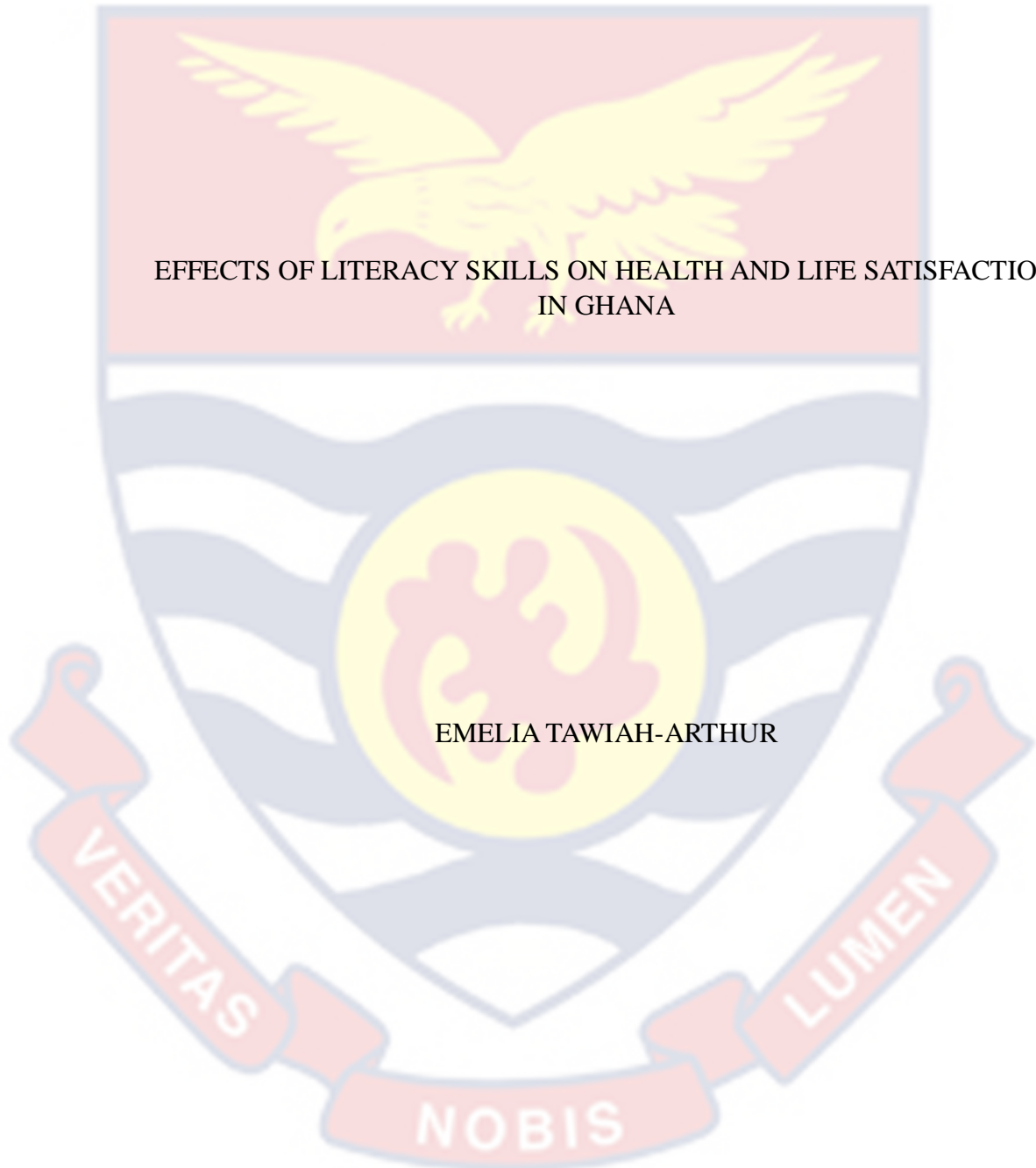UNIVERSITY OF CAPE COAST

COLLEGE OF HUMANITIES AND LEGAL STUDIES

SCHOOL OF ECONOMICS

EFFECTS OF LITERACY SKILLS ON HEALTH AND LIFE SATISFACTION
IN GHANA

EMELIA TAWIAH-ARTHUR

2023

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BY

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fulfillment of the requirements for the award of Master of Philosophy degree in
Economics.

MAY, 2023

DECLARATION

I hereby declare that this thesis is the result of my own original research work and that no part of it has been presented for another degree in this university or elsewhere.

Signature:…………………………..   Date:…………………………….

Name: Emelia Tawiah-Arthur

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature………………………… Date…………………

Mr. Kwabena Nkansah Darfor

Co-Supervisor's Signature………………….……… Date……………………

Dr. Jacob Nunoo

ABSTRACT

A healthier and well satisfied population is a very important component for the sustainable development of a country. Yet, high growing rates of overweight and obesity accompanied with widespread development of chronic illness are alarming health problems being encountered world-wide particularly in countries which are developing. Due to these health issues, the level at which individuals are satisfied with life may be affected. The main objective of this study is to establish the relationship between education and health outcomes and life satisfaction. The study also aims to find out if literacy skills is a better measure of education which helps improve the health and life satisfaction of individuals. Data from The World Bank STEP Skills Measurement Household Survey Wave 2 conducted in 2013 among adults between 15 and 64 years was used for the analysis of the study. Our sample includes 1735 respondents who have valid data on health and wellbeing indicators for Wave 2, as well as complete information on the other control variables used the analysis. Inferential statistics involving ordered logistic regression models and Lewbel IV regression were carried out to examine the relationship between. In the analysis for the full sample, literacy skills is a significant determinant of BMI and chronic illness but not life satisfaction. Age is an important determinant of BMI, chronic illness and life satisfaction whilst there were no important underlying differences for both chronic illness and life satisfaction.

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KEYWORDS

DEDICATION

To the entire Dadson and Tawiah-Arthur Family.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

WHO	World Health Organisation
NCDs	Non-Communicable Diseases
SDGs	Sustainable Development Goals
BMI	Body Mass Indexta
SSA	Sub-Sahara African
OECD	Organisation for Economic Co-operation and Development
GSS	Ghana Statistical Service
ESP	Education Strategic Plan
PHC	Population and Health Census
UNHESCO	United Nations Educational, Scientific and Cultural Organization
FCT	Fundamental Cause Theory
SES	Socioeconomic Status
IV	Instrumental Variables
STEP	Skills Towards Employment and Productivity
HCT	Human Capital Theory
SRH	Sexual Reproductive Health
HIV	Human Immunodeficiency Virus
WECS	Work Environment Cohort Study
AIDS	Acquired Immunodeficiency Syndrome
HILDA	Household Income and Labour Dynamics in Australia
CDA	Cognitive Decision Ability
MICS	Multiple Indicator Cluster Survey
PIAAC	Program for the International Assessment of Adult Competencies
LISS	Longitudinal Internet Studies for the Social Sciences
TSLS	Two Stage Least Squares
GMM	Generalized Method of Moments
FSTAGE	First Stage

CHAPTER ONE

INTRODUCTION

Introduction

This first chapter of the study provides the background of the study, identifies the statement of the problem, explains the main objective, the significance, the scope and the limitations of the study.

Background of the Study

The sustainable development of any economy can be improved if the population of that economy seek to ensure healthy and satisfied lives at all ages. The World Health Organization (WHO) defines health as "a state of complete physical, mental, and social wellbeing" in its 1946 constitution, indicating that it refers to more than just the absence of disease. As a result, improving health necessitates consideration of all three areas (WHO, 2022). Elflein (2022) indicates that although there have been recent improvements in technology and medicine that have improved overall health and life expectancy around the globe, there are still significant disparities in health and access to healthcare due to differences in affluence and geography.

The prevalence of overweight and obesity is a growing health problem globally as WHO (2022) indicates that more than 1 billion of the world population is suffering from this health problem where 39 million are children, 340 million are adolescents and 650 million are adults. While sustainable development goal 3 emphasizes the importance of promoting general health and well-being, it does not explicitly address the issue of obesity. This omission

1

reduces the chances of receiving development assistance. The SDGs which are clearly linked to obesity are 3.4: by 2030, reduce by one-third premature mortality from non-communicable diseases (NCDs) through prevention and treatment and promote mental health and well-being and 2.2: by 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons.

Initially, overweight and obesity were prevalent in developed countries, while underweight was more common among young individuals in sub-Saharan Africa (SSA). However, there has been a recent increase in obesity among adults in SSA countries. There are several factors that contribute to the growing number of people with obesity, such as insufficient physical activity, leading a sedentary lifestyle, and consuming diets that are rich in sugar and refined carbohydrates. Additionally, genetic, endocrine, metabolic, and environmental factors also play a role in the increasing rates of obesity. A comprehensive survey conducted in Ghana in 2021 found that 53% of Ghanaians are obese, as about 45% are neither physically active nor consume healthy diets (Agyemang, 2022).

The Body Mass Index (BMI) is commonly utilized as a measure for evaluating an individual's nutritional status. It is calculated using the height and weight of an individual and can be divided into four categories namely; underweight, normal weight, overweight and obesity with each category being associated with different health conditions. As stated by Kitahara, Flint, Bernstein *et al* (2014), obesity increases the risk of early age mortality resulting from

2

diseases such as heart disease, liver disease, stroke, cancer and diabetes. That is to say, compared to those of normal weight, people who are extreme obese witness a considerable decrease in life expectancy. Individuals with the body mass index between 40 and 44.9 are at risk of losing 6.5 years of their life span whilst those between 55 and 55.9 are at risk of losing about 13.7 years of their life span.

Better Health channel (2022) states that obesity plays a very significant role in the development of many chronic health conditions especially cardiological and endocrinological which includes gallbladder disease, hypertension, type 2 diabetes, chronic liver disease, coronary heart disease, stroke, pancreatitis, and respiratory problems and cancers. It is important for people suffering such health conditions to have knowledge of the type of diseases they are suffering from in order to aid in their effective management. Lack of knowledge on the prevention and management of such health conditions is likely to lead to poor health and poor health may lead to low life satisfaction.

Life satisfaction which is closely associated with health and subjective well-being describes the holistic complete assessment of life and measures the subjective cognitive evaluation by individuals regarding their lives (Ackerman, 2018). Cantril (1965) developed an eleven-rung ladder to measure life satisfaction. On this ladder, the least number on the ladder which is 0 indicates how lowest that an individual can be satisfied and the highest number which is 10 indicates the highest that an individual can be satisfied in life. People who indicated they stand at the top of the Cantril (1965) ladder of life satisfaction are said to be very satisfied in life (OECD, 2016). The World Happiness Report

3

which published in 2023 indicates that the life satisfaction of Ghana has dropped to 4.61 in 2022 from 4.87 in 2021.

Despite the complexity of the factors that contribute to life satisfaction, a report by OECD indicated that life satisfaction can be influenced by social and emotional skills, many of which are learned in schools but also come from family and cultural environments. These abilities may therefore contribute to bettering the economic and social results of education, such as decreased unemployment rates, increased incomes, improved health, and increased civic and political involvement. These economic and social results have positive influence on the well-being of individuals (OECD, 2015).

The global health inequalities are also greatly influenced by education as education is seen to be a good determinant of health in many countries around the globe. Global health inequalities can only be reduced when the individuals have proper understanding of the health benefits of education. Research done at both the country-specific level (Kim, 2016; Viner, 2016) and international level (Michaud, Goldman, Lakdawalla, Gailey & Zheng, 2011; Rahupathi & Rahupathi, 2020) have consistently found a link between education and health, although the strength of this relationship varies. There is, however, a persistent issue with these studies, which is the issue of endogeneity. Due to the possibility that education may be endogenous, observational research evaluating relationships between health and education cannot be causally interpreted. First, earlier health endowments may have a lasting impact on both schooling and health. Second, unobserved variables, such as time preferences, genetic makeup

4

and family history have potential effect on both education and health (Fonseca, Michaud & Zheng, 2020).

Literacy skills is a significant gateway to academic achievement, hence, an important component and a key measure of education. It has been noted to have significant influence on various aspect of life including but not limited to earnings, health and wellbeing. Education being an important component in development is aimed by the United Nations as part of their sustainable development goals to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all by 2030". The SDG 4 aims to improve the literacy skills by ensuring that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes by 2030 and ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy by 2030 as quoted as the 4,1 and 4.6 target outcomes. The OECD Survey of Adult Skills 2013 defines literacy skills as "the ability to understand, evaluate, use and engage with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential" (OECD, 2013: pp 59)

According to Smith-Greenway (2015), many studies use educational attainment as a proxy for adults' literacy, as it is assumed to be a reliable indicator of literacy skills. The assessment of education quality, which encompasses cognitive, social, and moral abilities, is frequently disregarded despite its pivotal role in cultivating a highly competent labor force. A basis to assess the functional capabilities of individuals is to use their cognitive skills such as literacy and

5

numeracy skills as these basic skills are considered as better measures of education (Smith-Greenway, 2015).

In contrast to developed countries where literacy skills can be assumed based on educational achievements, SSA faces the challenge of a substantial number of individuals who have completed schooling but possess limited literacy skills. Based on a report from the Ghana Statistical Service (GSS) in 2022, Ghana still has lower adult literacy rates compared to other countries in the lower middle income and SSA regions. This is despite the implemented measures outlined in the Education Strategic Plan (ESP) for the period 2018-2030 to address illiteracy. A total of 7.9 million individuals in Ghana, aged 6 years and older, lack literacy skills, meaning they are unable to read and write with comprehension. Out of this number, 4.6 million are females and 3.3 million are males, highlighting a consistent gender disparity favoring females. Also, there has been an increase of 1.2 million illiterate adults (aged 15 years and older) in the population between the 2010 and 2021 Population and Housing Censuses (PHC), bringing the total number of illiterate adults to 5.5 million in 2021, up from 4.3 million in 2010.

Basili (2011) suggests that, the term "literacy" can be described as an education indicator and how effective an educational system is. A significant proportion of literacy skills implies that a country's education system offers its population the chance to acquire essential foundational skills (Zua, 2020). Given that literacy skills is a desirable result of early education and one of the prerequisites for effective and independent learning in adulthood, it has a significant impact on educational access and perseverance.

