023; Hou *et al*., 2023). Another study that confirms a positive relationship between health and labour force participation, especially for women is that of Bakehe (2022). Using the 2014 data from the fourth Cameroon household survey, the study analyzed the relationship between energy poverty, respiratory health and labour force participation. The study employed the trivariate recursive probit model for data analysis and found that the respiratory illnesses that are caused by energy poverty have a negative effect on the labour force participation.

A study done by Mushtaq *et al.* (2013) in Pakistan used Instrumental Variable techniques to control for possible endogeneity. Additionally, the study also employed the autoregressive distributed lag (ARDL) co-integration approach to estimate short and long run elasticities, while dynamic causality between the variables was determined using a Wald coefficient test. The study also found a positive and significant relationship between health and labour force participation rate in the short run, but this status changes in the long run. This study is plausible because it accounts for different periods as opposed to a few studies such as that of Harris (2009) and Mufune (2013). Using data from five National Health Surveys (NHSs) in Australia, Belachew and Kumar (2014) used a logistic regression model to examine the association between labour force participation and self-assessed health status while controlling for other relevant socioeconomic variables such as age, period, and cohorts. Their results show that self-assessed health status and labour force

participation are positively associated, meaning that those that reported good health were more likely to participate in the labour force, but the effects are shown to be stronger for females than the male which is also supported by Mufune (2013). Furthermore, the study adds to the literature by examining cohorts' effect that varies between the sexes, with the youngest cohorts less likely to participate in the labour force.

Contrary to the assertion that there is a significant positive relationship between better health and labour force participation, the reverse causality of the effect of labour force participation exists. Dogrul (2015) argues that there is psychic utility in being economically active in the labour market. However, the findings that labour force participation positively affects health status contradict that of Cai's (2007) that health is negatively affected by labour force participation, more especially in men. This is true when there are poor and unconducive working environments such as unfair treatment, discrimination, and excessive working hours that negatively affect employees' mental health. In support of Cai's (2007) findings, Davis *et al.* (2005) did a study on health and productivity among U.S workers. The study showed that workers who work for more than 8 hours a day, especially those with more than one job, have a higher probability of experiencing poor health due to the labour market conditions.

There are relatively few studies that have investigated the relationship between health and labour supply in African countries. These include, Novignon *et al.* (2015); who found a positive and significant relationship between population health and labour force participation as consistent with literature by using a dynamic panel data model with 46 states. Other studies with similar findings include Umoru and Yaqub (1987), Bridges and Lawson (2008), McPake *et al.* (2013) and Nwosu and Woolard (2017).

In addition to these findings on African studies, Lawana's *et al.* (2020) empirical results found a negative effect of non-communicable diseases on labour force participation in South Africa.

2.4 Conclusion

Despite the plentiful evidence documenting the association between health and labour force participation, the focus has primarily been on developed countries. Similarly, there is limited, but growing research on Sub-Saharan Africa (Umoru and Yaqub, 1987; Bridges and Lawson, 2008; McPake *et al.*, 2013; Novignon *et al.*, 2015; Nwosu, 2015; Nwosu and Woolard, 2017; Lewana *et al.*, 2020), with the relationship still to be established in many African countries, including Namibia. Many of these studies used self-assessed health status which is often endogenous. Country-specific studies with more objective measures of health status are essential for policy interventions.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The methodology used to achieve the set of objectives of this study is presented in this chapter. This chapter also outlines the data sources, diagnostic tests, estimation approaches used as well as the economic theory that guides the empirical specification. This chapter further discusses the measurement of variables used and the ethical practices adhered to.

3.2 Data type and sources

This study employed cross-sectional household data to estimate the relationship between labour force participation and health outcomes in Namibia. The data used for the study was extracted from the Namibia Household Income and Expenditure Survey (NHIES). The survey was conducted by the Namibia Statistics Agency (NSA) between April 2015 and March 2016. This is the most recent nationally representative survey with detailed information on individual disease profiles as well as labour force participation outcomes. Individuals were interviewed on a range of topics, including their socioeconomic status, disease profile, and employment status. This study focuses on individuals between the age of 15 and 60 years. This is because the official retirement age in Namibia is 60.

A probability sampling technique, particularly the two-stage stratified cluster sampling procedure was used to select a nationally representative sample. In the first stage, 864 clusters were selected and in the second stage, 10,368 households were selected. The response rate was 97% - that is 10,090 of the 10,368 households were successfully interviewed. The data was collected over twelve months consisting of thirteen survey rounds to account for seasonal changes that may affect household

expenditure or income patterns. It provides information on labour market activities and the health status of individuals as well as individual-specific socioeconomic and demographic factors.

3.3 Model Specification

The main objective of the study is to analyze the relationship between labour force participation and health status in Namibia. The study assumes that an individual's labour force participation is determined by their health status, suggesting that people will fully participate in the labour market if they are in good health. There are two measures of labour force participation – broad and strict labour force participation. Each of these measures is dichotomous equivalent to 1 if an individual participated and zero otherwise. Under broad labour force participation, individuals are participants if they are employed or unemployed but searching for work or discouraged while non-participants are not economically active. Under strict labour force participation, individuals are participants if they are employed or unemployed but searching for work, and non-participants are not economically active, and the unemployed discourage individuals. This study uses both measures of labour force participation.

This study adopted the probit regression model to estimate the relationship between labour force participation and health status. The empirical implementation of the model requires the use of the maximum likelihood approach. The choice of the appropriate model estimation was determined by the structure of the dependent variable (labour force participation), the assumption that the stochastic error terms of the model are normally distributed, and the fact that it is commonly used in the literature (Hirth, *et al*., 2003; Gannon, 2005; Kalwij and Vermeulen, 2008; Ward, 2015). The employed model has labour force participation (LFP) at time t ($l^*_{i,t}$), as a

function of health status ($h_{i,t}$), a vector of individual characteristics ($X_{i,t}$), and the error term ($\varepsilon_{i,t}$). The labour force participation function is specified as follows:

$$l^*_{i,t} = \alpha + X'_{i,t}\,\beta + h_{i,t}\gamma + \varepsilon_{i,t} \qquad [3.1]$$

Where $l_{i,t}$=1 if $l^*_{i,t} > 0$ and/or $l_{i,t}$=0 if $l^*_{i,t} \leq 0$. The coefficients that are estimated from the probit model indicate the direction of the effect of an independent variable on the probability of participating in the labour market. In addition, the marginal effects estimates are also presented to determine the change in predicted probabilities in percentiles, in association with changes in the independent variables. Marginal effects measure the partial effects of each independent variable on the likelihood that the explained variable equals 1 (Tunceli *et al*., 2005). The probability of labour force participation is determined as follows;

$$P(l^*_{i,t} = 1 \big| X_{i,t}) = F(X'_{i,t}\,\beta) = \varphi(X'_{i,t}\,\beta) \qquad [3.2]$$

For continuous independent variables, the marginal effect estimates concerning to $X_{i,k}$ are calculated as follows;

$$\frac{\partial P(l^*_{i,t}=1)}{\partial X_{i,k}} = \frac{\partial \varphi(X'_{i,t}\,\beta)}{\partial X_{i,k}} = \varphi\left(X'_{i,t}\,\beta\right)\frac{\partial X'_{i,t}\,\beta}{\partial X_{i,k}} = \varphi\left(X'_{i,t}\,\beta\right)\beta_k \qquad [3.3]$$

Where k represents the k^{th} element in $X_{i,t}$ and φ is the standard normal density function, while the $X'_{i,t}$ is calculated at the means of the explanatory variables. Some of the explanatory variables in this study are dichotomous; we, therefore, interpret the marginal probability effects as the change in the probability of labour force participation as a result of a change in one or more independent variables. These effects are calculated as follows;

$$P(l^*_{i,t} = 1 \big| X_{i,k} = 1) - P(l^*_{i,t} = 1 \big| X_{i,k} = 0) = \varphi\left(X'_{1,t}\,\beta\right) - \varphi\left(X'_{0,t}\,\beta\right) \quad [3.4]$$

Where $X'_{1,t}$ represents a vector of explanatory variables with $X_{i,k} = 1$, and $X'_{0,t}$ represents a vector of explanatory variables with $X_{i,k} = 0$. $X'_{1,t}$ and $X'_{0,t}$ are calculated at the means of the independent variables.