High levels of literacy skills across society are important contributing factors for individuals to healthy, happy and fulfilling lives (Morrisroe, 2014). OECD (2016) reported that individual decisions about diet and lifestyle which impact a population's health outcomes is influenced by knowledge and literacy skills. Based on the report, individuals who have attained a high level of education and possess proficient literacy skills reported 33 percent better health outcomes in comparison to those with lower education levels and poor literacy skills. In particular, studies (Wagner, Semmler, Good, & Wardle, 2009; Davis, Wolf, Bass, Thompson, Tilson, Neuberger *et al*., 2006; Schillinger, Barton, Karter, Wang & Adler, 2006) investigating the connection between literacy skills and health have centered on people's capacity to read and understand complex and difficult texts necessary to operate the health systems, correctly treat themselves using prescribed medication and adhere to general health guidelines and advice. The studies have shown that individuals who struggle to comprehend health information have poorer health outcomes. In other words, a population with higher literacy skills is also a population that experiences better health and longer life expectancy. In addition, higher reliance on emergency care, higher BMI and lower life satisfaction are all adversely affected by lower literacy skills (Berkman, Sheridan, Donahue, Halpern & Crotty, 2011).

Life satisfaction has also been identified to be positively associated with education according Gallup World Poll data. On th average, 92 percent of tertiary educated adults across OECD countries were satisfied in life as at 2015 compared to 83 percent of upper and post-secondary educated adults. Individuals with lower

literacy skills are highly likely to report poorer health and experience greater social isolation (OECD, 2016). Similar to levels of education, literacy skills has a very significant impact on overall life satisfaction of individuals. Literacy skills does not only influence the reading, writing and understanding abilities of individuals, it also affects the day-to-day interactions of individuals with others, which lead higher self-esteem and social inclusion there by increasing the life satisfaction of the individuals.

This study establishes the relationship between literacy skills, health and life satisfaction amongst working groups in Ghana. The study examines how literacy skills influences body mass index, chronic illness and life satisfaction of individuals and why literacy skills is a better measure of education.

Statement of the problem

Numerous studies conducted in different countries consistently affirm the association between education, physical health, and life satisfaction. The research consistently indicates that education is a vital factor in shaping an individual's health and overall sense of well-being (MacDonald, Arpin & Quesnel-Vallee, 2022). The education system in Africa is marked by frequent absenteeism, a lack of high-quality schools and delayed school enrollment, and insufficient resources. According to UNESCO (2022), in 2018, there were 207 million children attending schools in sub-Saharan Africa. Although this indicates a high level of participation, the rates of completion are still low, with only 69 percent finishing primary school and only 44 percent completing lower secondary school.

8

Based on a report released by the Ministry of Education in 2020, UNESCO (2022) states that significant educational reforms, such as the implementation of free senior high school and the ground-breaking 'one teacher, one laptop' program pursued since 2017, have led to a 77% completion rate for primary school children. Although there has been some improvement, the report indicates that there are still notable obstacles in terms of the quality of education. It reveals that a significant proportion, around 80%, of children are still deficient in fundamental literacy skills upon completing primary school. This problem is attributed to the unequal distribution of education throughout the country, with public schools in disadvantaged and rural areas bearing the brunt of insufficient resources. The acquisition and enhancement of literacy skills can be viewed as empowering individuals to attain favorable outcomes in multiple facets of adulthood, including health, satisfaction with life, employment, and participation in society.

The association between education, health and life satisfaction is still subject to certain degree of scrutiny as there is a large body of literature that has proven this relationship. Yet the health and life satisfaction salience of the basic component of education which is literacy skills has not been well examined in Africa. There has been minimal research on whether literacy skills impact health and life satisfaction in Africa since, with few exceptions, poor literacy levels are a common aspect of Africa's educational systems. Individuals with low literacy skills are more likely to engage less in activities that promote health and detect diseases, have higher rates of smoking, experience more work accidents, struggle

9

to manage chronic diseases, have poor adherence to medication, experience more hospitalizations, have increased morbidity and are less likely to be satisfied with life.

Smith-Greenway (2015) argues that when measuring education, educational attainment is a poor substitute for literacy skills, since some individuals with no years of schooling can read while others with several years of schooling have been observed not to be proficient or cannot read at all. Focusing less on literacy skills prevents the population of Ghana from getting the full health benefits of education. It is therefore important to examine how actual literacy skills impact the health status and life satisfaction of individuals especially in a developing country like Ghana.

With the persistent rise in the prevalence of obesity and chronic illness in Ghana over the years, employing BMI and chronic illness to measure health is appropriate. BMI which gauges whether the weight of an individual is in healthy proportion to the height and determines any health risks that may be faced outside of the healthy range (For Health Group, 2022). Smith, Chu, Smith, Boyko, Hopper, *et al.,* (2008) suggested that chronic conditions are a more relevant measure of reporting health because early diagnosis would persist into adulthood, be documented in healthcare databases, and thus be consistent with self-report. Life satisfaction in Ghana on the other hand has been low compared to other countries in the world. In 2022, the value of life satisfaction in Ghana is 4.61 which is less than the world average value of 5.54 based on 134 countries.

10

Just a few studies have been done to establish the relationship between education and health (BMI and chronic illness) and life satisfaction in Ghana. These studies examined the relationship between maternal education and child health (Niels-Hugo, 2003; Agyeman, 2013); levels of education and BMI (Tetteh, Yawson, Biritwum, Mensah, Minicuci, Naidoo, *et al.,* 2022) yet none of these studies employed literacy skills as a measure of education.

In order to address this gap, this study introduce a new measure for education as its contribution in deepening our knowledge of the link between education and health outcomes. In doing this, the study explores the robustness of literacy skills as a measure of education. In addition, the study explores the relationship between literacy skills and disaggregated health outcomes and life satisfaction using the Ghana STEP measurement survey.

Purpose of the Study

The purpose of this study is to examine the relationship between literacy skills and the health and life satisfaction of working adults in Ghana.

Objectives of the Study

The following objectives were formulated;

1. To identify the levels and dimensions of literacy skills in Ghana.

2. Examine the relationship between literacy skills and health outcomes in Ghana.

3. Examine the relationship between literacy skills and life satisfaction in Ghana.

11

Research Hypotheses

H_0: There exists no effect of literacy skills on Body Mass Index (BMI).

H_0: There exists no relationship between literacy skills and the chronic illness statuses.

H_0: There exists no effect of literacy skills on life satisfaction.

Significance of the Study

In reviewing the literature, relatively scarce studies address the influence of literacy skills on the various aspects of health of working adults in Ghana. Specifically, virtually no studies have delved into the impact of literacy skills on the physical health and life satisfaction of urban working Ghanaians. In this regard, this study determines whether literacy skills influence adults' health and life satisfaction, net of their educational levels and other confounding factors. It also influences programs and policies that support literacy skills acquisition in school and work in order to improve health-related outcomes and life satisfaction. In the context of literature, this study contributes to the debate as to which indicator best measures education.

Scope of the Study

The study attempts to examine the relationship between literacy skills, health outcomes and life satisfaction of working adults in Ghana. The data used for this study covered information from both individual and household levels located in the urban part of Ghana. This study relies on micro-level secondary data from Skills Towards Employability and Productivity (STEP) measurement Household Survey Wave 2 which was conducted by World Bank in 2013. The

study basically examines at quantitative measures of the relationship between literacy skills and health and life satisfaction among working adults aged between 15 to 64 years. The time frame of the study was chosen largely for data availability and to represent the current situation of literacy skills in Ghana, as well as their relationship with health and life satisfaction.

Limitations of the study

The limitations of the present study relate to the use of self-report methodology as the data used for this study employed the self-report methodology. That is, individuals have a tendency to give inaccurate information about their height and weight, therefore using self-reported data could potentially cause bias in the findings. Self-report bias may differ among individuals with different levels of literacy skills, although there isn't any conclusive evidence.

Another limitation is the occurrence of incomplete responses and inaccuracies in data lead to a lot of missing values. There is therefore insufficient information about the variables which serve as the determinants of body mass index and levels of satisfaction of men and women in. This led to the usage of just a small percentage of the total population being used as sample size and may not give a true reflection. This could also restrict the applicability of the findings and lead to potential limitations in statistical power, accuracy, and the ability to make conclusive statements.

Also, the data for the study was collected in 2013 and this study being in 2023 means the data is old. The findings of this study may not predict the true

13

reflection of the effects of literacy skills on health and life satisfaction as a lot of policies have implemented with this 10-year period to improve literacy skills in Ghana.

Furthermore, the study adopted the cross-sectional design. The use of cross-sectional has restrictions the ability to evaluate trends and determine the relationships between various determinants and health outcomes and life satisfaction.

Finally, due to the reliance on higher order moments in the Lewbel (2012) method, the instrumental variable (IV) estimations may not be as reliable as those obtained using robust conventional IVs. The reliability of the results cannot be verified when there are no strong conventional IVs available to compare the results with, as is the case with our sample.

Organisation of the Study

The study seeks to examine the effects of literacy skills on physical health and life satisfaction among working adults in Ghana and it has been organized into six chapters. The first chapter discusses the introduction and background to the study, the statement of the problem and the research hypotheses. It also states the specific purpose of the study as well as the significance and the scope of the study. Finally, it outlines the organization of the study.

The second chapter reviews the theoretical and empirical literature on the subject at hand. Education-health theories such as the Fundamental Cause Theory, Human Development Theory, and Grossman model has been explained in

14

theoretical literature section. Previous research on education, literacy skills, and several aspects of health has been examined in the empirical literature section. The third chapter discusses the methodology of the study. It describes in detail the research design, research approach, theoretical and empirical model specification, estimation technique and the type of data used in the data analysis.

The fourth chapter presents results, analysis of the data and discussion of the study. The study is concluded in the fifth chapter with a summary of the key findings, conclusions, and policy implications or recommendations based on the findings.
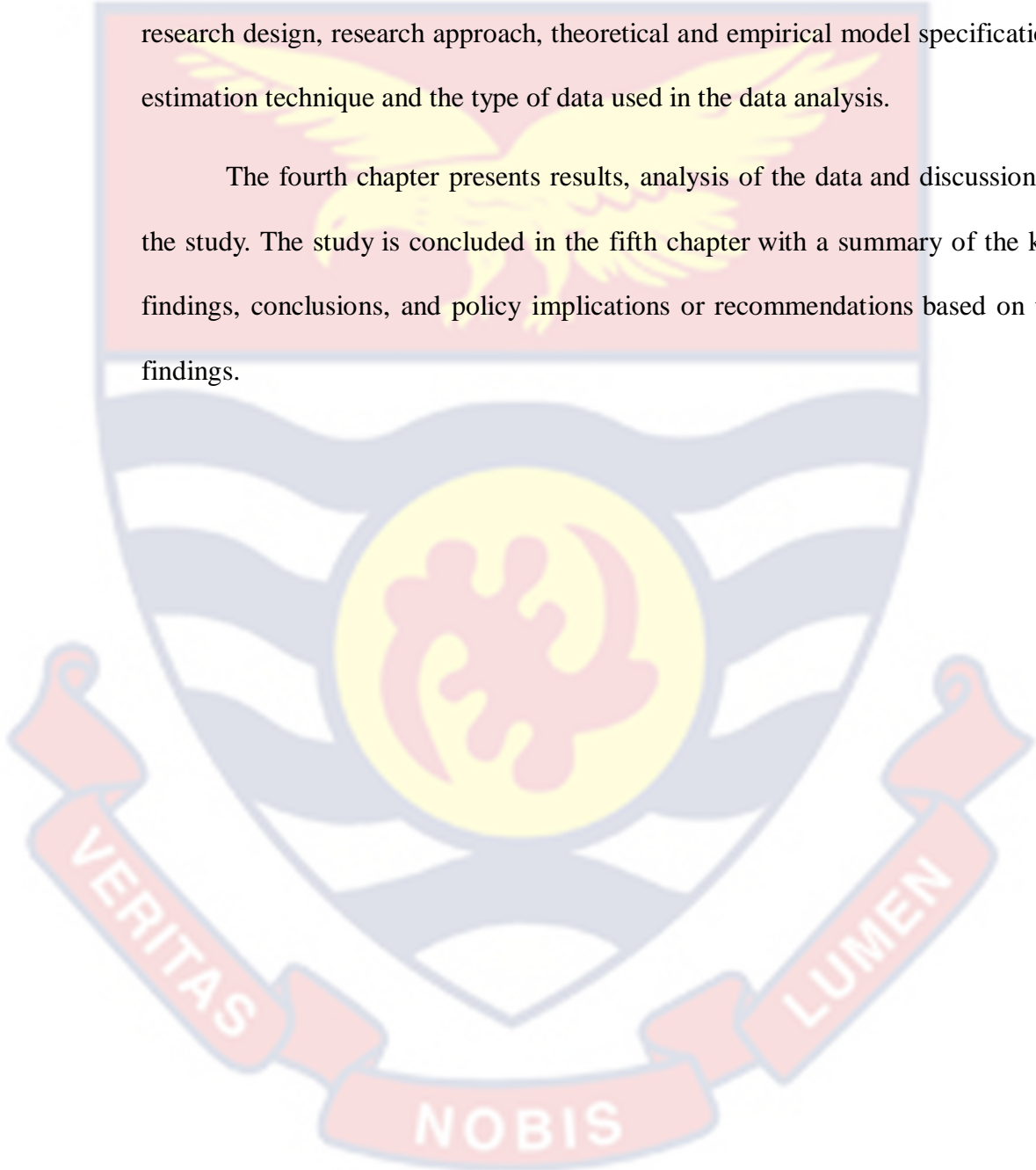
CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter reviews the existing theoretical and empirical literature on education, health and life satisfaction. The first section of this chapter looks at the theoretical literature on education, health and life satisfaction. Three main theories have been reviewed for this study. The second section of this chapter discusses the empirical literature on education and its relationship with health and life satisfaction of individuals. The third section of the chapter looks at the conceptual framework of education, health and life satisfaction.