This study assumes that individuals who are suffering from chronic illnesses or are severely disabled have a lower probability of participating in the labour market, irrespective of their age. However, the patterns of labour force participation may differ for men and women, thus, the study also disaggregated the analysis by gender. Personal characteristics such as marital status, household size, age in years, gender and education are also important determinants of labour force participation and are included in the analysis.

The study performed various diagnostic tests to implicitly test whether the model employed is correctly specified in terms of the regressors included, as well as to guide the research on the type of modelling strategy to use. The diagnostic tests include the Pagan-Hall test to check the presence of heteroscedasticity. A Likelihood Ratio test is considered to assess and compare the goodness of fit of two models based on their likelihood ratios (Buse, 1982). The study uses the Wald test to determine and confirm whether the independent variables used in the model are collectively significant or not. Lastly, a test of multicollinearity was done to determine whether the independent variables used in the model are correlated or not. The study made use of the Stata/SE 15.1 statistical package.

3.4 Definition of variables and their measurements

The effect of health on labour force participation may differ among individuals depending on different health conditions such as chronic illnesses and disabilities and other characteristics. The study, therefore, included marital status, household size, and

the quadratic for age, gender, and education in our analysis. These variables are defined in Table 3.1.

Table 3.1 Variables definition and measurement

Variables	Definition
Broad Labour Force Participation	1: if an individual is employed or unemployed searching or discouraged; and 0 if not economically active.
Strict Labour Force Participation	1: if an individual is employed or unemployed searching; and 0 if unemployed discouraged or not economically active.
1: if diagnosed with Diabetes, High blood pressure, Joint inflammation, Cancer, Cardiac / Heart disease, Epilepsy, Stomach ulcer, Respiratory disease, Chronic kidney disease, Anaemia, Chronic mental/ psychological illness; and 0 otherwise.	
Difficulty cleaning	1: if physically immobile; and 0 otherwise
Difficulty remembering	1: if suffering from memory loss; and 0 otherwise
Difficulty walking	1: if having difficulty in walking; and 0 otherwise
1: if having difficulty in hearing; and 0 otherwise	
Gender	1: if male; and 0 if female
Age in years	Actual age in years
Age squared	Square of age in years
1: if married; and 0 if single	
No school education	1: if have no formal education; and 0 otherwise
Primary school completed	1: if completed primary school; and 0 otherwise
Secondary school completed	1: if completed at least secondary school; and 0 otherwise

3.5 Research ethics

The research endeavored to respect professional integrity. The study acknowledged all sources and avoided plagiarism. The data used in the study was not distorted, fabricated, or falsified in any manner. The ethical clearance was issued by the University of Namibia Decentralized Ethics Committee.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the empirical findings and analysis of the study. The chapter also covers the discussions and interpretations of the econometric test results. Different diagnostic tests used to evaluate the estimation technique are also discussed in this section.

4.2 Descriptive Statistics of Variables

Table 4.1 presents descriptive statistics on the indicators of both health and labour force participation used in the analysis. It also presents descriptive statistics on other controls used in the analysis. The results from the entire sample show that about 63% of individuals participated in the labour market (broadly defined); relative to 50% for strict labour force participation. The results also show that 13% of the sample suffers from at least one chronic illness compared to 2%, 4%, 6%, and 5% who reported having difficulties in cleaning, remembering, walking, and hearing respectively. About 67% of individuals in the sample are not married, and the average age is 55 years. Concerning education, 58% of the sample reported having completed secondary school education, 32% reported having completed primary education and 9% reported having tertiary education through either university, teachers training, or short college courses. Only 0.4% of the sample have not attended school at all, which means that the majority of the respondents have attained some formal education.

The results from the male sample show that 61% of individuals participated in the labour market (broadly defined); while for strict definition about 48% participated in the labour market. Approximately, 15% of the sampled male individuals were suffering from at least one chronic illness compared to 2%, 4%, 5%, and 7% who had

difficulties in cleaning, remembering, hearing and walking respectively. The results also show that 68% of the male sample are unmarried. In terms of education, a large fraction of the sample reported completing secondary education (60%) and only an average of 9% reported having tertiary education through either university, teachers training, or short college courses. In addition, only 0.4% of the sample have not attended school at all, which means that about 99.6% of the respondents have attended some formal education. The average age of male individuals in the sample is 55 years.

For women, the broad definition shows that 66% of the sampled individuals participated in the labour market; while the strict definition shows labour force participation of about 54%. This suggests that on average, the inequality in labour force participation in Namibia generally favours women. Approximately, 10% of the sampled women were suffering from chronic illnesses compared to 2%, 3%, 5%, and 4 % who had difficulties in cleaning, remembering, walking, and hearing respectively. Again, inequality in health is in favour of women. The results also show that 66% of the sampled women were not married. Concerning education, 55% of the women reported having completed secondary school education and 10% reported having continued to tertiary education through either university, teachers training, or short college courses. Just like the sample for men, only 0.4% of the sampled women have no school education at all. The average age of a woman in the sample is 54 years.

Table 4.1 Descriptive statistics of variables used in the statistics

Men	Women		Entire sample			
Variables	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Broad Labour Force Participation	0.613	0.487	0.655	0.475	0.633	0.482
Strict Labour Force Participation	0.475	0.499	0.536	0.499	0.503	0.499
Chronic Illnesses	0.152	0.359	0.099	0.299	0.127	0.333
Difficulty cleaning	0.020	0.141	0.019	0.135	0.020	0.139
Difficulty remembering	0.042	0.202	0.029	0.168	0.036	0.187
Difficulty walking	0.065	0.246	0.045	0.207	0.056	0.229
Difficulty hearing	0.052	0.221	0.038	0.192	0.045	0.208
Age in years	0.553	0.497	0.537	0.499	0.545	0.498
Marital status (not married)	0.681	0.466	0.658	0.474	0.671	0.470
No school education	0.004	0.065	0.004	0.063	0.004	0.064
Primary school completed	0.310	0.462	0.338	0.473	0.322	0.467
Secondary school completed	0.602	0.490	0.553	0.497	0.580	0.494
Have tertiary education	0.085	0.278	0.105	0.306	0.094	0.292

Table 4.2 Descriptive statistics on different types of chronic illnesses

Men	Women		Entire sample			
Chronic illness type	Frequency	Percent	Frequency	Percent	Frequency	Percent
Diabetes	205	0.94	143	0.73	348	0.84
High blood pressure	1,901	8.68	884	4.50	2,785	6.70
Joint inflammation	240	1.10	180	0.92	420	1.01
Cancer	44	0.20	28	0.14	72	0.17
Cardiac / Heart disease	238	1.09	98	0.50	336	0.81
Epilepsy	118	0.54	106	0.54	224	0.54
Respiratory disease (asthma, etc.)	233	1.06	184	0.94	417	1.00
Stomach ulcer	64	0.29	55	0.28	119	0.29
Chronic kidney disease	30	0.14	32	0.16	62	0.15
Anaemia	45	0.21	17	0.09	62	0.15
Chronic mental/ psychological illness	96	0.44	113	0.58	209	0.50
Does not have a chronic illness	18,573	84.77	17,698	90.09	36,271	87.29

Table 4.2 shows descriptive statistics on the chronic diseases used in the analysis. The most prevalent health condition reported is high blood pressure. Results from the entire sample show that about 6.7% of the respondents reported having been diagnosed with high blood pressure, followed by joint inflammation and respiratory diseases with 1.01% and 1% respectively. Less than 1% of the entire sample reported being diagnosed with other chronic illnesses such as diabetes, cancer, cardiac disease, epilepsy, stomach ulcer, chronic kidney disease, and anaemia. Moreover, 87.3% of the respondents reported having any chronic illness. This suggests that they are in good health or are either suffer from other health conditions not defined in the study.

The results from the male sample show that 8.7% of the respondents reported having been diagnosed with high blood pressure, which is the most prevalent health condition, followed by joint inflammation, cardiac/heart disease, and respiratory disease with 1.1% each. All the other reported types of chronic illnesses affect less than 1% of the male. Overall, 84.8% of the male respondents did not report any chronic illnesses. The results from the female sample also show that high blood pressure affects more respondents (4.5%) than any other reported chronic illnesses, followed by respiratory disease (0.9%) and joint inflammation (0.92%). Similar to the male sample, all the other reported types of chronic illnesses are found in less than 1% of the female sample. Overall, 90.1 % of the female respondents reported not having any chronic illnesses. Based on the list of chronic illness considered in this study, women seem to have better health outcomes than men – on average.

4.3 Diagnostic tests

4.3.1 Breusch-Pagan test for Heteroscedasticity

The estimation of cross-sectional data is most likely to suffer from heteroscedasticity. This particular concern cannot be ignored in a study of this nature because the reported labour force and health status such as chronic illnesses and physical disability is diverse due to different age groups and are also not normally distributed – meaning no constant variance (Schofield *et al.*, 2013). Therefore, the presence of heteroscedasticity cannot be ignored because it may compromise the efficiency of parameters and also produce inconsistent standard errors. The study applied the Breusch-Pagan test to check if the errors are heteroscedastic.

Table 4.3 The Breusch-Pagan test using the broad labour force estimations

chi2(22)	= 25779.58
Prob > chi2	= 0.0000

Table 4.4 The Breusch-Pagan test using strict labour force estimations

chi2(22)	= 15258.44
Prob > chi2	= 0.0000

Table 4.3 reports test statistics for heteroscedasticity (broad labour force estimation) whereas estimations for strict labour force are shown in Table 4.4. The null hypothesis of this test denotes that the model is homoscedastic, while the alternative denotes that the model is heteroscedastic. Using the Breusch-Pagan test, the results for both Table 4.3 and Table 4.4 show that the model does indeed suffer from heteroscedasticity since the p-values of 0.000 are less than 5 percent; meaning that we reject the null hypothesis and conclude that the models are heteroscedastic. Therefore, to obtain efficient parameter estimates, robust estimations of variances are used.

4.3.2 Likelihood ratio test for goodness of fit

A likelihood ratio test was conducted for goodness of fit. The probability values in Table 4.5 and Table 4.6 ($p<0.000$) which is significant at all levels, suggesting that the variables that are added to the models significantly explain the models.

Table 4.5 Likelihood ratio test using broad labour force estimation

LR chi2(2) = 6460.38	(Prob > chi2 = 0.000)

Table 4.6 Likelihood ratio test using strict labour force estimation

LR chi2(2) = 11301.36	(Prob > chi2 = 0.000)

4.3.3 Multicollinearity test of correlation

A test of multicollinearity was conducted to determine whether there is a high correlation between two or more independent variables in the regression. A high correlation among independent variables is not ideal because it can cause problems when interpreting the regression model. Multicollinearity can be detected using the variance inflation factor (VIF), which measures the strength of correlation between the independent variables in a regression model (Alin, 2010). Table 4.7 shows the VIF value for each of the independent variables in the model. As a thumb of rule, a VIF value of 1 indicates that there is no correlation between a given independent variable and other independent variables in the regression model; while a VIF value between 1 and 5 indicates a moderate correlation between one independent variable and other independent variables in the model. Any VIF value greater than 5 indicates that there is a high correlation between that given independent variable and other independent variables in the model, and an action should be taken

as a corrective measure for the detected collinearity (Alin, 2010). As seen from table 4.7, the VIF values of completed primary school, completed secondary school and having tertiary education are above 5, meaning that there is an alarming higher correlation between those variables with other independent variables in the model. Therefore, a corrective measure is to remove one of the flagged variables and re-run the VIF to test confirm the solution. The correlation matrix is listed in the Appendix A.

Table 4.7 Variance Inflation Factor values

Variables	VIF
Secondary school	66.77
Primary school	59.55
Tertiary education	24.07
Age in the labour force	2.42
Difficulty walking	1.28
Difficulty Chronic illnesses	1.20
Difficulty cleaning	1.14
Difficulty remembering	1.14
Marital status	1.11
Difficulty hearing	1.09
Sex	1.02
Mean VIF	12.67

4.4 Estimated effect of health on labour force participation.

Table 4.8 presents results from the probit regression for the effect of different types of chronic illnesses as well as four types of labour force participation. Broad labour force participation is used as a measure of labour force participation. In the entire sample, the majority of the disabilities have significant negative relationships with

broad labour force participation; except difficulty in hearing is statistically insignificant. The results also show that many chronic illnesses have a negative significant association with broad labour force participation. For example, joint inflammation, chronic kidney disease, and stomach ulcer; however, only diabetes, high blood pressure, cancer, epilepsy, and respiratory disease are statistically significant. Notably, cancer was found to have a larger negative effect compared to other chronic illnesses. Concerning, having difficulties in cleaning has a larger negative effect compared to other types of disabilities.

The results for the female sample show that the majority of the disabilities have significant negative relationships with broad labour force participation; except difficulty in hearing is statistically insignificant. For men, all four types of disabilities have significant negative relationships with broad labour force participation. The results for women also show that some of the chronic illnesses have a negative association with broad labour force participation. For example, only diabetes, epilepsy, and respiratory disease are statistically significant. Notably, epilepsy was found to have a larger effect compared to other chronic illnesses. Concerning disabilities, having difficulties in cleaning has a larger negative effect compared to other types of disabilities. Whereas, results for the male sample show that many of the chronic illnesses, including diabetes, high blood pressure, cancer, and epilepsy are statistically significant and have a negative association with labour force participation. Again, epilepsy and having difficulties in cleaning were found to have a larger effect on men's labour force participation compared to other chronic illnesses and disabilities respectively. The magnitude of the effects of many of the health outcomes are generally lower for men compared to women and most of the chronic illnesses are statistically insignificant among women relative to men.

In terms of the other control variables, broad labour force participation rises with age for the entire sample and both men and women. The results for the entire sample and women suggest that completing primary and secondary education negatively significantly affects broad labour force participation. Interestingly, the results show that the likelihood of labour force participation is lower for married men and the entire sample, but higher for married women. This is in contrast with Van Hedel *et al*. (2015) that did a study in the USA and six European countries and found that marriage actually reduces the chances of women to participate in the labour force, while men are the opposite. Azcona and Bhak (2020) also did a study on the impact of marriage and children on labour market participation and found the same conclusion that married women are less likely to be part of the labour force, especially when they have children to care for. The results for the entire sample show that epilepsy reduces the probability of broad labour force participation by 13%, followed by cancer by 11%; while diabetes and high blood pressure reduce the probability of broad labour force participation by 6% and 3% respectively. Concerning disabilities for the entire sample, the majority of the types of disabilities have the expected signs and are statistically significant, except for difficulty in hearing. Difficulty in cleaning reduces the probability of participating in the labour force by 22%, and difficulty in remembering and walking reduces the probabilities by 4% and 6% respectively.