Theoretical Review:

This section discusses the three main theories that underpin the study. The theories considered are the Fundamental Cause Theory, Human Capital Theory and Grossman Model.

Fundamental Cause Theory

The theory of fundamental causes was created in 1995 by Phelan and Link. The Fundamental Cause Theory (FCT) was developed to explain why socioeconomic status (SES) and health inequalities endure in spite of medical advancements and the long-term eradication of numerous diseases. The FCT, which asserted that education is a basic societal driver of health inequalities, demonstrated how socioeconomic status correlates with health but did not address why health inequalities are unavoidable. Education, income and social connections are some of the most significant social resources that influence

16

socioeconomic status. These resources have assisted individuals in avoiding risks and implementing protective measures. Changes in these socioeconomic factors lead to changes in the health of the population.

According to Masters, Link and Phelan (2015), individuals can make use of their personally owned resources such as education, income and social connections to acquire knowledge relating to health, access useful services, and buy preventive and curative technology. Additionally, these resources place people in social contexts that may affect how exposed they are to different health-related risks (such as hazardous working conditions, polluted neighbourhoods, higher smoking rates, etc.) and safeguards (e.g., safe neighborhoods and working environments, decreased health risks behaviours, etc.).

Human Capital Theory

The Human Capital Theory (HCT), developed by Becker and Schultz in the 1960s, viewed education as an investment that yields a return in the form of higher production. Knowledge, skills, reasoning, efficacy, and other abilities that can be used to promote the health status of individuals are all enhanced by education (Becker, 1975). The idea of human capital was extended by Mirowsky and Ross (1998) and they suggested that education enhances health because it increases effective agency. Mirowsky and Ross propounded the human capital theory of learned effectiveness. Learned effectiveness indicates that educated effective people combine disparate behaviours into a positive way of life that acts as a coherent trait. In order words, education fosters learned effectiveness

necessary for self-direction toward any and all desired values of life including health and life satisfaction.

Theoretically, education improves a person's ability to utilise information. People are encouraged through education to learn with the intention of using what they learn. According to Maringe (2015), the HCT portrays higher education as a choice between public and private investment for both governments and its citizens. The central claim is that public spending on education generates economic growth through higher productivity, social stability, and healthier lifestyles. On the other side, the theory sees investment in education as a private investment option that results in higher lifetime incomes for people with more educational experience, access to better-paying positions, less time spent on the labor market, and quicker transitions to enhanced career prospects.

Grossman Model

The Grossman (1972) model shed light on the use of healthcare services and products (inputs) by an educated person. According to the model, education enables people to raise the marginal productivity of inputs into the production of health. This model, which is created to meet the demand for good health, views health as a long-lasting investment that generates an output of health time. It is presumable that each person has a starting stock of health that deteriorates with age and can be increased through investment. It shows the relationship between personal health choices, health spending, and health outcomes.

According to this concept, a number of additional factors such as social class, education, diet and lifestyle affect the "shadow price" of health other than

18

the cost of medical care. The shadow price increases with age if the rate of depreciation on the stock of health increases across the life cycle and decreases with education if more educated individuals are more effective producers of health (Grossman, 1972). According to Grossman (1972), the model makes it easier to analyze the effects of demographic factors like age and education without presuming that they are associated with consumers' "tastes" for health. These variables enter the model through their impact on the cost of health capital or its marginal efficiency. This hypothesis asserted that if education increases the productivity of gross investments in health, then those with higher levels of education would call for a greater optimal stock of health. Healthcare's marginal product and healthy time spent producing health improves with increased knowledge and education.

Health depreciation can be lowered and the health stock can be increased by adopting healthier lifestyles, eating, and exercise options as a result of increased education. Less direct inputs are required to produce a given amount of investment when one has a higher degree of education. An educated person may make a given investment for less money, which results in a higher rate of return on a given stock of health. As a result, the stock of optimal health rises with educational level. A better articulate person therefore selects a higher optimal stock of health than the less informed person. The association between medical expenditures and education, on the other hand, would be negative given a generally inelastic demand curve.

These three theoretical perspectives highlight how education affects health as well as establish the association between education and health. The FCT emphasizes the dynamism and flexibility of the processes through which education affect health, while the HCT posits these processes as embodied skills and talents (Raghupathi & Raghupathi, 2020). The Grossman model on the other hand views educational attainment as a major investment. However, it must be noted that none of theories laid much emphasis on the educational attainment of the individual instead of considering the type or quality of education, which can also affect health. Furthermore, while these theories emphasize the personal resources, less attention is given to the social resources which also facilitate education and health mechanisms.

Education as a Consumption Good

Education can be considered a consumer good that increases individual utility or satisfaction. The consumption value of education extends beyond current consumption as it can broaden the range of future enjoyments of goods. The common argument is that education may boost the consumption of cultural goods like reading, art, or music (Haveman & Wolfe, 1984). The consumer value of education increases when there is an increase in these goods, which are also stimulating and creative activities, as well as the future satisfaction derived from such activities.

Additionally, education may raise aspirations, which may cause frustration if they are not realized. In other words, the disparity between actual and imagined opportunities affects each individual's wellbeing. Therefore, when earnings and

20

consumption opportunities as well as expectations increase, the effect of education on life satisfaction can be measured by comparing the increase in real life opportunities to the aspirations of individuals (Salinas-Jiménez, Artés, & Salinas-Jiménez, 2011).

Empirical Review

This section provides an overview of the existing empirical literature concerning the topic of interest. It is apparent that numerous studies have been conducted to explore the association between education and health. The association between education and health found in these studies may reflect one of these three types of relationship: a) a direct causal relationship, whereby education affects health; b) a reverse causal relationship, whereby health affects education; or c) lack of direct causal relationship in which education appears to be associated with health due to potential unobserved factors that may be affecting both health (or obesity) and education in the same direction. The three causal relationships are not mutually exclusive, meaning that a combination of all three could offer a reasonable explanation for the significant relationship between education and health, or obesity, that have consistently been found across different countries.

Education and Health

With the aim of incorporating social mechanisms in education such as level of education and skills attained through enrollment, Raghupathi and Raghupathi (2020) studied the associations and relationship between education and health indicators using empirical data from OECD and the World Bank

21

between 1995 and 2015 for 26 OECD countries. The study which used approaches such as ranking, association and data visualization to analyse the data highlights health discrepancies between countries and concluded that there is a direct positive impact of education on health. The study examined the relationship adult education levels (below-secondary, upper-secondary, and tertiary) and cancer deaths and indicated that the correlation between adult education levels (below secondary and tertiary) and cancer mortality is negative, but the correlation between adult education levels (above secondary) and cancer mortality is positive. With the exception of upper-secondary data, we may surmise that, generally speaking, as education level increases, the number of cancer-related deaths decreases.

The findings highlight the role that education plays in the potential years of life lost, a statistic that depicts the typical years a person would have lived had he or she not passed away prematurely. Education promotes health improving general self-awareness about one's own health and making it easier access to treatment. That is, individuals who have attained higher educational level have better health and longer lifespan than their peers who are less educated.

Research conducted by Ward and Viner (2016) which used data from the Cape Area Panel Study found that the various educational levels attained by the respondents in South Africa influence the prevalence of some negative health outcomes such as poor general health, health problem and disability, how frequently health interferes with work or study, smoking, illicit drug use, and sex under the age of 16 varied significantly according to the educational attainment

levels of males and females in South Africa using the Cape Area Panel Study. Using both logistic regression and structural marginal models, the results strongly imply that there are additional health benefits to higher education levels, beyond those that are already known to exist for lower education levels (like primary), such as those. The results of this research showed that young females who completed upper secondary education had a lower risk of experiencing negative sexual health outcomes. Specifically, those who continued their education were 40 to 60% less likely to have been pregnant before the age of 18 or to have started engaging in sexual activity before the age of 16, compared to those who did not complete upper secondary education. In the case of young males, completing upper secondary education had a broader protective effect, encompassing general health, substance use, and sexual health.

Mazumder (2010) used Survey of Income and program participation (SIPP) panels and found no strong evidence to support the causal relationship between education and health. The study employed two-stage conditional maximum likelihood regression and an observation made was that the effects of education brought about by compulsory schooling laws on general health is large but are robust to state time trends as none of the health conditions (vision, hearing, speaking ability, back problems, deformities, and senility) associated with education except diabetes correspond to the leading theories of how education improves health.

Mensch, Chuang, Melnikas, and Psaki (2019) did a systematic review on the on how education influences health particularly the sexual reproductive health

(SRH) of individuals in the low-and middle-income countries. The study discovered inconsistent evidence in favor of mechanisms linking SRH to education. The results on the effects of increasing schooling on the age at marriage and the effects of education on the age at first pregnancy or birth are equivocal. The study finds more evidence of a grade attainment effect on delayed marriage than on delayed birth across all measures. Increased school exposure has a marginally but significantly negative impact on decreased fertility, which is consistent with the study's findings. The last point is that, despite the fact that the mean effects are null, there is some evidence that more schooling may have a negative impact on human immunodeficiency virus (HIV) risk. The study also concluded that studies which treated the problem of endogeneity for this association found weaker effect compared to studies which did not account for endogeneity.

Literacy Skills and Health

A study by Prins, Monnat, Clymer, and Toso (2015) examined the connection between self-reported health and (a) literacy, numeracy, and technological problem-solving skills, (b) post-initial learning using the US PIAAC assessment. The findings obtained from the use of the ordinal logistic regression analysis showed that literacy, numeracy, and the technological problem-solving skills though the results predicted self-rated health. However, literacy skills is a stronger predictor of self-rated health than the other skills after controlling for individual characteristics. The study consistently revealed that individuals with lower literacy skills experienced worsening health conditions.

24

Specifically, those with the lowest literacy skills were more likely to report declining health between the ages of 34 and 38, in contrast to individuals with higher literacy skills.

Smith-Greenway (2015) aimed to show the effect of direct and indirect assessment of measuring literacy skills on young adults' health. The study used data from Tsogolo la Thanzi in Malawai and logistic regression for its analysis. The direct assessment of literacy skills was focused on elementary-level reading and comprehension and the indirect assessment was based on educational attainment and self-report. The results indicated that literacy skills is associated with self-rated health as respondents with full reading and comprehension skills have reported better health compared to other individuals with no reading or comprehension skills. In addition to highlighting the health benefits of literacy, the results confirm that respondents' educational attainment is protective of their self-rated health. Young adults who have completed primary school experience a 51 percent higher likelihood of reporting better health compared to their peers who attended only some primary school. The results obtained confirm that there is relationship between literacy skills and self-rated health among young adults in Malawi.

Lundetrae and Gabrielsen in 2016 used the PIAAC assessment to examine if there is any correlation between literacy skills and self-reported health in the Nordic countries (Denmark, Finland, Norway and Sweden). For each country, binary logistic regression was used to examine the relationship between low levels of literacy skills and poor self-reported health, taking into consideration

25

factors such as sex, age, and educational attainment. In all of the Nordic nations, sub-optimal self-reported health was prevalent in particular socio-demographic categories, and there were strong positive correlations between low literacy skills and sub-optimal self-reported health. The prevalence of sub-optimal self-reported health rose with age and fell with more education and more developed literacy abilities. Therefore, having sub-optimal self-reported health was substantially correlated with having low reading skills when compared to high-level skills. The findings imply that having weak literacy skills increases the chance of having bad health in the Nordic countries.

Education and Body Mass Index

The prevalence of obesity is a major health problem being faced globally as it is associated with quite a number of chronic diseases. Due to this, many researchers are keen to know the contributing factors associated with this high prevalence of obesity. It is therefore very important to explore the possible way that education can influence the prevalence of obesity as this helps with the making and implementation of appropriate education-based policies to curb the high prevalence of obesity and related chronic diseases.

Kassie, Abate, and Kassaw (2020) looked at the relationship between educational level and the prevalence of overweight and obesity among Ethiopian women in the reproductive age group and concluded that highly educated women who reside in urban areas and hold demanding jobs have little time to lead healthy lifestyles, which contributes to obesity. The study performed a meta-analysis using the random-effects model due to the presence of heterogeneity. Education

26

was highly connected with women's obesity and excess weight. Age, region, residing in a city, quintile of wealth, increasing frequency of television viewing, and frequency of internet use were all significant predictors of being overweight or obese among Ethiopian women in the reproductive age group. This highlights how obesity and overweight are important challenges for women, especially those who live in urban areas, regardless of educational attainment. This is problematic since being obese and overweight may increase a woman's risk of developing certain non-communicable diseases like hypertension and other cardiovascular disorders.

In contrast, Asil, Surucuoglu, Cakiroglu, Ucar, Ozcelik, Yilmaz, and Akan (2014) which examined the variables that affect adults' BMI using multiple regression analysis found that the average BMI is strongly affected by educational levels in Ankara, Turkey. Additionally, this study clearly demonstrates that an individual's BMI dramatically decreases as their education degree rises. The study found that factors such as age, level of education, marital status, smoking habits, and sleep duration accounted for 34% of the average body mass index among individuals.

Hermann, Rohrmann, Linseisen, May, Kunst, *et al.,* (2011) using the European Prospective Investigation into Cancer and Nutrition data also supported the argument that BMI is inversely related to levels of education as higher educated participants had lower BMI. This relationship between educational levels and BMI was estimated across countries using multilevel mixed linear models with random intercepts and coefficients. Another inverse relationship

27

between education and BMI was observed in the study conducted by Hernández-Yumar, Alessón and López-Valcárcel (2019) which used Canary Islands Health Survey. According to the study, which employed a linear regression model for its analysis, BMI reduces as educational level increases in both men and women, although educational attainment had a greater influence on BMI in women. Spasojevic (2003) generated an instrumental variable (degree of education) from compulsory school reform and found consistent result that additional years of education in Sweden have causal effect on BMI.

Arendt (2005), on the other hand, reported inconclusive findings regarding the influence education has on BMI after using changes in compulsory school laws in Denmark as an instrumental variable for education. The Danish National Work Environment Cohort Study (WECS) was the data employed in the study for analysis, and this data was analyzed using a two-stage conditional maximum likelihood regression.

Education and Chronic Illness

The prevalence of chronic illness is the leading global causes of deaths and disabilities amongst the elderly population in the world. Jana and Chattopadhyay (2022) found that the elderly in urban India with higher educational level are likely to develop chronic illness using the National Sample Survey to support its argument. According to the study which employed bivariate and logistic regression analyses, higher educational increases the risk of having chronic illness in the urban areas as the highly educated are likely to be associated

28

with poor dietary behavior, sedentary lifestyle as a result of too much work load which increases the prevalence of obesity and the chronic illness.

Contrary to the above study, the results presented in the study by Vennu, Abdulrahman, Alenazi, and Bindawas (2020) indicated that lower educational level is associated with the prevalence of several chronic illnesses among the older population. This study analyzed data from the Osteoarthritis Initiative from United States using multivariable logistic regression.

The findings of a study by Singh, Singh, Dubey, Singh, and Mehrotra (2019) used data from the India Human Development Survey and discovered elderly with no formal education are more likely to develop chronic illness compared to individuals with at least secondary level of education. The study employed multilevel logistic regression where the highest level of education attained by respondents was used as a measure of education.

Fonseca, Pierre-Carl, and Zheng (2020) used cross-country variation across OECD countries. The study which used compulsory schooling laws over time as an instrumental variable for education and discovered a causal relationship between more years of education and several chronic illnesses such cancer, diabetes, heart disease, hypertension, arthritis, lung disease and stroke. The results obtained from the use of IV-probit models are more significant than those from a probit model without endogeneity correction for education. Before the correction of endogeneity, the results indicated that many more years of education is associated with lower probability of having chronic illness except for cancer. The estimates of the IV-probit regression that helped conclude on the

29

causal relationship between education and a number of other chronic illnesses are statistically significant and larger than the estimates of probit regression except for cancer and stroke. That is, increasing schooling age decreases the likelihood of developing some chronic illness such as diabetes, heart disease, hypertension, arthritis and lung disease.

Education and Life Satisfaction

Using data from the World Values Survey, Hassaan, Hina, and Qayyum (2021) identified six determining factors such as health status, employment status, marital status, parity, income earnings, and freedom of choice as the mediating variables through which a relationship is established between education and life satisfaction in Pakistan. The data was analyzed using the marginal mediation approach, and the results showed that education is directly and indirectly statistically significant on life satisfaction.

To explain the relationship between education and life satisfaction, Ilies, Yao, Curseu, and Linag (2018) identified three aspects of satisfaction (work, financial, and health satisfactions) as mediating factors. The data from the Longitudinal Internet Studies for the Social Sciences (LISS) panel in the Netherlands was analyzed using the structural equation model. These three mediating factors have distinct effects in predicting the relationship between education and life satisfaction. The findings supported a bottom-up approach to understanding life satisfaction, in which an individual's satisfactions with various aspects of their life, including their employment status which is a result of education acquired, increase their life satisfaction. Also, education improved life

30

satisfaction when the knowledge acquired through education by these individuals was used enhance their health and financial satisfactions.

Powdthavee, Lekfuangfu and Wooden (2015) advanced the knowledge on the relationship between years of education and life satisfaction the Household, Income and Labour Dynamics in Australia (HILDA) Survey data and structural equation model for the analysis. According to the findings, the direct effect of years of education on life satisfaction is negatively statistically significant, but the indirect effect of years of education on life satisfaction through mediating factors such as marriage, parity, income, employment and health is considerable is positively statistically significant.

The 2008 National Income Dynamics Survey data used by Botha (2014) to conduct a study in order to examine the relationship between education and life satisfaction in South Africa. The findings showed a statistically significant positive relationship between educational attainment and life satisfaction. Evidence suggests that education is a positional good since individuals with higher levels of education are significantly satisfied with their lives than those with lower levels of education.

Studies done in Ghana

Peters, Baker, Dieckmann, Leon, and Collins (2010) conducted research in Ghana to test the schooling-decision-making model, which holds that formal education fosters intellectual ability, giving people enduring competencies to support better HIV/AIDS health-related behaviors. Structural equation regression was used to analyse data collected from the field study in the rural Ghana.

31

Education in this study was measured as the number of years of schooling. The study's findings, which are consistent with those of numerous other studies, show that having more education is linked to engaging in more preventive activities. According to the findings, formal education affects preventative health behaviors and knowledge via fostering the growth of cognitive decision-making abilities in students. Individuals with more developed CDAs may be better able to apply prior knowledge of health to novel situations, consider activities from a different perspective, and use statistics to make decisions in daily life.

Agyemang and Asibey (2018) examined the association between educational attainment and healthcare where utilization measured as the total number of doctor visits, general practitioner visits, and specialist visits a responder made throughout the course of the previous four (4) episodes of illness and education was measured as total number of years of schooling. Continuous and ranked primary data which was collected from four communities in the Bekwai Municipality was analysed using bivariate regression analysis. According to the study, there is a positive correlation between years of education and participants' extent of healthcare utilisation. More respondents with higher education used healthcare than those with secondary, basic, or no education. This positive relationship is possible because education improves people's access to information about healthcare needs, accessibility, and knowledge, which tends to have a beneficial effect on how often people utilize it and educated people have a tendency to have more gainful employment, which results in better revenues that enable them to pay for healthcare.

Tetteh *et al.,* (2022) found that higher level of education leads to higher prevalence of obesity in Ghana as individuals who have attained the tertiary educational level are liable to be obese compared to those who are less literate and illiterate. The data acquired from the World Health Organization Study on global ageing and adult health Ghana Wave 2 which was conducted in 2015 among adults was analyzed using ordered logistic regression for this study. Educational level was used a measure of education in this study. The results indicated that individuals who have attained higher levels of education have the capability to afford foods which may be unhealth as well as engage in other unhealthy sedentary occupations.

Owusu-Ansah, Dey, Adade, and Agbadi (2022) examined the determinants of life satisfaction among Ghanaians in order to determine the relationship between these determinants and life satisfaction. The study analysed the Ghana Multiple Indicator Cluster Survey Six (MICS 6) 2017/2028 data using the ordered probit regression. In this study, educational levels were used as the measure of education. According to the study, education plays an important role in determining how satisfied one is with life as having a higher level of education on average boosts a person's likelihood of identifying as highly satisfied for both men and women. This is in contrast to respondents who had no formal education or just completed pre-primary education. It can be concluded that employment coupled with higher wages serve as mediating channels through which education increases life satisfaction since education serves as a springboard for increased job opportunities and decreases the risk of being unemployed.

Based on the review, it can be observed that most studies done to examine the relationship between education and health (BMI and chronic illness) and life satisfaction measured education using educational attainment, years of education or levels of education but have failed to use literacy skills as a measure of education. The study intends to examine the how literacy skills influence the health and life satisfaction of individuals in Ghana as functional literacy which is the ability to comprehend and utilize written health information is vital for individuals to effectively manage their own health and the well-being of their families. The effects of literacy skills as a measure of education tends to relate more highly to behaviours and outcomes that cab ne controlled such as smoking, drinking or general health. (DeWalt, 2004) Moreover, it plays a critical role in disease prevention and the promotion of overall health.

The few studies which considered functional literacy other than health literacy on general health did not account for the correction of endogeneity using the Lewbel IV approach. The Lewbel IV method utilizes the presence of heteroskedasticity in mismeasured or endogenous independent variables to create instrumental variables. In Ghana, majority of the studies done to establish the relationship between education and health (BMI) examined the intergenerational effect. No study has been conducted to examine the association between literacy skills and BMI, chronic illness and life satisfaction in Ghana using the ordered logistic regression and the Lewbel IV approach to correct endogeneity.

Conceptual Framework

The linkages between literacy skills, health outcomes and life satisfaction are examined in the context of Grossman's 1972 model. The conceptual framework for examining the interactions of socioeconomic factors that affect the demand for and production of health and life satisfaction is provided by the Grossman model on health demand. According to Grossman's model, education serves as a catalyst that positively influences health just as medical inputs, food, exercise, and other health behaviors also affect health. Smith and Kington (1997) modified Grossman's work as the model propounded th Grossman excluded significant variables such demographic, socioeconomic and biological factors which are crucial to health status. They included the abovementioned factors in the model to refine the Grossman model.

This study includes literacy skills as a measure of education in addition to standard measures of education that have been used in several studies as literacy skills contribute to an improvement in health. The various standard measures of education and literacy levels capture different aspects of individuals' human capital and, as a result, contribute to various aspects of health outcomes. It is crucial to consider and evaluate literacy skills as these skills are potentially more accurate measure of how efficiently and effectively individuals produce health. Health knowledge and outcomes are more likely to be strongly associated with literacy skills than with levels of education (Coulon, Meschi & Yates, 2010).

Literacy skills as a measure of education are usually assessed based on different types which include but not limited functional literacy, health literacy,

35

and mental health literacy (Lincoln, Adams, Eyllon, Garverich, Prener *et al.*, 2017). This study considers functional literacy which is explained as the ability to read, listen and speak think critically and judge correctly and numeracy and negotiation skills. These skills and abilities can be acquired and developed through school educational training, work and on the job training and knowledge gained from the broader community over time. Good literacy skills is a prerequisite for a sound education.

The physical health outcomes analyzed in this study are measured using the body mass index and the chronic illness status of the individuals. Life satisfaction which reflects the cognitive component of subjective well-being (Kaiser, Hennecke & Luhmann, 2020) was used as the measure for subjective well-being.
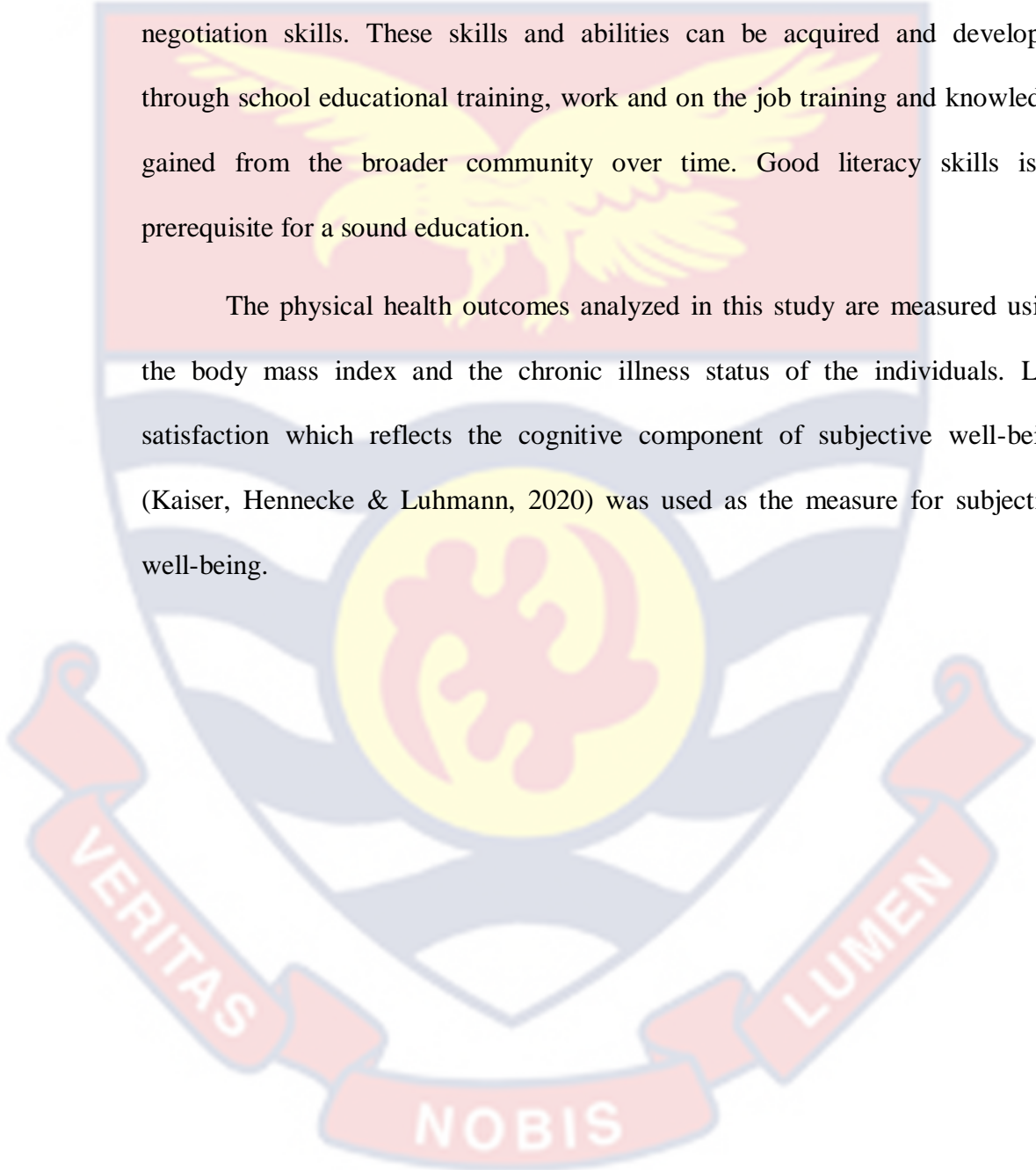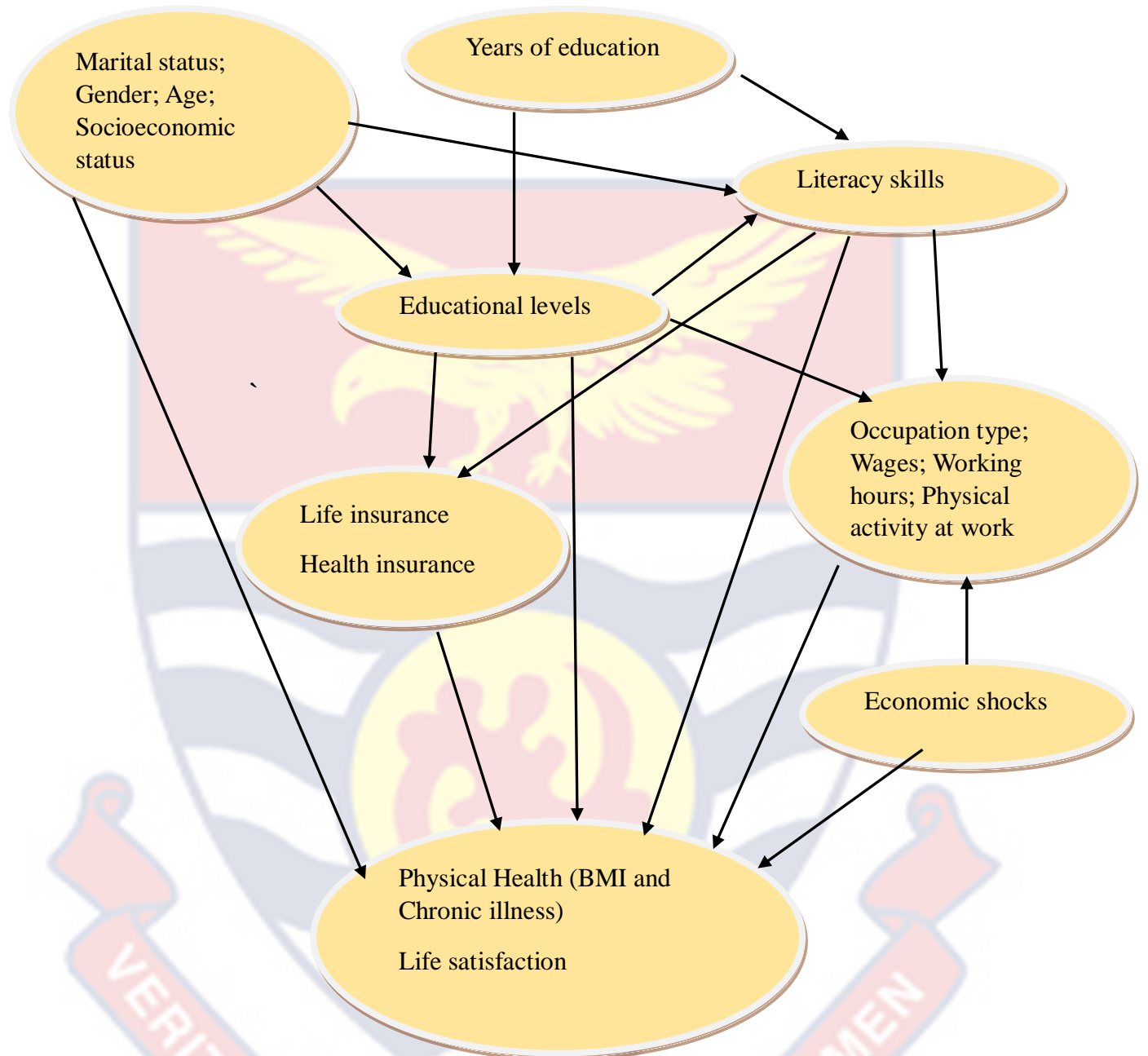
Figure 1: Conceptual model of the effect of literacy skills on the body mass index, chronic illness status and life satisfaction of working adult groups in urban Ghana.