Table 4.8: Estimated effect of health on broad labour force participation

Women		Men		Entire sample	
Variables	Coefficient	Marginal Effects	Coefficient	Marginal Effects	Coefficient	Marginal Effects
Diabetes	-0.260**	-0.066**	-0.337**	-0.059**	-0.255***	-0.058***
	(0.110)	(0.028)	(0.143)	(0.025)	(0.087)	(0.019)
High blood pressure	-0.053	-0.014	-0.143**	-0.025**	-0.064*	-0.015*
	(0.044)	(0.011)	(0.068)	(0.012)	(0.037)	(0.008)
Joint inflammation	0.192	0.049	0.171	0.030	0.193**	0.043**
	(0.122)	(0.031)	(0.156)	(0.027)	(0.096)	(0.021)
Cancer	-0.367	-0.093	-0.699**	-0.123**	-0.493**	-0.111***
	(0.239)	(0.061)	(0.297)	(0.052)	(0.182)	(0.040)
Cardiac / Heart disease	-0.031	-0.008	-0.106	-0.019	-0.061	-0.014
	(0.119)	(0.030)	(0.213)	(0.038)	(0.104)	(0.023)
Epilepsy	-0.430***	-0.109***	-0.871***	-0.153***	-0.614***	-0.132***
	(0.164)	(0.042)	(0.190)	(0.032)	(0.123)	(0.027)
Respiratory disease	-0.225*	-0.057*	-0.102	-0.018	-0.175*	-0.039*
	(0.121)	(0.031)	(0.184)	(0.032)	(0.100)	(0.022)
Stomach ulcer	0.363	0.092	0.197	-0.035	0.326	0.068
	(0.291)	(0.074)	(0.440)	(0.077)	(0.243)	(0.053)
Chronic kidney disease	-0.164	-0.042	0.197	0.035	0.017	0.003
	(0.336)	(0.085)	(0.360)	(0.063)	(0.240)	(0.053)
Anaemia	-0.304	-0.077	-0.000	-0.000	-0.252	-0.058
	(0.256)	(0.065)	(0.544)	(0.096)	(0.229)	(0.051)
Difficulty cleaning	-0.938***	-0.239***	-0.969***	-0.170***	-0.974***	-0.216***
	(0.143)	(0.037)	(0.157)	(0.028)	(0.106)	(0.024)
Difficulty remembering	-0.128*	-0.032*	-0.242**	-0.043**	-0.160***	-0.035***
	(0.070)	(0.018)	(0.098)	(0.017)	(0.057)	(0.013)
Difficulty walking	-0.219***	-0.056***	-0.365***	-0.064***	-0.257***	-0.057***
	(0.058)	(0.015)	(0.075)	(0.013)	(0.046)	(0.010)

Difficulty hearing	0.081	0.021	-0.234***	-0.041***	-0.032	-0.007
	(0.067)	(0.017)	(0.085)	(0.015)	(0.053)	(0.012)
Age	1.002***	0.255***	1.211***	0.213***	1.038***	0.230***
	(0.049)	(0.013)	(0.59)	(0.011)	(0.037)	(0.008)
Marital status (Not married)	0.119***	0.030***	-0.387***	-0.068***	-0.048**	-0.008**
	(0.031)	(0.008)	(0.043)	(0.008)	(0.025)	(0.005)
No school education	-0.146	-0.037	0.026	0.005	-0.066	-0.012
	(0.229)	(0.058)	(0.285)	(0.050)	(0.179)	(0.040)
Primary school	-0.424***	-0.108***	-0.266***	-0.047***	-0.362***	-0.074***
	(0.064)	(0.016)	(0.073)	(0.013)	(0.048)	(0.011)
Secondary school	-0.220***	-0.056***	-0.110*	-0.019*	-0.177***	-0.036***
	(0.062)	(0.016)	(0.072)	(0.013)	(0.047)	(0.010)
Tertiary education (base category)						
Observations	**9,992**		**8,198**		**18,190**	

Note: The dependent variable is broad labour force participation. *** Significant at 1%, ** Significant at 5%, and * Significant at 10%.

The results for men show that epilepsy reduces the probability of broad labour force participation by 15%, followed by cancer by 12%; while diabetes and high blood pressure reduce the probability of labour force participation by 6% and 3% respectively. Concerning disability, all four types of disabilities have the expected signs and are statistically significant for men; while for women, only difficulty in hearing is statistically insignificant. For men, difficulty in cleaning reduces the probability of participating in the labour force by 17%, difficulty in remembering and hearing reduces the probabilities by 4% each, while difficulty in walking reduces labour force participation by 6%. These results are consistent with studies done in Ireland, Bulgaria, and Nigeria on the effects of disability on labour force participation (Gannon, 2005; Wolff, 2005; Remi *et al.*, 2020). The results for women are almost similar to those of men, with epilepsy showing a higher reduction in the broad labour force participation by 11% than the rest of other chronic conditions, followed by diabetes at 7% and respiratory disease at 6%. The results for women show that difficulty in cleaning reduces the probability of participating in the labour force by 24%, and difficulty in remembering and walking reduces the probabilities by 3% and 6% respectively.

Table 4.9 show the estimated effect of health on strict labour force participation. The majority of the disabilities related health outcomes have significant and negative relationships with strict labour force participation; except difficulty in remembering that is statistically insignificant. The results also show that only high blood pressure, cancer and epilepsy have a negative and significant association with strict labour force participation. Epilepsy was found to have a larger negative effect compared to other chronic illnesses. With respect to disabilities, having difficulties in cleaning has the

largest negative effect on labour force participation. The results for the male sample show that the majority of the reported disabilities have significant negative relationships with strict labour force participation; except difficulty in remembering which is statistically insignificant. As for women, only difficulty in cleaning and walking is statistically significant. The results for men also show that all chronic illnesses have a negative association with strict labour force participation, with only epilepsy, high blood pressure, and cancer having statistically significant relationships. Similar to the results of broad labour force participation, epilepsy and having difficulties in cleaning were found to have a larger effect compared to other chronic illnesses and disabilities. The results for women show that only high blood pressure and epilepsy are statistically significant. Again, epilepsy and having difficulties in cleaning were found to have a larger effect on women compared to other chronic illnesses and disabilities.

In terms of the other control variables, strict labour force participation rises with age for the entire sample and both male and female samples. Having completed primary and secondary school education negatively and significantly influence strict labour force participation for the entire sample and male sample. The results also show that the likelihood of labour force participation is lower for married men but higher for married women. There is a notable distinction between the results of strict and broad labour force participation. The magnitude of the effect of strict labour force participation is lower than that of broad labour force participation.

Table 4.9 Estimated effect of health on strict labour force participation

Women		Men		Entire sample	
Variables	Coefficient	Marginal Effects	Coefficient	Marginal Effects	Coefficient	Marginal Effects
Diabetes	-0.072	-0.024	-0.184	-0.043	-0.100	-0.029
	(0.117)	(0.039)	(0.146)	(0.034)	(0.091)	(0.026)
High blood pressure	-0.093**	-0.031**	-0.057	-0.013	-0.0893***	-0.026***
	(0.044)	(0.015)	(0.066)	(0.015)	(0.036)	(0.011)
Joint inflammation	-0.121	-0.041	-0.095	-0.022	-0.112	-0.033
	(0.119)	(0.040)	(0.142)	(0.033)	(0.092)	(0.027)
Cancer	-0.297	-0.100	-0.304	-0.071	-0.3128*	-0.092*
	(0.241)	(0.081)	(0.308)	(0.072)	(0.188)	(-0.092)
Cardiac / Heart disease	-0.138	-0.046	-0.083	-0.019	-0.139	-0.041
	(0.115)	(0.039)	(0.201)	(0.047)	(0.099)	(0.029)
Epilepsy	-0.562***	-0.191***	-0.887***	-0.208***	-0.678***	-0.199***
	(0.165)	(0.056)	(0.189)	(0.044)	(0.125)	(0.037)
Respiratory disease	-0.145	-0.049	-0.161	-0.038	-0.141	-0.041
	(0.119)	(0.040)	(0.172)	(0.040)	(0.098)	(0.029)
Stomach ulcer	0.177	0.059	0.249	0.058	0.180	0.053
	(0.273)	(0.092)	(0.421)	(0.099)	(0.224)	(0.067)
Chronic kidney disease	-0.083	-0.028	0.202	0.047	0.068	0.020
	(0.330)	(0.111)	(0.321)	(0.075)	(0.226)	(0.066)
Anaemia	-0.327	-0.110	0.485	0.114	-0.213	-0.062
	(0.242)	(0.082)	(0.592)	(0.139)	(0.219)	(0.064)
Difficulty cleaning	-0.721***	-0.243***	-0.847***	-0.199***	-0.825***	-0.242***
	(0.176)	(0.060)	(0.170)	(0.040)	(0.123)	(0.036)
Difficulty remembering	-0.023	-0.008	-0.155	-0.036	-0.069	-0.020
	(0.073)	(0.024)	(0.099)	(0.023)	(0.058)	(0.017)
Difficulty walking	-0.261***	-0.088***	-0.403***	-0.095***	-0.310***	-0.091***
	(0.061)	(0.021)	(0.074)	(0.017)	(0.047)	(0.014)