Source: Adapted from Smith and Kington (1997)

Through enhanced employment and increasing income levels, higher literacy skills have the potential to improve health and the satisfaction of life. Individuals who possess strong literacy skills are more likely to secure full-time employment in favorable working conditions, resulting in higher incomes and improved socioeconomic statuses. As a result, they are able to afford quality healthcare services and reside in safer communities, characterized by amenities grocery stores with high quality food and fitness facilities. These factors contribute to better body mass index (BMI), reduced prevalence of chronic diseases, and ultimately, higher levels of life satisfaction.

Individuals who possess proficient literacy skills have the chance to secure employment with companies that provide comprehensive health and life insurance benefits. Additionally, they have the privilege of working in safer occupations, thereby minimizing their exposure to hazardous substances, pollution, and potentially dangerous equipment. Moreover, they are less inclined to partake in physically strenuous manual labor that heightens the likelihood of sustaining injuries. Likewise, persons with high levels of literacy are more likely to exert control at work, which lowers the risks associated with chronic health issues, thereby improving their life satisfaction.

Individuals who possess high literacy skills experience numerous benefits in terms of their psychosocial and cognitive resources such as a sense of personal control and provide access to social networks and support, ultimately resulting in improved overall health. Their ability to acquire and comprehend information, solve problems, and endure challenging circumstances leads to enhanced BMI

38

and chronic illness status. This is due to their heightened understanding of health, inclination towards preventive measures, and strong belief in their capacity to manage their own well-being. Having high literacy skills allows individuals to form more stronger social support networks, as they are capable of building meaningful relationships with their family, acquaintances, and coworkers. These social connections can provide both emotional and practical support, especially during times of economic shocks, thereby decreasing the risk of experiencing mental health issues such as depression and anxiety. Moreover, individuals with high literacy skills are more likely to actively seek out healthcare services when necessary. This improves the BMI, chronic illness and life satisfaction statutes of the individuals.

Individuals with high literacy skills have the ability to make informed choices about their health and lifestyle. These skills provide them with access to knowledge, resources, and skills that assist in making well-informed decisions. These decisions may involve seeking necessary medical services, adopting healthy behaviors such as regular exercise, avoiding smoking and substance abuse, maintaining a nutritious diet, having leisure time. These practices improve the health and life satisfaction statutes of the individuals.

Conclusion

Some theoretical frameworks, including the Grossman Model, Human Capital Theory, and Fundamental Cause Theory, were reviewed in this chapter. This chapter also analyzed empirical research on the relationship between health and education and examined how it supported or refuted various beliefs.

39

Classifying the reviewed literature according to the following themes: intergenerational effect: education and health, impact of education on general health, impact of education on sexual and reproductive health, effect of education on mental health, studies conducted in Ghana, and influence of education on Body Mass Index (BMI). Although there are differing views on the causal association between health and education, many researchers hold that social, economic, and psychological factors have an impact on both health and education. As a result, there are additional transmission mechanisms to each variable having an effect on the others.

CHAPTER THREE

RESEARCH METHODS

Introduction

The methodology employed for this study has been described in depth in this chapter. The chapter also discusses the data used for this study, the econometric estimation method and the theoretical ideas that underpin the study. In addition to introducing the research strategy and the empirical procedures used, the chapter also discusses the philosophical underpinnings of this study. An overview of the study's research procedures is provided in this chapter as well. Furthermore, the techniques employed to analyze the data are also discussed in details.

Research Philosophy

Research philosophy mainly include positivism, post-positivism, interpretivism and constructivism. Positivism emphasizes acquiring objectively verifiable facts through the use of quantitative methods and follows an objective approach to study. The study adopts positivism as the appropriate research philosophy because it urges the researcher to be objective in the findings so that the researcher is not influenced and distances from personal values when studying a phenomenon.

Positivism enables the researcher to use approaches embedded in statistical analysis that include strategies like inferential statistics, testing of hypotheses, mathematical exposition, experimental and quasi-experimental design randomization, blinding, structured protocols, and questionnaires with limited

41

variety of predetermined answers (Lee, as cited in Slevitch, 2011). Using this philosophy helps the researcher generate is more precise, quantifiable, and objective data. This philosophy aids in the production of policy recommendations as knowledge gained can be an appealing source of information. Positivism helps the researcher to develop deterministic view of causality, where explanations of whether "x causes y" are portrayed as predictable and generalizable "cause and effect" situations based on scientific laws (Schwandt, 1997).

Research Approach

There are various approaches of analyzing and explaining a study and its results based on using descriptive style, numbers as a measure, or a combination of both. Depending on the purpose, the researchers may adopt various approaches to discover the truth or knowledge. In order to understand the research problem in question more thoroughly, the study employs the quantitative method research approach.

The quantitative method research approach is used because it enables researchers to describe current conditions, establish the relationship between variables and sometimes attempt to establish and explain the causal relationships between these variables. This kind of research approach is employed in a study which is focused on describing and explaining phenomenon under examination (Creswell, 2005). Additionally, it helps the researcher in maintaining objectivity so that results of the study can be extrapolated outside of the specific context in which it was conducted. Through quantitative data analysis, the researcher is able to gather, organize, and process information from large samples in a consistent

42

and reliable manner. The use of quantitative research is crucial to increase the accuracy of the variable descriptions and the ability to identify their relationships.

Research Design

A research design is the 'procedures for collecting, analyzing, interpreting and reporting data in research studies' (Creswell & Plano Clark 2007, p.58). It consists of a comprehensive strategy for linking conceptual research issues with relevant and doable empirical research. The three types of study design under the quantitative research approach are descriptive, correlational and experimental.

The correlational research design was employed in this study because it is the best approach for analyzing the relationship between variables in a study without controlling or changing the variables. The study design allows the researcher to determine whether and to what extent a statistical relationship exists between two or more variables. The researcher can also measure or characterize existing conditions or prior occurrences. Correlational research allows the researcher in developing theories and making predictions by providing an understanding of complex real-world relationships. Correlational research can provide preliminary evidence or more support for causal relationship theories.

Theoretical Model

In the Grossman model of demand for health (1972), individuals obtain utility from better health consumption of goods. The utility of the individual is depicted as

$$U = u(H, C) \tag{1}$$

43

As illustrated by Grossman in his model, whereas medical inputs (M), diet, exercise and other health behaviours affects health, education (E) acts as a catalyst that positively influence the stock of individual health (H). This study employed a set of individual literacy skills and levels of education as human capital skills (education) rather than from formal education. The utility of health of individuals *(H)* is affected by human capital skills *(S)*, consumption of goods *(C)*, observed individual and household characteristics *(B)* and unobserved characteristics μ, modelling the utility function

$$U = u(M; S, C, B, \mu) \tag{2}$$

This relationship between health stock, medical input, education and the other unobservable factors is expressed by the relation:

$$U = F(M; S, B, \mu) \tag{3a}$$

From the above relationship a linear specification of the health production function can be expressed as;

$$H = \alpha M + \beta E + \gamma \mu \tag{3b}$$

The utility of every household is expected to be increased from its consumption which is a function of its possible income sources subject to its health production function and budget constraint. The household is expected to gain income from engaging in labour activities, Supplying *L* units of labour at the wage rate of *W*, which is affected by the set of human capital skills, *S*:

$$W(S)L = P_1 X_1 + P_2 X_2 \tag{4}$$

44

In this case, the budget constraint being subjected to is given by:

$$Y(S, B) = P_1 M_1 + P_2 C_2 \tag{5}$$

Where Y denotes the income of the household which is primarily based on the human capital skills and a set of observable control variables B, P_1 and P_2 are the set of prices of medical inputs (M) and consumption goods (C).

Given an implicit form, the maximum consumption level for this household is

$$C = C(S, P_1, P_2, \mu, B) \tag{6}$$

Substituting equation 6 into equation 2 gives the reduced form of the health equation of the household as:

$$H = H(S, P_1, P_2, \mu, B) \tag{7}$$

The assumption is that the utility function behaves as expected, which means that the marginal utility for the individuals health strictly increases at a decreasing rate, so that $uH > 0$.

The human capital skills in this model improves health at a given level of inputs. Human capital skills in this analysis are measured by the levels of education and literacy skills.

Empirical Model

Based on the already discussed Grossman health model in the previous section, the relationship between health and life satisfaction and literacy skills were estimated using the following regression:

$$HS_i = c + \alpha Lit_i + \beta X_i + \gamma I_i + \delta W_i + \varepsilon_i \tag{8}$$

45

Where HS_i denotes the individual $i's$ physical health and subjective well-being, Lit_i denotes the individual $i's$ literacy skills, X_i is a set of individual and household sociodemographic characteristics that include age, gender and marital status, I_i denotes the set of insurance individuals have signed up for, W_i denotes a set of work characteristics and conditions, c denotes the constant term and ε_i denotes the error term. The coefficient on literacy skills α is the main object of interest as it measures the effect of a unit change in literacy skills on the particular measure of the dependent variables.

In specific terms, the outcomes are estimated as

$$BMI_i = \alpha_1 + \alpha_2 lit_i + \alpha_3 educ_i + \alpha_4 age_i + \alpha_5 gen_i + \alpha_6 marital_i + \alpha_7 occ_i +$$
$$\alpha_8 wages_i + \alpha_9 ses_i + \alpha_{10} hrs_i + \alpha_{11} shocks_i + \alpha_{12} life_i + \alpha_{13} health_i +$$
$$\alpha_{14} psy_i + \varepsilon_i \qquad (9)$$

$$Life\_sat_i = \beta_1 + \beta_2 lit_i + \beta_3 educ_i + \beta_4 age_i + \beta_5 gen_i + \beta_6 marital_i +$$
$$\beta_7 occ_i + \beta_8 wages_i + \beta_9 ses_i + \beta_{10} hrs_i + \beta_{11} shocks_i + \beta_{12} life_i +$$
$$\beta_{13} health_i + \beta_{14} psy_i + \varepsilon_i \qquad (10)$$

$$Chronic_i = \gamma_1 + \gamma_2 lit_i + \gamma_3 educ_i + \gamma_4 age_i + \gamma_5 gen_i + \gamma_6 marital_i + \gamma_7 occ_i +$$
$$\gamma_8 wages_i + \gamma_9 ses_i + \gamma_{10} hrs_i + \gamma_{11} shocks_i + \gamma_{12} life_i + \gamma_{13} health_i +$$
$$\gamma_{14} psy_i + \varepsilon_i \qquad (11)$$

Where the outcomes are measured independently as body mass index (BMI), life satisfaction (Life_sat) and chronic illness (Chronic)

lit_i=literacy skills

$educ$=educational level

age=age

gen=gender

$marital$= marital status

occ= type of occupation

$wages$= log of wages received

ses= socioeconomic status

hrs= working hours

$shocks$= economic shocks

$life$= life insurance

$health$= health insurance

psy= physical activity at work

Data description and variables measurement

This analysis of the research employed secondary data. The study is conducted using the STEP (Skills Toward Employment and Productivity) Skills Measurement Household Survey 2013 (Wave 2) dataset from the Word Bank. The specially crafted Household Survey includes modules that assess the cognitive (reading, writing, and numeracy) skills, socio-emotional skills (personality, behavior, and preferences), and job-specific skills (subset of transversal skills

47

with direct job relevance) of a representative sample of adults aged 15 to 64 years living in urban areas, whether or not they are employed.