Difficulty hearing	-0.035	-0.012	-0.287***	-0.067***	-0.132***	-0.039***
	(0.069)	(0.023)	(0.084)	(0.020)	(0.053)	(0.016)
Age	1.757***	0.588***	1.667***	0.391***	1.667***	0.489***
	(0.058)	(0.021)	(0.59)	(0.015)	0.041	(0.013)
Marital status (Not married)	0.058**	0.020**	-0.026***	-0.076***	-0.066***	-0.019***
	(0.030)	(0.010)	(0.040)	(0.009)	(0.023)	(0.007)
No school education	-1.012***	-0.341***	-0.822***	-0.193***	-0.946***	-0.277***
	(0.290)	(0.098)	(0.268)	(0.063)	(0.197)	(0.058)
Primary school	0.767***	-0.258***	-0.493***	-0.116***	-0.612***	-0.179***
	(0.062)	(0.021)	(0.068)	(0.016)	(0.046)	(0.013)
Secondary school	-0.358***	-0.121***	-0.140**	-0.033**	-0.245***	-0.072***
	(0.060)	(0.020)	(0.068)	(0.016)	(0.045)	(0.013)
Tertiary education (base category)						
Observations	**9,992**		**8,198**		**18,190**	

Note: The dependent variable is strict labour force participation. *** Significant at 1%, ** Significant at 5%, and * Significant at 10%.

The results for the entire sample show that epilepsy significantly reduces the probability of strict labour force participation by 20%, followed by cancer by 9%; while high blood pressure reduces the probability of strict labour force participation by 3%. With respect to disabilities for the entire sample, difficulty in cleaning significantly reduces the probability of participating in the labour force by 24%, and difficulty in hearing and walking reduces the probabilities by 4% and 9% respectively. The results for men show that epilepsy significantly reduces the probability of strict labour force participation more than the rest of the chronic diseases by 21%. These results are consistent with existing literature, especially for diabetes which is discussed by (Schofield *et al.*, 2008) in their study of chronic disease and labour force participation among older Australians. The results for women are almost similar to those of men, with epilepsy showing a higher reduction in strict labour force participation than the rest of other chronic conditions by 19%.

With respect to disability, the majority of the disabilities have the expected signs and are statistically significant for men, except for difficulty in remembering; while for women, only difficulty in cleaning and walking are statistically significant. For men, difficulty in cleaning significantly reduces the probability of participating in the labour force by 20%, and difficulty in walking and hearing reduces the probability by 10% and 7% respectively. Evidence from other countries such as Ireland, Australia, and South Africa also supports the results of this study by finding a reduction in labour force participation among individuals living with disability (Gannon, 2005; Cai and Kalb, 2006; Nwosu, 2015). The results for women show that difficulty in cleaning reduces the probability of participating in the labour force by 24%, and difficulty in walking reduces the probability by 9% respectively. With respect to education, the

results for the entire sample and both men and women have a negative and significant effect on strict labour force participation. For example, relative to tertiary education, having completed primary and secondary education reduces the chance of participating in the labour market.

4.5 Summary of results

Poor health status entails reduced labour force participation because of the inability to fully engage in remuneration work. Consistent with previous studies (Mete and Schultz, 2007; Cai, 2010; Dogrul; Holt, 2010; Novingnon *et al*., 2015), this study ascertains an inverse relationship between health status and labour force participation in Namibia. This study further endorses the role of health status on labour force participation, suggesting that there is a positive and significant relationship between good health and labour force participation regardless of the estimator. Concerning the health variables, the estimation results indicated a negative association between health outcomes and labour force participation as suggested by the literature. In other words, the probability of labour force participation is higher the better the health status of the individual.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Summary of findings and conclusion

Individuals living with disabilities and those with chronic illnesses are faced with many barriers that hinder their full participation in the labour market. This study complements existing work on the relationship between health status and labour force participation in developing economies, using 2015/16 Namibia Household Income and Expenditure Survey (NHIES). The literature suggests strong evidence of the existing relationship between health status and labour force participation, particularly chronic illness, and disability. Research in this area is limited, particularly in developing African countries where the availability of data has hindered research in this area (Remi *et al.*, 2020; Novingnon *et al*., 2015). Evidence from these studies further highlights the positive relationship between good health and labour force participation. However, there is a need for country-specific studies for better policy options. The current study contributes to this literature by examining the effect of both chronic illness and disability on broad and strict labour force participation in a country where such evidence is scarce if any.

The estimation approach used in this study is the probit model. The analysis was disaggregated to assess the relationship between health status on labour force participation by gender. The study confirms that an increase in the prevalence of chronic illnesses such as diabetes, high blood pressure, joint inflammation, cancer, cardiac disease, epilepsy, respiratory disease, chronic kidney disease, and anaemia is significantly and negatively associated with both broad and strict labour force participation in Namibia. Additionally, the presence of disability types such as those with difficulty in cleaning, difficulty in walking, difficulty in remembering, and difficulty in hearing also has a significant negative impact on labour force

participation. The study has also shown that the association between chronic conditions/disabilities and broad/strict labour force participation varies with gender. Therefore, any policy option that improves the health status of individuals will enhance the level of labour force participation in general and can also narrow the gender inequality gap in labour force participation.

5.2 Recommendations

The findings of the study provide an overview of the relationship between health status and labour force participation at a micro level. The prevalence of chronic illnesses and disabilities reduces participation in the labour force, an additional burden to the already compressed labour market. Hence, knowledge of how different health conditions possibly affect labour market outcomes is needed to support policy interventions toward minimizing premature exit of individuals from the labour market due to illness.

In terms of policy implications, it might not be feasible to eliminate or fully treat chronic conditions or disabilities, especially in the short run, but encouraging and promoting social behavior change such as regular exercising, reducing cigarette smoking and alcohol intake, and maintaining healthy diets will promote health outcomes and increase labour force participation. Promoting healthy lifestyles may not only reduce the prevalence of chronic conditions but may also have a positive impact on other serious non-chronic illnesses that affect labour market outcomes. Although the study did not discuss in detail various treatment methods for the estimated health conditions, finding better advanced treatment methods that focus on deadly chronic conditions such as cancer would reduce ill health and increase labour force participation.

The Ministry of Health and Social Services in Namibia has taken numerous measures to manage and control the prevalence of communicable and non-communicable diseases in the country. Examples of specific strategies used by the Ministry of Health and Social Services, in collaboration with the World Health Organization (WHO) for the prevention and control of non-communicable diseases include but are not limited to the ban of advertising and display of tobacco products; heavy sin tax on alcoholic beverages, constant campaigns on the alcohol and drug abuse; promotion of exercising through the establishment of community parks with gym equipment; and health warnings on all alcohol and tobacco products. While such policies have been effective in promoting healthy behaviours, intensifying such intervention is essential in reducing the prevalence of chronic diseases, thereby enhancing labour force participation.

Other supporting policy frameworks include the National Multisectoral Strategic Plan for Prevention and Control of Non-Communicable Diseases in Namibia (2017/2018 – 2021/2022) and the WHO Global Action Plan for the Prevention and Control (2020-2030). However, implementation remains a challenge and there is a need to enforce implementation plans and strengthen monitoring and evaluation of the ongoing health programs. While community awareness programs and campaigns on the importance of detection, prevention, and treatment remain vital, a community-based health education strategy is required to enhance health education and promote healthy lifestyles (Hou *et al*., 2014). Tailored health programs that promote healthy lifestyle behaviours for both men and women are important. Hence, this study recommends gender-tailored health models that will cater to gender-specific needs, instead of a blanket approach. Finally, the Ministry of Information and Communication

Technology together with its private media partners should catalyse in information sharing and promote health education by proving the necessary information on good health practices.