A direct evaluation of reading literacy based on the Survey of Adults Skills items is also included in the cognitive skills module. Additionally, modules collect data on family, health, and language. The households and individual respondents are the units of study. A household roster is completed at the beginning of the survey, and a random household member between the ages of 15 and 64 is chosen to be the individual respondent. The STEP team created the random selection technique, and fieldwork is used to closely monitor compliance with the protocol. Both the individual and household datasets were merged for this study.

The study makes use of data collected from the working group aged between 18 and 65 in Ghana, a developing country in the Sub-Saharan Africa. The Ghana STEP measurement survey, 2013 was the instrument used to interview and collect the data used for this analysis. In all, the World STEP dataset Ghana Wave 2 sample totaled 11,485 respondents. A final sample of 1,735 respondents was used in this study after dropping the missing values in the variables.

The dependent variables of interest are the health and life satisfaction of working adults between the ages of 15 and 64 years in Ghana.

Dependent variable: Health

The health variable constitutes of the Body Mass Index (BMI) of individuals and the chronic illness statuses of individuals. Using the self-reported weight and height of the individuals, BMI is calculated as weight divided by

48

height. The standard body weight status category ranges associated with BMI are underweight (below 18.5); normal weight (18.5-24.9); overweight (25.0-29.9) and obese (30.0 and above).

BMI was created as a disease risk indicator as overweight and obesity are associated with certain chronic health conditions such as diabetes, high blood pressure, osteoarthritis, cardiovascular diseases and premature death. The respondents were asked if they have or do not have chronic illness.

Dependent variable: Life satisfaction

The subjective evaluation of an individual's quality of life is called "life satisfaction". Life satisfaction assessment include a significant amount of cognition due to its judgmental nature. The Self-Anchoring Ladder of Life Satisfaction scale which was developed in 1975 by Cantril was used to evaluate the second outcome variable (life satisfaction). On this ladder, respondents were asked to indicate the step of the ladder which they stood as the ladder was numbered from "0" to "10". The number 0 which is at the lowest point of the ladder indicated worst life satisfaction and the number 10 which is at the highest point of the ladder indicated best life satisfaction.

Based on the statistical studies of the Cantril's ladder-present and future scale and how it relates to items and dimensions, Gallup categorized the scale into three categories to form the Life Evaluation Well-Being index. The three categories include Thriving: where the individual describes his well-being to be strong, consistent and progressing; Struggling: where the individual describes his well-being to be moderate or inconsistent and Suffering: where individuals

49

describe their well-being to be at a high risk. The study therefore categorizes the responses from respondents into suffering (0-4) as '0', struggling (5-6) as '1' and thriving (7-10) as '2'.

Independent variable: Literacy Skills

The STEP literacy assessment is used to define the independent variable-literacy skills. The literacy skills measure was designed to measure three cognitive strategies that are essential to help understand full texts. Literacy skills was measured in terms of reading components, core literacy and literacy proficiency scale and levels. In this study, Principal Component Analysis (PCA) was used to create a synthetic index to measure literacy skills since all the three variables; reading skills, core literacy and proficiency levels are all measuring the dimension of the same concept.

At the beginning of the literacy skills evaluation, respondents were asked to participate in the reading test of random texts which were provided. After the reading test, respondents were introduced to the core literacy test. Core literacy is a collection of eight literacy skills materials that help identify respondents who are less literate from the others who are highly literate. The literacy evaluation process ended for respondents who failed the core literacy test whilst those who passed the core literacy test were given four exercise books to test their proficiency level.

The proficiency level test that was given to respondents included simple and demanding tasks. The results scored by the interviewers were reported along a proficiency scale numbered from 0 to 500 where the simple and easy tasks were at

50

the lower end of the scale and the demanding tasks were at the higher end of the

scale. The proficiency scale scores were further divided into six categories.

Table 1: Proficiency scale and levels

Literacy Below Level 1	**0 to 175**
The respondent is required to read brief, continuous texts on familiar topics as part of the tasks at this level in order to locate one specific piece of non-competing information. The reader does not need to comprehend sentence or paragraph structure or make use of other text characteristics as basic vocabulary is only needed. Tasks at below level 1 do not use any digital text-specific features.	
Literacy Level 1	**176 to 225**
For the majority of tasks at this level, the respondent must read relatively short digital or print continuous, noncontinuous, or mixed texts in order to locate a single piece of information that is identical or synonymous with the information stated in the directive or question. In the case of some non-continuous texts, certain tasks may require the respondent to enter personal information into a document. There is very little, if any, competing information.	
Literacy Level 2	**226 to 275**
The complexity of the text increases at this level. Texts may be printed or digital, and they may be of mixed, continuous, or noncontinuous types. The tasks in this level require responders to match information to text, and may require low-level inferences or paraphrasing. There might be some information that is competing.	
Literacy Level 3	**276 to 325**
At this level, texts are frequently lengthy or dense, with a combination of continuous, noncontinuous, mixed, and many pages. Successful task completion becomes more dependent on comprehension of text and rhetorical structures, particularly when navigating through complex digital text. Tasks generally involve varying levels of inferencing and require the respondent to recognize, analyze, or assess one or more pieces of information. Although competing information is frequently present, it does not always stand out more than the correct information.	
Literacy Level 4	**326 to 275**
Respondents are frequently required to carry out multi-step processes in order to integrate, analyze, or synthesize information from complex or	

51

lengthy continuous, non-continuous, mixed, or multiple type texts. To perform successfully, one may need to draw complex inferences and apply background information. In tasks at this level, conditional information is frequently present and must be taken into consideration by the respondent. Competing information is present and can sometimes appear to be more prominent than accurate information.

Literacy Level 5	376 to 500

At this level, tasks may require for the respondent to find and integrate information across numerous, dense texts, construct synthesis of related and contrasting concepts or points of view, or evaluate arguments supported by evidence. To complete tasks, one may need to apply and evaluate logical and conceptual models of idea. Selecting important information and assessing the reliability of the evidentiary sources are typically important requirements. Respondents are frequently required to make high-level inferences, employ specialized background knowledge, and be aware of subtle, rhetorical cues in order to complete tasks.

Source: Educational Testing Services, (2014).

The categories were recoded to five in line with previous studies (Long & Jacobsen, 2018). The level 4 and level 5, were respectively collapsed because of limited data. Thus, level 5 is included in level 4. Below level 1 represents the lowest proficiency score, while Level 4 represents the higher score. This was done to adequately measure the skills of adults with different educational backgrounds and life experiences.

The reading skills of the working group was also used as a measure of literacy skills. This variable was categorized as a dummy where 0= do not read and 1=do read.

The socio-demographic/economic control variables included in the model are level of education, age, gender, marital status, type of occupation, wages (log), socioeconomic status, number of economic shocks, number of working hours,

possession of health and life insurance and the level of physical activity involved at work.

Control Variables

Levels of education in the data are measured on a 14-point scale from 1=no level to 14= Master degree. In order to establish a normal distribution, the responses are categorized into 1= no education; 2= basic education; 3=high school education and 4; tertiary education.

The data provided information on individuals aged between 15 and 64 years in a continuous form. The sample of the continuous form of age is divided into 10-year age groups: into 10-year age groups: 0= 15–24, 1= 25–34, 2= 45–54, 4= 55–64 years. Gender is categorized as male and female. Female was set as the reference category.

Participants answered their marital status on 7-point scale which is recoded to 1=Married/Co-habitation, 2=Divorced/Separated/Widowed and 3=Never married/Single. The occupation type of participants is measured on 6-point scale from 1= Military personnel to 6=Skilled agriculture. The Socioeconomic status of participants is categorized into low, middle and high. The number of economic shocks the respondents experienced before 15 is indexed into 0= No shocks, 1= One shock and 2= Two or more shocks. The economic shocks measure the number of worse economic situations such as death and illness of a household member, alcohol or drug problem, bankruptcy, loss of employment, etc. at the age of 15. Life insurance and Health insurance were categorized into Yes or No. The physical activities associated with the work of

53

participants are categorized into 0=skill not used, 1=low, 2=medium and 3=high. Both the log of hourly earnings and working hours of participants were measured in continuous form.

Table 2: Categories of Variables

Variables	Categories	Reference Categories	Expected Sign
Body Mass Index	Underweight Normal Overweight Obese	Normal	
Chronic Diseases	Yes No		
Life Satisfaction	Suffering Struggling Thriving		
Literacy Skills	Reading Core Literacy Proficiency Level	No reference categories	+
Age	16-24 25-34 45-54 55-64	16-24	+
Gender	Female Male	Female	+ -
Marital Status	Married / Co-habitation Divorce / Separated / Widowed Never married / Single	Married / Co-habitation	+
Levels of education	No education Basic High school Tertiary	No education	+
Types of occupation	High skilled collar job Low skilled collar job Crafts and trade Elementary occupations Skilled Agriculture	High skilled collar job	+
Wages (log)	Continuous variable		+/-
Socioeconomic status	Low Medium	Low	+

54

	High		
Number of working hours	Continuous variable		+
Number of economic shocks	No shocks	No shocks	+
	One shock		
	Two or more shocks		
Life insurance	Yes	Yes	+
	No		
Health insurance	Yes	No	+
	No		
Physical Activity at work	No skills used	No skills used	+
	Low		
	Medium		
	High		

Source: Author's Construct

Estimation Technique

To examine the relationship between the dependent variables and independent variable, two logistic regression models were formulated for analysis: binary logistic regression and ordered logistic regression. One of the dependent variables which is chronic illness is measured as a dummy where 0= have no chronic illness and 1= have chronic illness therefore it is appropriate to employ the binary logistic regression. The ordered logistic regressions were employed to analyse the other two dependent variables namely body mass index and life satisfaction as these variables are measured as naturally ordered discrete variables. Body mass index is measured into 1= underweight; 2= normal weight; 3=overweight; 4=obesity and life satisfaction is measured into 1= suffering; 2= struggling and 3= thriving. Let Y_i represents the dependent variables for the body mass index, life satisfaction and chronic illness of an individual i respectively. Consider the following general linear model:

$$Y = \sum_{k=1}^{k} \beta_k X_k + e \tag{12}$$

55

Where β represents the body weight indices and e represent residuals of the independent variables Xs.

In the ordered logistic regression model, an ordered variable Y is observed to be a function of another continuous unmeasured latent variable Y^*. The values of Y^* determine the values of the ordered variable Y as the continuous latent variable Y^* has various threshold points. That is, the value of the observed order variable Y depends on whether or not a particular threshold of Y^* has been crossed. Suppose that the outcome variable- body mass index has ordered levels "j" where the four categories for the first independent variable Y_i are underweight, normal, overweight, and obese labeled from $j = 1,2,3,4$, then the link function between these ordered levels and the coefficients can be denoted by the following equations:

$Y_i = 1 \; if \; Y_i^* \leq \alpha_1$

$Y_i = 2 \; if \; \alpha_1 < \; Y_i^* \leq \alpha_2$

$Y_i = 3 \; if \; \alpha_2 < \; Y_i^* \leq \alpha_3$

$Y_i = 4 \; if \; Y_i^* > \alpha_3$ \hfill (13)

where α represents the threshold parameter that differentiates the latent ordered structure. The estimated probability for the ordered logistic model for a given dependent variable based on the independent variables can be stated as:

$$p(y = X_k) = F\big(\alpha_j - \sum_{k=1}^{k} \beta_k X_k\big) - F\big(\alpha_{j-1} - \sum_{k=1}^{k} \beta_k X_k\big) \hfill (14)$$

The probability distribution for observing each category is expressed as

$$(\gamma \leq j) = \frac{\exp(Z_i' \alpha_j)}{1 + \exp(Z_i' \alpha_2) + \cdots + \exp(Z_i' \alpha_s)} \; for \; j = 1,2,3,4 \hfill (15)$$

Where $Z_i = \sum_{k=1}^{k} \beta_k X_{ki}$

$$P(\gamma \leq j) = \frac{\exp(\alpha_j(\beta_1 X_i + \cdots + \beta_k X_k))}{1 + \exp(\alpha_j(\beta_1 X_i + \cdots + \beta_k X_k))} \; for \; j = 1,2,3,4 \qquad (16)$$

where,

α_j = Called threshold

β_1 = Parameter

X_i = Factor of predictor

On the other hand, considering Y as the ordered dependent variable and $K + 1$ as the ordered group can be defined as:

$$P(Y \leq j) = P_1 + \cdots P_j \qquad (17)$$

The proportional odds model which is a type of the ordinal logistic model where the odds ratio are equal is independent of the variable category "j" and it is described as:

$$Odds \; (Y \leq j) = \frac{P(Y \leq j)}{1 - P(Y \leq j)} = \frac{P_1 + \cdots + P_j}{P_j + 1 \ldots + P_k + 1} \qquad (18)$$

$$logit \left(P(Y_i \leq j) \right) = \log\left(\frac{P(Y_i \leq j)}{1 - P(Y_i \leq j)} \right) = \alpha_j - X_i \boldsymbol{\beta}, j = 1,2,3,4 \qquad (19)$$

Where $P(Y_i \leq j)$ is denoted as the cumulative probability of an event $(Y_i \leq j)$. $\boldsymbol{X}_i$ represents a vector on individual and household control variables, $\boldsymbol{a}_j$ represents an unknown intercept that separates the dependent variable categories, $\boldsymbol{\beta}$ represent the vector of unknown regression parameters. The regression parameters are estimated using the maximum likelihood estimation by applying the fisher scoring iterative algorithm simultaneously for all "j".