5.3 Further research

A better understanding of the burden on economic performance and productivity as a result of the prevalence of chronic conditions and disabilities will motivate legislators to consider the need to intensify health promotion programs. The study could therefore be extended in several ways. Firstly, given that the focus of the study was only on the effect of health status on labour force participation, the study was not able to conduct a detailed analysis of the effect of health status on the country's economic performance and productivity. Therefore, future research should consider studying the relationship between health status and economic productivity in Namibia. Secondly, only four control variables were included in the study. It would be interesting to study more control variables such as ethnic race and fertility. Finally, there is a need to assess the relationship between communicable diseases and labour force participation in Namibia. To expand this analysis, other types of disabilities that could severely limit a person's daily life can also be included. Such studies will provide a holistic picture of the relationship between health and labour market outcomes in Namibia.

APPENDIX A: The correlation matrix of independent variables

	Broad_lfp	Chronic_ill	Sex	Diff_ cleaning	Diff_ remembering	Diff__walking	Diff_hearing	Marital status	Age	No_education	Primary	Secondary	Tertiary
Broad_lfp	1.000												
Chronic_ill	-0.151	**1.000**											
Sex	0.088	-0.093	1.000										
Diff_ cleaning	-0.162	0.096	-0.000	1.000									
Diff_ remembering	0.119	0.154	0.044	0.233	1.000								
Diff__walking	-0.184	0.232	-0.031	0.286	0.247	1.000							
Diff_hearing	0.096	0.119	-0.027	0.117	0.186	0.176	1.000						
Marital status	0.003	-0.122	-0.042	0.020	-0.008	-0.036	-0.039	1.000					
Age	0.326	-0.272	0.018	-0.149	-0.163	-0.303	-0.203	0.073	1.0000				
No_education	-0.025	0.030	-0.001	0.061	0.070	0.066	0.032	-0.007	-0.088	1.000			
Primary	-0.138	0.121	0.031	0.075	0.099	0.157	0.113	-0.055	-0.223	-0.042	1.000		
Secondary	-0.108	-0.126	-0.049	-0.072	-0.085	-0.139	-0.099	0.111	0.226	-0.072	-0.801	1.000	
Tertiary	-0.045	0.014	0.034	-0.012	-0.029	-0.030	-0.019	-0.098	0.004	-0.020	-0.221	-0.380	1.0

REFERENCES

Aaberge, R. and Colombino, U., 2014, *Labour supply models*. Emerald Group Publishing Limited.

Ahuru, R.R. and Akpojubaro, E.H., 2020, 'The effects of ill health and disabilities on labour force participation among Nigerian households', *Journal of Business and Economics*, vol. 5, no. 4, pp. 8-19

Alin, A., 2010, 'Multicollinearity', *Wiley Interdisciplinary Reviews: Computational Statistics*, vol. *5, no* .4, pp. 370-374.

Anson, O. and Anson, J., 1987, 'Women's health and labour force status: an enquiry using a multi-point measure of labour force participation', *Social Science* and *Medicine*, vol. 25, no. 1, pp.57-63.

Azcona, G. and Bhak, A., 2020, 'The impact of marriage and children on labour market participation'. ILOSTAT, retrieved from www.ilostat.ilo.org/data

Bakehe, N.P., 2022, 'Energy poverty: consequences for respiratory health and labour force participation in Cameroon', *Journal of Environmental Economics and Policy*, vol. 11, no. 3, pp.235-247.

Barro, R. J., 2013, 'Health and economic growth', *Annals of economics* and *finance*, vol. 14, no. 2, pp.329-366.

Bates, N., Callander, E., Lindsay, D. and Watt, K., 2018, 'Labour force participation and the cost of lost productivity due to cancer in Australia', *BMC Public Health*, vol. 18, no. 1, pp.1-7.

Belachew, T.A. and Kumar, A., 2014, 'Examining association between self-assessed health status and labour force participation using pooled NHS data'. *Canberra: ABS*.

Blackstone, E.A., Fuhr J.r. and Pociask, S., 2014, 'The health and economic effects of counterfeit drugs: American health and drug benefits', vol. 4, no. 3, p.216.

Bloom, D.E., Canning, D., Kotschy, R., Prettner, K. and Schünemann, J.J., 2019, 'Health and economic growth: reconciling the micro and macro evidence', *National Bureau of Economic Research*.

Bloom, D.E., Chatterji, S., Kowal, P., Lloyd-Sherlock, P., McKee, M., Rechel, B. *et al.*, 2015, 'Macroeconomic implications of population ageing and selected policy responses', *The Lancet*, vol. 3385, no. 9968, pp.649-657.

Bor, J., Herbst, A.J., Newell, M.L. and Bärnighausen, T., 2013, 'Increases in adult life expectancy in rural South Africa: valuing the scale-up of HIV treatment', *Science*, vol. 339, no. 6122, pp.961-965.

Bridges, S. and Lawson, D., 2008, *Health* and *labour market participation in Ug*and*a*, WIDER Discussion Paper.

Bubonya, M., Cobb-Clark, D.A. and Wooden, M., 2016, 'Mental health and productivity at work: Does what you do matter?', *Labour Economics*, vol. 46, pp.150-165.

Burdorf, A., Fernandes, R.C. and Robroek, S.J., 2023, 'Health and inclusive labour force participation', *The Lancet*, vol. 402, no. 10410, pp. 1382-1392.

Buse, A., 1982, 'The Likelihood Ratio, Wald, and Lagrange Multiplier Tests: An Expository Note'. *The American Statistician*, vol. 36, no. 3a, pp.153–157

Bushnik, T., Hennessy, D.A., McAlister, F.A. and Manuel, D.G., 2018, 'Factors associated with hypertension control among older Canadians', *Health Rep*, vol. 29, no. 6, pp.3-10.

Cai, L. and Kalb, G., 2006, 'Health status and labour force participation: evidence from Australia', *Health economics*, vol. 15, no. 3, pp.241-261.

Cai, L. and Lubitz, J., 2007, 'Was there compression of disability for older Americans from 1992 to 2003?'. *Demography*, vol. 44, no. 3, pp.479-495.

Cai, L., 2010, 'The relationship between health and labour force participation: evidence from a panel data simultaneous equation model', *Labour Economics*, vol. 17, no. 1, pp.77-90.

Case, A., Fertig, A. and Paxson, C., 2005, 'The lasting impact of childhood health and circumstance'. *Journal of Health Economics*, vol. 24, no. 2, pp.365-389.

Chow, C.K., Teo, K.K., Rangarajan, S., Islam, S., Gupta, R., Avezum, A., Bahonar, A., Chifamba, J., Dagenais, G., Diaz, R. and Kazmi, K., 2013, 'Prevalence, awareness, treatment, and control of hypertension in rural and urban communities in high, middle, and low-income countries'. *Jama*, vol. *310, no.* 9, pp.959-968.

Christians, F., 2020, 'Country profile–Primary healthcare and family medicine in Namibia', *African Journal of Primary Health Care and Family Medicine*, vol. 12, no.1, pp.1-3.

Clark, C., Smuk, M., Lain, D., Stanfeld, S.A., Carr, E., Head, J. and Vickerstaff, S., 2017, 'Impact of childhood and adulthood psychological health on labour force participation and exit in later life', *Psycological Medicine*, vol. 47, no. 9, pp. 1597-1608

Davis, K., Collins, S.R., Doty, M.M., Ho, A. and Holmgren, A.L., 2005, 'Health and productivity among US workers'. *Issue Brief,* vol. *856, no.* 856, pp.1-10.

Devaux, M. and Sassi, F., 2015, 'The labour market impacts of obesity, smoking, alcohol use and related chronic diseases'.

Dlodlo, N. and Hamunyela, S., 2017, 'The status of integration of health information Systems in Namibia'. *Electronic Journal of Information Systems Evaluation,* vol. 20, no. 2, pp.61-75.

Doğrul, H.G., 2015, 'The effects of health on labour force participation: evidence from Turkey', *International Journal of Economics* and *Finance*, vol. 7, no. 8.

Egoda, T.N., 2021, '*Two essays on regional differences in health outcomes of women and children: The role of female labour force participation'* (Doctoral dissertation, Queensland University of Technology).

Ekholuenetale, M., Wegbom, A.I., Edet, C.K., Joshua, C.E., Barrow, A. and Nzoputam, C.I., 2023, 'Impact of Chronic Diseases on Labour Force Participation among South African Women: Further Analysis of Population-Based Data', *World*, vol. 4, no. 1, pp.110-121.

Frijters, P., Johnston, D.W. and Shields, M.A., 2010, 'Mental health and labour market participation: Evidence from IV panel data models'.

Fu, R., Noguchi, H., Kaneko, S., Kawamura, A., Kang, C., Takahashi, H. *et al.*, 2019, 'How do cardiovascular diseases harm labor force participation? Evidence of nationally representative survey data from Japan, a super-aged society', *PloS One*, vol. 14, no. 7.

Gannon, B. and Nolan, B., 2004, 'Disability and labour force participation in Ireland'.

Gannon, B., 2005, 'A dynamic analysis of disability and labour force participation in Ireland 1995–2000'. *Health Economics,* vol. 14, no. 9, pp.925-938.

García-Gómez, P., von Gaudecker, H.M. and Lindeboom, M., 2011, 'Health, disability and work: patterns for the working age population', *International Tax* and *Public Finance,* vol. 18, no. 2, pp.146-165.

Gathergood, J., 2013, 'An instrumental variable approach to unemployment, psychological health and social norm effects', *Health Economics,* vol. 22, no. 6, pp.643-654

Golberstein E., 2018, 'The effects of income on mental health: Evidence from the social security notch'. *The Journal of Mental Health Policy* and *Economics, vol.* 18, no. 1, pp.27–37.

Guariguata, L., 2015, 'Prevalence and knowledge assessment of HIV and non-communicable disease risk factors

Gutiérrez-i-Puigarnau, E. and van Ommeren, J.N., 2010, 'Labour supply and commuting', *Journal of Urban Economics,* vol. 68, no. 1, pp.82-89.

Hanandita, W. and Tampubolon, G., 2014, 'Does poverty reduce mental health? An instrumental variable analysis', *Social Science* and *Medicine,* vol. 113, no. 1, pp.59-67.

Hanly, P.A. and Sharp, L., 2014, 'The cost of lost productivity due to premature cancer-related mortality: an economic measure of the cancer burden'. *BMC Cancer,* vol. 14, pp.1-10.

Harris, A., 2009, 'Diabetes, cardiovascular disease and labour force participation in Australia: an endogenous multivariate probit analysis of clinical prevalence data', *Economic Record,* vol. 85, no. 271, pp.472-484.

Hicks, J.R., 1946, *Value* and *capital, 1939: an inquiry into some fundamental principles of economic theory*, Oxford University Press, Oxford.

Hirth, R.A., Chernew, M.E., Turenne, M.N., Pauly, M.V., Orzol, S.M. and Held, P.J., 2003, 'Chronic illness, treatment choice and workforce participation'. *International Journal of Health Care Finance and Economics*, vol. 3, no. 3, pp.167-181.

Holt, H., 2010, '*Health* and *labour force participation'. Vol.* 10, no. 3. New Zealand Treasury Working Paper.

Hou, J., Zhou, W., Zhu, K. and Ren, X., 2023, 'The Impact of Labor Force Participation on Elderly Health in China', *In Healthcare*, vol. 11, no. 2, p. 160.

Husain, M.J., 2010, 'Contribution of health to economic development: a survey and overview', *Economics: The Open-Access, Open-Assessment E-Journal*, vol. *4*.

International Labour Organization, 2023, "Labour Force Statistics database (LFS)" ILOSTAT, retrieved from www.ilostat.ilo.org/data

International.

Jonkman, L.J., Tsuchihashi, K., Liu, E., Lates, J., Niaz, Q. and Rennie, T., 2020, 'Patient experiences in managing non-communicable diseases in Namibia'. *Research in Social* and *Administrative Pharmacy*, vol. 16, no. 11, pp.1550-1557.

Kalomo, E.N. and Liao, M., 2018, 'Burden of care among caregivers of persons living with HIV/AIDS in rural Namibia: Correlates and outcomes'. *Social work in public health*, vol. 33, no. 1, pp.70-84.

Kalwij, A. and Vermeulen, F., 2008, 'Health and labour force participation of older people in Europe: what do objective health indicators add to the analysis?'. *Health Economics*, vol. 17, no. 5, pp.619-638.

Kim, I.H., 2011, ‘Age and gender differences in the relation of chronic diseases to activity of daily living (ADL) disability for elderly South Koreans: based on representative data’. *Journal of Preventive Medicine* and *Public Health*, vol. 44, no. 1, pp.32-40.

King, T.L., Taouk, Y., LaMontagne, A.D., Maheen, H. and Kavanagh, A.M., 2021, ‘Gendered associations between household labour force participation and mental health using 17 waves of Australian cohort data’. *Social Psychiatry and Psychiatric Epidemiology*, vol. 56, pp.1035-1047.

Lawana, N., Booysen, F., Tsegaye, A., Kapingura, F.M. and Hongoro, C., 2020, ‘Lifestyle risk factors, non-communicable diseases and labour force participation in South Africa’, *Development Southern Africa*, vol. 37, no. 3, pp.446-461.

Levinsohn, J., McLaren, Z.M., Shisana, O. and Zuma, K., 2013, ‘HIV status and labor market participation in South Africa’, *Review of Economics* and *Statistics*, vol. 95, no. 1, pp.98-108.

Manthorpe, J., 2021, ‘Women and employment in later life: the impact of long-term health conditions on labour market participation’, *Working with Older People*, vol. 25, no. 4, pp.304-315.

McPake, B., Maeda, A., Araújo, E.C., Lemiere, C., El Maghraby., A. and Cometto, G., 2013, ‘Why do health labour market forces matter?’, *Bulletin of the World Health Organization*, vol. 9, no. 1, pp.841-846.

Mete, C. and Schultz, T.P., 2007, ‘Health and labour-force participation of the elderly in Taiwan’. *Allocating public* and *private resources across generations*, pp.163-200. Springer, Dordrecht.

Ministry of health and Social Services, 2018, "National Multisectoral Strategic Plan for Prevention and Control of Non-Communicable Diseases (NCDs) in Namibia 2017/2018-2021/22", retrieved from www.afro.who.int/sites/default/files/2019-04/Namibia%20NCDs%20Multisectoral%20Strategic%20Plan%20FINAL_For_PRINT_2018.pdf

Mohammed, O.A., Njiforti, P.P. and Rafindadi, S.A., 2020, 'Analysis of the impact of reproductive health outcome on women labour force participation and earnings in Nigeria', *International Journal of Educational Research*, vol. 8, no. 1, pp.93-116.

Moreira, J.P.D.L., Moraes, J.R.D. and Luiz, R.R., 2013, 'Prevalence of self-reported systemic arterial hypertension in urban and rural environments in Brazil: a population-based study'. *Cadernos de Saúde Pública*, vol. 29, no. 1, pp.62-72.

Mufune, P., 2013, 'Factors affecting women's participation in Namibia's workforce: evidence from the 2009/10 Namibia households incomes and expenditure Survey', *International Journal of Business* and *Management*, vol. 8, no. 22, p.40.

Mussida, C. and Patimo, R., 2023, 'Care, labour force participation and health: the case of Italy'. *International Journal of Manpower*, vol. 44, no. 9, pp.91-107.

Mushtaq, A., Mohsin, A. and Zaman, K., 2013, 'Effects of health on changing labor force participation in Pakistan'. *Springerplus*, vol. *2*, pp.1-10.