The model assumes that the effect of $\boldsymbol{X}_i$ is identical for all three cumulative logistic models. The unknown intercept is assumed to follow $a_1 \leq a_2 \leq a_3$. The matrix of $\boldsymbol{X}_i$ contains categorical and continuous independent

variables. The model includes indicator variables that represent the various categorical levels and omit the reference category if the independent variable is categorical. The negative sign in equation (17) is used to ensure that the large values of $X_i\beta$ represent an increase in probability in the higher-numbered categories.

The cumulative logistic model is estimated by:

$$\text{Odds} (Y \leq j) = \exp(-X_i'\beta), j = 1,2,3 \tag{20}$$

For the second independent variable, the categories of Y_i are suffering, struggling and thriving labelled from j =1,2,3. The link function between these ordered levels and the coefficients can be denoted by:

$$Y_i = 1 \; if \; Y_i^* \leq \alpha_1$$

$$Y_i = 2 \; if \; \alpha_1 < Y_i^* \leq \alpha_2$$

$$Y_i = 3 \; if \; Y_i^* > \alpha_2 \tag{21}$$

The probability distribution for observing each category is expressed as

$$P(\gamma \leq j) = \frac{\exp(\alpha_j(\beta_1 X_i + \cdots + \beta_k X_k))}{1 + \exp(\alpha_j(\beta_1 X_i + \cdots + \beta_k X_k))} \; for \; j = 1,2,3 \tag{22}$$

where,

α_j = threshold

β_1= Parameter

X_i= Factor of predictor

Two post estimation tests which include oparralel test and linktest were used to check whether the assumptions of the parallel regression model were violated and to detect if there is a specification error respectively.

For the third independent variable in the study where individual is either suffering from chronic illness or not, the link function between the levels and the coefficient is different due to the binary nature of the variable and it is as follows:

$$\ln\left[\frac{p_i}{1-p_i}\right] = \alpha + x_i\beta + \omega_i\gamma + e \qquad (23)$$

Where $\ln\left[\frac{p_i}{1-p_i}\right]$ is the logistic in which p_i is the probability of individual "i" to have chronic illness, ω_i is the vector of individual and household characteristics, α is a constant term, β and γ are vectors of estimated parameters and e is residual term.

The marginal effects of the logistic regression results were estimated to help with easy interpretation. Marginal effect which can be explained at the slope of the nonlinear regression line for the control variables on the probability of obtaining an outcome is assessed while holding the values of other variables constant in the model. Marginal effect provides a good approximation of the amount of change that a 1-unit change in X_k can cause in Y.

In the case of this study as logistic models are being used, the marginal effect of X_k is given by

$$\frac{\partial \Pr(y=1)}{\partial X_k} = \frac{e^{x\beta}}{(1+e^{x\beta})^2}\frac{\partial(x\beta)}{\partial X_k} \qquad (24)$$

$$= \frac{e^{x\beta}}{(1+e^{x\beta})^2}\beta_k \qquad (25)$$

$$= \Lambda(x\beta)(1 - \Lambda(x\beta))\,\beta_k \qquad (26)$$

$$= \Pr(y = 1) \times \Pr(y = 0) \times \beta_k \qquad (27)$$

From the above formula, it can be seen that marginal effect depends on the value of all the x variables. Marginal effect measures the instantaneous rate of change

for continuous variables whilst it measures the discrete change for binary and categorical variables. Since the study considered the average marginal effects for all covariates, the command margins, dy/dx(*) was ran.

An issue identified in this study is that the main independent variable which is of high interest may be endogenous. For instance, literacy skills which has an effect on health and life satisfaction can also be affected by these dependent variables, introducing reverse causality. It can be argued the possible endogeneity which can arise because of reverse causality between the dependent variables (Body mass index, Chronic illness and Life satisfaction) and the independent variable (Literacy skills). Also, a simultaneity bias causality is a possible cause for endogeneity due to the inclusion of the control variable "level of education" which is correlated with literacy skills.

The most robust way of identifying endogeneity with cross-sectional data is to express it in the generic model in the following form:

$$H = X'\beta_1 + Lit + \varepsilon_1 \qquad\qquad \varepsilon_1 = \alpha_1 U + V_1 \qquad\qquad (28)$$

$$Lit = X'\beta_2 + \varepsilon_2 \qquad\qquad \varepsilon_2 = \alpha_2 U + V_2 \qquad\qquad (29)$$

Where Lit is an endogenous variable, H is the outcome variables, X is a vector of exogenous variables, ε_1 and ε_2 are the error terms. Here V_1 and V_2 is an iid errors, whereas U is the unobserved variable that directly influences both the dependent variables and the independent variable. The above equation can be estimated using an IV if there is an access to variable Z. Z may be either a subset of exogenous variables X or equal to X.

The study therefore adopts an IV regression model that uses heteroskedasticity-based instruments generated through Lewbel's approach (Lewbel, 2012). That is, the study uses the approach developed by Lewbel (2012) that uses endogenous explanatory variables to construct instrumental variables. The best way to correct this issue is to involve an objective methodology approach that is not restricted to the choice of variables collected at a survey and it is robust to various specifications within a framework. Let Z denote a vector of exogenous variables. Lewbel (2012) shows that $(Z - \bar{Z})\varepsilon_2$ are valid instruments for Lit under two assumptions:

$$Cov(Z, \varepsilon_2^2) \neq 0 \qquad\qquad\qquad (30)$$

$$Cov\,(Z, \varepsilon_1\varepsilon_2) = 0 \qquad\qquad\qquad (31)$$

In other words, Z is correlated with the heteroskedasticity in equation (29), but uncorrelated with the covariance between the error terms in equations (28) and (29). We can then obtain a consistent estimate of Lit using Two stage least squares (TSLS) or Generalized method of moments (GMM).

Lewbel (2012) approach is an alternative approach to construct internal instrument using data from the model. This approach is employed when there is no valid external instruments to serve as instrumental variable for the endogenous variable.

Statistical analyses are performed using STATA (SE) version 17. Statistical analysis involving descriptive statistics, ordered logistic regression model and Lewbel IV approach are fitted to model the association between BMI, chronic illness and life satisfaction as dependent variables and potential associated

61

factors as independent variables. The Rao-Scott χ^2 test of independence was used to assess the association between the dependent variables (BMI levels, chronic illness and life satisfaction) the independent variables and the covariates. This was done by adjusting for the design effect of STEP to correct for normal Pearson χ^2. Four ordered logistic regression models were applied to explore the association between literacy skills and BMI, chronic illness and life satisfaction taking the control variables into account. In model 1, literacy skills together with the control variables were included; model 2: educational levels with the control variables; model 3: both literacy skills and educational levels with the control variables and model 4: the interaction between literacy skills and educational levels with the control variables. The results are reported as coefficients with 90%, 95% and 99% confidence intervals for having chronic illness, having higher BMI and life satisfaction. Finally, as part of validation of the ordered logistic regression, parallel regression assumption was examined using oparrallel test and specification error was examined using linktest.

Conclusion

This chapter discussed the research design, approach and philosophy employed in the study. Estimation techniques employed for empirical studies of literacy skills and health and life satisfaction relationship were also discussed in this chapter. Considering the data set available and the scope of this study, the ordinal model, specifically the ordered logistic regression model is selected for the analysis. the chapter further discusses the theoretical and empirical models that anchor the study. Though Smith and Kington 1997's model of health

62

production function is based on the classic Grossman model, it provides a detailed

relationship between education and health whilst it is devoid of complexities. The

model is adopted and modified to suit the investigation into the effect of literacy

skills on selected health outcomes and life satisfaction of adults in Ghana. Other

explanatory variables included in the model were also discussed in this chapter.

The last section of this chapter describes the data that is used for the empirical

analysis and estimations.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter constitutes the results obtained, its analyses, and discussion. This chapter starts with the descriptive statistics of the study, followed by the description of the dimensions and levels of the independent variable, then the analysis of the data using four (4) models and finally discusses the ordered logistic regression and Lewbel IV regression results.

Descriptive Statistics

In this study, out of the 1,745 respondents, the proportion of respondents who were found to be underweight and normal weight was 6.97% and 48.07% respectively. Also, 29.34% and 15.62% of the population are overweight and obese respectively. The results show that major number of the respondents have a normal weight. Due to this, it can be said that the risks of developing obesity related chronic illness is low among this population. 1,544 (88.99%) respondents out of 1,735 (100%) reported that they do not have chronic illness compared to 191 (11.01%) respondents who reported to have chronic illness. This shows that just a few number of people reported to have developed chronic illness in the country. Among the 1,735 respondents, 27.27%, 33.83% and 38.44% are in the struggling, suffering and thriving categories of the Cantril's Self-Anchoring Ladder of Life Satisfaction scale.

64

Table 3: Descriptive statistics of health outcomes and life satisfaction (n, %)

Variable	Description of variable	Frequency	Percentage
Body mass index	Underweight	121	6.97
	Normal weight	834	48.07
	Overweight	509	29.34
	Obese	271	15.62
Chronic illness	No	1544	88.99
	Yes	191	11.01
Life satisfaction	Struggling	481	27.27
	Suffering	587	33.83
	Thriving	667	38.44

Source: Author's Construct

Distribution of dependent variables across demographic characteristics is presented and analysed in this section. Tables 4-6 illustrates the distribution of Body Mass Index, Chronic illness and Life Satisfaction across different individual characteristics.

Over all the prevalence of obesity was very high amongst Ghanaian respondents who scored 0 in the core literacy test (29.52%) and very low amongst those who scored 4 in the core literacy test (2.21%). It was highest among respondents whose proficiency level was below 1 and lowest among respondents whose proficiency level was 4. Respondents who are interested in reading are more obese (75.28%) than those who do not read (24.72%) (Table 4). The prevalence of obesity is observed to be high amongst respondents who passed the

65

literacy tests with very low scores. The findings indicate a statistically significant relationship between the various dimensions and levels of literacy skills and the body weight of the respondents.

The prevalence of obesity for the respondents in Ghana aged between 55 and 64 years was 19.19%. The prevalence of obesity was higher (21.77%) among participants aged 25 – 34 years and decreased among respondents aged 15-24 years (16.97%). Respondents aged 45-54 years have the highest prevalence of obesity (42.07%). Gender differences showed that females experience the highest prevalence of obesity (66.05%) compared to males (33.95%). More female respondents are more obese than the male respondents. Females are mostly obese compared to males because females tend to have a high percentage of body fat. This is consistent with results from previous research findings. Respondents who had basic education were relatively the most obese (42.44%). Followed by respondents who have high school education (25.09%), then respondents who had tertiary education (22.14%) and finally respondents who had no education (10.33%). Obesity was more common among the married and cohabiting (46.86%) than the never married/single (40.59%), and divorced/separated/widowed (12.55%). This suggest that marriage is a contributing factor to obesity amongst Ghanaian respondents.

Mean wage per hour for respondents who are obese is -0.231. Mean working hour for respondents who are obese is 40.310. That is on the average, higher wages decrease the obesity rate among respondents as longer working hours increase the obesity rate. The prevalence of obesity is higher among

66

respondents who have registered and purchased life insurance policy (79.70%) than respondents who are insurers (20.30%). The occurrence of obesity was less among respondents whose jobs do not require any physical activity and jobs which also acquire high physical activity (10.33% and 23.25% respectively) but high among individuals who are engaged in low and medium physical activity at work (30.26 and 36.16 respectively) (Table 3).

Table 4: Prevalence of BMI by regressors and baseline characteristics of respondents (n=1,735)

Variable	Description of Variable	Body Mass Index (n, %)				Chi-square	p-value
		Underweight N=121	Normal weight N=834	Overweight N=509	Obese N=271		
Core Literacy	0	35(28.93)	238 (28.54)	196 (38.51)	80 (29.52)	90.8743	0.000
	1	10 (8.26)	29 (3.48)	31 (6.09)	15 (5.54)		
	2	5 (4.13)	42 (5.04)	15 (2.95)	13 (4.80)		
	3	15(12.40)	53 (6.35)	38 (7.74)	4 (1.48)		
	4	11 (9.09)	28 (3.36)	14 (2.75)	6 (2.21)		
	5	5 (4.13)	70 (8.39)	40 (7.86)	20 (7.38)		
	6	14 (11.57)	92 (11.03)	34 (6.68)	34 (12.55)		
	7	8 (6.61)	110 (13.19)	46 (9.04)	56 (20.66)		
	8	18 (14.88)	172 (20.62)	95 (18.66)	43 (15.87)		
Proficiency	Below level 1	72 (59.50)	379(45.44)	289(56.78)	123 (45.39)	39.7898	0.000
	Level 1	12 (9.92)	172 (20.62)	86 (16.90)	55 (20.30)		
	Level 2	25 (20.66)	231 (27.70)	89 (17.49)	71 (26.20)		
	Level 3	12 (9.92)	51 (6.12)	45 (8.84)	22 (8.12)		
	Level 4	0 (0.00)	1(0.12)	0 (0.00)	0 (0.00)		
Reading	No	30 (24.79)	145 (17.39)	141 (27.70)	67 (24.72)	21.6510	0.000
	Yes	91 (75.21)	689(82.61)	368 (72.30)	204 (75.28)		
Age	15-24	44(36.36)	153 (18.35)	41 (8.06)	46 (16.97)	121.4675	0.000
	25-34	46 (38.02)	306(36.93)	183 (35.95)	59 (21.77)		
	45-54	20 (16.53)	306 (36.69)	241 (47.35)	114 (42.07)		
	55-64	11 (9.09)	67 (8.03)	44 (8.64)	52 (19.19)		
Gender	Male	60 (49.59)	559(67.03)	257 (50.49)	92 (33.95)	102.7908	0.000
	Female	61 (50.41)	275 (32.97)	252 (49.51)	179 (66.05)		
Level of education	No education	8 (6.61)	45(5.40)	51 (10.02)	28 (10.33)	36.4770	0.000
	Basic	71 (58.68)	353 (42.33)	228 (24.79)	115 (42.44)		
	High School	20 (16.53)	275 (32.97)	154 (30.26)	68 (25.09)		
	Tertiary	22 (18.18)	161(19.30)	76 (14.93)	60 (22.14)		
	Married/Cohabitation	62 (51.24)	402 (48.20)	316 (62.08)	127 (46.86)	31.9992	0.000