Nakale, S., 2016, 'Determinants of Economic growth in Naimbia'. Namibia Planning Commission working papers

Namibia Statistics Agency, 2016, 'Namibia Household Income and Expenditure Survey 2015/16 Report, Namibia Statistics Agency, Windhoek.

Namibia Statistics Agency, 2017, 'Namibia Labour Force Survey 2016 Report', Namibia Statistics Agency, Windhoek.

Ndishishi, A., 2014, Namibia Demographic and Health Survey 2013. *Namibia Demographic* and *Health Survey 2013.*

Novignon, J., Nonvignon, J. and Arthur, E., 2015, 'Health status and labour force participation in Sub- Saharan Africa: a dynamic panel data analysis', *African Development Review,* vol. 27, no. 1, pp.14-26.

Nwosu, C.O. and Woolard, I., 2017, 'The impact of health on labour force participation in South Africa', *South African Journal of Economics,* vol. 85, no. 4, pp.481-490.

Nwosu, C.O., 2015, 'An analysis of the relationship between health and the labour market in South Africa.

Oksanen, T. and Virtanen, M., 2012, 'Health and retirement: a complex relationship', *European Journal of Ageing*, vol. 9, no. 3, pp.221-225.

Organisation for Economic Co-operation and Development., 2012, '*Sick on the job?: myths* and *realities about mental health* and *work,* Paris, OECD Publishing.

Osundina, O.A., 2020, 'Sustainable development: Does improvement in education and health of women improve female labour force participation rate?', *Sustainable Development*, vol. 28, no. 1, pp.13-24.

Pawłowska-Cyprysiak, K., 2015, 'Self-perceived quality of life of people with physical disabilities and labour force participation', *International Journal of Occupational Safety* and *Ergonomics,* vol. 19, no. 2, pp. 185-194, DOI:10.1080/10803548.2013.11076977

Poças, A.I., 2013. ‘Human capital dimensions–education and health–and economic growth’.

Pope III, C.A. and Dockery, D.W., 2006, ‘Health effects of fine particulate air pollution: lines that connect’. *Journal of the air* and *waste management association*, vol. 56, no. 6, pp.709-742.

Prasad, S., Sung, B. and Aggarwal, B.B., 2012, ‘Age-associated chronic diseases require age-old medicine: role of chronic inflammation’. *Preventive medicine*, vol. 54, pp.S29-S37.

Remi, R.A., Daniel, O. and Efegbere, H.A., 2020, ‘What role does health play in enhancing labour productivity in Nigeria?’, *Academic Journal of Economic Studies*, vol. 6, no. 2, pp.102-111.

Schofield, D.J., Shrestha, R.N., Passey, M.E., Earnest, A. and Fletcher, S.L., 2008, ‘Chronic disease and labour force participation among older Australians’, *Medical Journal of Australia*, vol. 189, no. 8, pp.447-450.

Schofield, D.J., Shrestha, R.N., Percival, R., Passey, M.E., Callander, E.J. and Kelly, S.J., 2013, ‘The personal and national costs of lost labour force participation due to arthritis: an economic study’. *BMC Public Health*, vol. 13, pp.1-10.

Sienaert, A., 2008,’ The labour supply effects of the South African state old age pension: theory, evidence and implications’.

Silvaggi, F., Leonardi, M., Raggi, A., Eigenmann, M., Mariniello, A., Silvani, A. *et al.*, 2020, ‘Employment and work ability of persons with brain tumors: a systematic review’, *Frontiers in Human Neuroscience*, vol. 14, p.452.

Slopen, N., Non, A., Williams, D.R., Roberts, A.L. and Albert, M.A., 2014 'Childhood adversity, adult neighborhood context, and cumulative biological risk for chronic diseases in adulthood'. *Psychosomatic medicine*, vol. 76, no. 7, p.481.

Stern, N., 1986, 'On the specification of labour supply functions', *Unemployment, Search* and *Labour Supply*, pp.143-189.

The Namibia Ministry of Health and Social Services (MoHSS)., 2014, '*The Namibia Demographic* and *Health Survey 2013',* Windhoek, Namibia, and Rockville, Maryland, USA

Trevisan, E. and Zantomio, F., 2016, 'The impact of acute health shocks on labour supply of older workers: Evidence from sixteen European countries, *Labour Economics*, vol. 43, pp. 171-185.

Tunceli, K., Bradley, C.J., Nerenz, D., Williams, L.K., Pladevall, M. and Elston Lafata, J., 2005, 'The impact of diabetes on employment and work productivity'. *Diabetes care*, vol. 28, no. 11, pp.2662-2667.

Umoru, D. and Yaqub, J.O., 1987, 'Labour productivity and health capital in Nigeria: the empirical evidence', *World*, pp.1995-2007.

Van Hedel, K., Van Lenthe, F.J., Avendano, M., Bopp, M., Esnaola, S., Kovacs, K., Martikainen, P., Regidor, E. and Mackenbach, J.P., 2015, 'Marital status, labour force activity and mortality: a study in the USA and six European countries'. *Scandinavian Journal of Public Health*, vol. 43,no. 5, pp.469-480.

Varekamp, I., van Dijk, F.J.H. and Kroll, L.E., 2013, 'Workers with a chronic disease and work disability', *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz*, vol. 56, no. 3, pp.406-414.

Victora, C.G., Adair, L., Fall, C., Hallal, P.C., Martorell, R., Richter, L. *et al.,* 2008, 'Maternal and child undernutrition: consequences for adult health and human capital'. *The Lancet*, vol. 371, no. 9609, pp.340-357.

Waenerlund, A.K., Gustafsson, P.E., Hammarström, A. and Virtanen, P., 2014, 'History of labour market attachment as a determinant of health status: a 12-year follow-up of the Northern Swedish Cohort'. *BMJ open*, vol. 4, no. 2.

Ward, B.W., 2015, 'Multiple chronic conditions and labor force outcomes: a population study of US adults. *American Journal of Industrial Medicine*, vol. 58, no. 9, pp.943-954.

Weil, D.N., 2014, 'Health and economic growth', *H*and*book of Economic Growth,* vol. 2, pp. 623-682.

Wolff, F.C., 2005, 'Disability and labour supply during economic transition: evidence from Bulgaria', *Labour*, vol. 19, no. 2, pp.303-341.

World Health Organization, 2018, 'Non-communicable Diseases (NCD): Country Profiles'.

Zhang, X., Zhao, X. and Harris, A., 2009, 'Chronic diseases and labour force participation in Australia', *Journal of Health Economics*, vol. 28, no. 1, pp.91-108.

UNAM

ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: DEC FOC/24/02/ 05 Date: **06/03/2024**

This Ethical Clearance Certificate is issued by the University of Namibia Ethics Committee (REC) in accordance with the University of Namibia's Research Ethics Policy and Guidelines. Ethical approval is given in respect of undertakings contained in the Research Project outlined below. This Certificate is issued on the recommendations of the ethical evaluation done by the ethics committee.

Title of Project: ESTIMATING THE RELATIONSHIP BETWWEN HEALTH STATUS AND LABOUR FORCE PARTICIPATION IN NAMIBIA

Student: Mr. SAARI SIMON

Student Number: 201204987

Supervisor(s): Dr. Alfred Mukong

Centre for Research Services

Take note of the following:

1. Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the ethics committee. An application to make amendments may be necessary.
2. Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the ethics committee
3. The Principal Researcher must report issues of ethical compliance to the ethics committee (through the Chairperson) at the end of the Project or as may be requested by the ethics committee
4. The ethics committee retains the right to:

i) Withdraw or amend this Ethical Clearance if any unethical practices (as outlined in the Research Ethics Policy) have been detected or suspected,

ii) Request for an ethical compliance report at any point during the course of the research.

The ethics committee wishes you the best in your research.

Precious Mushendami (Decentralized Research Ethics Committee)

Prof. Davis Mumbengegwi (Head, Multidisciplinary Research)