	Divorced/Separated / Widowed	11 (9.09)	73 (8.75)	35 (6.88)	34 (12.55)		
	Never married/Single	48 (39.67)	359(43.05)	158 (31.04)	110 40.59)		
Occupation type	High skilled white-collar job	19 (15.70)	243(29.14)	128 (25.15)	76 (28.04)	75.3585	0.000
	Low skilled white-collar job	59 (48.76)	246 (29.50)	187 (36.74)	128 (47.23)		
	Crafts and trade job	31 (25.62)	239 (28.66)	134 (26.33)	50 (18.45)		
	Elementary occupation	6 (4.96)	72 (8.63)	19 (3.73)	15 (5.54)		
	Skilled agriculture job	6 (4.96)	34 (4,08)	41 (8.06)	2 (0.74)		
Wages (mean)		0.244	0.394	0.450	-0.231		0.000
Socioeconomic status	Low SES	24 19.83)	152 (18.23)	119 (56.97)	36 (13.28)	19.5101	0.003
	Middle SES	82 (67.77)	517 (61.99)	290 (27.46)	167 (61.62)		
	High SES	15 (12.40)	165 19.78)	100 (19.65)	68 (25.09)		
Working hours (mean)		46.727	45.299	44.379	40.309		0.0117
Shocks	No shocks	60 49.59)	400 (7.96)	278 (54.62)	147 (54.24)	9.8981	0.129
	One shock	33 (27.27)	262 (31.41)	126 (24.75)	76 (28.04)		
	Two or more shock	28 (23.14)	172 (20.62)	105 (20.63)	48 (17.71)		
Life insurance	No	96 (79.34)	688 (82.49)	432 (84.87)	216 (79.70)	4.2936	0.231
	Yes	25 (20.66)	146 (17.51)	77 (15.13)	55 (20.30)		
Health insurance	No	55 (45.45)	323 (38.73)	160 (31.43)	48 (17.71)	49.0375	0.000
	Yes	66 (54.55)	511 (61.27)	349 (68.57)	223 (82.29)		
Physical activity	No activity	3 (2.48)	46 (5.52)	19 (3.73)	28 (10.33)	50.7032	0.000
	Low	63 (52.07)	280 (33.57)	187 (36.74)	82 (30.26)		
	Medium	22 (18.18)	226 (27.10)	127 (24.95)	98 (36.16)		
	High	33 (27.27)	282 (33.81)	176 (34.58)	63 (23.25)		

Source: Author's Construct

69

Table 5: Prevalence of chronic illness by regressors and baseline characteristics of respondents.

Variable	Description of Variable	Chronic Illness (n, %) Doesn't have N=1544	Have N=191	Chi-square	p-value
Core Literacy	0	496 (32.12)	53 (27.75)	19.5928	0.012
	1	81 (5.25)	4 (2.09)		
	2	72 (4.66)	3 (1.57)		
	3	96 (6.22)	14 (7.33)		
	4	48 (3.11)	11 (5.76)		
	5	111 (7.19)	24 (12.57)		
	6	155 (10.04)	19 (9.95)		
	7	191 (12.37)	29 (15.18)		
	8	294 (19.04)	34 (17.80)		
Proficiency	Below level 1	783 (50.71)	80 (41.88)	7.5286	0.110
	Level 1	280 (18.13)	45 (23.56)		
	Level 2	362 (23.45)	54 (28.27)		
	Level 3	118 (7.64)	12 (6.28)		
	Level 4	1 (0.06)	0 (0.00)		
Reading	No	342 (22.5)	41 (21.47)	0.0463	0.830
	Yes	1,202 (77.85)	150 (78.53)		
Age	15-24	279 (18.07)	5 (2.62)	247.6235	0.000
	25-34	573 (37.11)	23 (12.04)		
	45-54	594 (38.47)	87 (25.55)		
	55-64	98 (6.35)	76 (39.79)		
Gender	Male	862 (55.83)	106 (55.50)	0.0076	0.931
	Female	682 (44.17)	85 (44.50)		
Educational level	No education	126 (8.16)	6 (3.14)	7.9739	0.047
	Basic	675 (43.72)	92 (48.17)		
	High School	465 (30.12)	52 (27.23)		
	Tertiary	278 (18.01)	41 (21.47)		
Marital status	Married/Cohabitation	821 (53.17)	86 (45.03)	8.0850	0.018
	Divorced/Separated/ Widowed	127 (8.23)	26 (13.61)		
	Never married/Single	596 (38.60)	79 (41.36)		

70

Occupation type	High skilled white-collar job	412 (26.68)	54 (28.27)	3.3910	0.495
	Low skilled white-collar job	546 (35.36)	74 (38.74)		
	Crafts and trade job	406 (26.30)	48 (25.13)		
	Elementary occupation	102 (6.61)	10 (5.24)		
	Skilled agriculture job	78 (5.05)	5 (2.62)		
Wages (mean)		0.309	0.249		0.7962
Socioeconomic status	Low SES	297 (19.24	34 (17.80)	1.2352	0.539
	Middle SES	943 (61.08)	113 (59.16)		
	High SES	304 (19.69)	44 (23.04)		
Working hours (mean)		44.357	44.287		0.9688
Shocks	No shocks	774 (50.13)	111 (58.12)	8.1468	0.017
	One shock	459 (29.73)	38 (19.90)		
	Two or more shock	311 (20.14)	42 (21.99)		
Life insurance	No	1,268 (82.12)	164 (85.86)	1.6490	0.199
	Yes	276 (17.88)	27 (14.14)		
Health insurance	No	554 (35.88)	32 (16.75)	27.8004	0.000
	Yes	990 (64.12)	159 (83.25)		
Physical activity	No activity	85 (5.51)	11 (5.76)	19.8897	0.000
	Low	56 (34.72)	76 (39.79)		
	Medium	404 (26.17)	69 (36.13)		
	High	519 (33.61)	35 (18.32)		

Source: Author's Construct

Table 6: Descriptive statistics of life satisfaction across regressors and baseline characteristics of respondents

Variable	Description of Variable	Life satisfaction			Chi-square	p-value
		Suffering N=481	Struggling N=587	Thriving N=667		
Core Literacy	0	179 (37.21)	176 (29.98)	194 (29.09)	90.8743	0.000
	1	31 (6.44)	34 (5.79)	20 (3.00)		
	2	30 (6.24)	29 (4.94)	16 (2.40)		
	3	24 (4.99)	44 (7.50)	42 (6.30)		
	4	28 (47.46)	12 (2.04)	19 (2.85)		
	5	32 5.82)	67 (11.41)	36 (5.40)		
	6	46 (9.56)	58 (9.88)	70 (10.49)		
	7	36 (7.48)	77 (13.12)	107 (16.04)		
	8	75 (215.59)	90 (15.33)	163 (24.44)		
Proficiency	Below level 1	292 (60.71)	269 (45.83)	302 (45.28)	39.7898	0.000
	Level 1	94 (19.54)	127 (21.64)	104 15.59)		
	Level 2	76 (15.80)	155 (26.41)	185 (27.74)		
	Level 3	19 (3.95)	35 (5.96)	76 (11.39)		
	Level 4	0 (0.00)	1 (0.17)	0 (0.00)		
Reading	No	134 (27.86)	118 (20.10)	131 (19.64)	21.6510	0.000
	Yes	347 (72.14)	469 (79.90)	536 (80.36)		
Age	15-24	99 (20.58)	78 (13.29)	107 (16.04)	121.4675	0.000
	25-34	173 (35.97)	222 (37.82)	201 (30.13)		
	45-54	188 (39.09)	241 (41.06)	252 (37.78)		
	55-64	21 (4.37)	46 7.84)	107 (16.04)		
Gender	Male	266 (55.30)	363 (61.84)	339 (50.82)	102.7908	0.000
	Female	215 (44.70)	224 (38.16)	328 (49.18)		
Educational level	No education	55 (11.43)	40 (6.81)	37 (5.55)	36.4770	0.000
	Basic	251 (52.18)	259 (44.12)	257 (38.53)		
	High School	134 (27.86)	187 (31.86)	196 (29.39)		
	Tertiary	41 (8.52)	101 (17.21)	177 (26.54)		
Marital status	Married/Cohabitation	264 (54.89)	297 (50.60)	346 (51.87)	31.9992	0.000
	Divorced/Separated/	43 (8.94)	53 (9.03)	57 (8.55)		

	Widowed					
	Never married/Single	174 (36.17)	237 (40.37)	264 (39.58)		
Occupation type	High skilled white-collar job	78 (16.22)	159 (27.09)	245 (34.33)	75.3585	0.000
	Low skilled white-collar job	192 (39.92)	183 (31.18)	245 (36.73)		
	Crafts and trade job	129 (26.82)	175 (29.81)	150 (22.49)		
	Elementary occupation	44 (9.15)	43 (7.33)	25 (3.75)		
	Skilled agriculture job	38 (7.90)	27 (4.60)	18 (2.70)		
Wages (mean)		0.234	0.441	0.229		0.0145
Socioeconomic status	Low SES	159 (33.06)	109 (18.57)	63 (9.45)	19.5101	0.003
	Middle SES	249 (51.77)	391 (66.61)	416 (62.37)		
	High SES	73 (15.18)	87 (14.82)	188 (28.19)		
Working hours (mean)		45.474	46.171	41.936		
Shocks	No shocks	211 (43.87)	258 (43.95)	416 (62.37)	9.8981	0.129
	One shock	150 (31.19)	194 (33.05)	153 (22.94)		
	Two or more shock	120 (24.95)	135 (23.00)	98 (14.69)		
Life insurance	No	420 (87.32)	470 (80.07)	542 (81.26)	4.2936	0.231
	Yes	61 (12.68)	117 (19.93)	125 (18.74)		
Health insurance	No	209 (43.45)	184 (31.35)	193 (28.94)	49.0375	0.000
	Yes	272 (56.55)	403 (68.65)	474 (71.06)		
Physical activity	Skill not used	21 (4.37)	42 (7.16)	33 (4.95)	50.7032	0.000
	Low	164 (34.10)	202 (34.41)	246 (36.88)		
	Medium	134 (27.86)	156 (26.58)	183 (27.44)		
	High	162 (33.68)	187 (31.86)	205 (3073)		

Source: Author's Construct

Overall the prevalence of chronic illness was very high amongst Ghanaian respondents who scored 0 in the core literacy test (27.75%) and very low amongst those who scored 2 in the core literacy test (2.21%). Chronic was highest among respondents whose proficiency level was below 1 (41.88%) and lowest among respondents whose proficiency level was 4 (0.00%). Respondents who are interested in reading are more chronically ill (78.53%) than those who do not read (21.47%) (Table 3). This suggest the prevalence of chronic illness is high amongst respondents with lower literacy skills.

The occurrence of chronic illness among the respondents aged 25-54 years was 12.04%. The prevalence of chronic illness is higher (39.79%) among respondents aged between 55 and 64 years but significantly lower among respondents aged 15-24 years (2.62%). Respondents aged 45-54 years had the highest prevalence of obesity (42.07%). This suggests middle aged respondents are prone to developing chronic illness compared to the old aged respondents. Gender differences indicate that males experienced the highest prevalence of chronic illness (55.50%). Males compared to females are mostly involved in strenuous and physically demanding jobs which could cause chronic illness. Respondents belong to the high school level category have the highest prevalence of chronic illness (48.17%) compared to those with no educational level having the lowest prevalence (3.14%).

In addition, chronic illness was highest among low skilled white-collar workers (38.74%) and lowest among skilled agriculture (2.62%). This could be due to the physically exhausting nature of the jobs that low-skilled white-collar

workers are involved in. The prevalence of chronic illness is highest among respondents who have not experienced any economic shocks and lowest among respondents who have experienced only one economic shock. The prevalence of chronic illness was relatively lower among respondents who do not have health insurance (16.75%) compared to those who have health insurance (83.25%). Majority of respondents who are covered by the health insurance scheme have developed chronic illness compared to those who have not covered by the scheme.

Life satisfaction is categorized into suffering, struggling and thriving. Nonetheless, there are some gender differences. As shown in Table 6, suffering as the worst level of life satisfaction is highest for respondents aged 45-54 years (39.09%) and lowest for respondents aged 55-64 years (4.37%). This suggests that the older respondents are less likely to suffer or be less satisfied in life than middle aged respondents as the older respondents are less likely to be obese and to develop chronic illnesses.

About 55 percent of males and 45 percent of females report that they are at the bottom of the life satisfaction ladder and are suffering while 51 percent of males and 49 percent of females report thriving life. This interestingly suggests that higher number of males fall in all the three categories of life satisfaction than females. Respondents who had basic education are found to be thriving (38.53%) than those who had high school education (29.39%), followed by those who had tertiary education (26.54%) and then those who had no education (5.55%). The proportions of adults who are thriving in life and constitute the low, middle and

75

high socioeconomic status (SES) categories are 9.45%, 62.37% and 28.19% respectively. Whilst those suffering in life who constitute the low, middle and high (SES) categories are 33.06%, 51.77% and 15.18% respectively. It is also shown that a higher fraction of the thriving respondents have experienced no economic shocks (62.37%), followed by those who have experienced just one economic shock (22.94%) and then those who have experienced two or more economic shocks (14.69%). In terms of health insurance, 71.06% of respondents who are thriving in life are covered by health insurance and 28.94% of those thriving in life are not covered by health insurance. Meanwhile, 43.45% of respondents who are struggling in life are not covered and 56.55% of respondents who are struggling un life are covered by health insurance.

Dimensions and levels of Literacy

In this study, three dimensions of literacy skills are used according to PIAAC assessment. The dimensions include reading skills, core literacy skills and proficiency scales/levels. The reading skills of respondents are assessed based on whether or not they can read and comprehend reading materials they are given from a broad range of settings that are familiar to the participants. Therefore, the reading texts include contexts such as home and family, health and safety, community and citizenship, work and training, education, and leisure and recreation. Reading skills is categorized into two levels: 1. Adults who cannot read and 2. Adults who read.
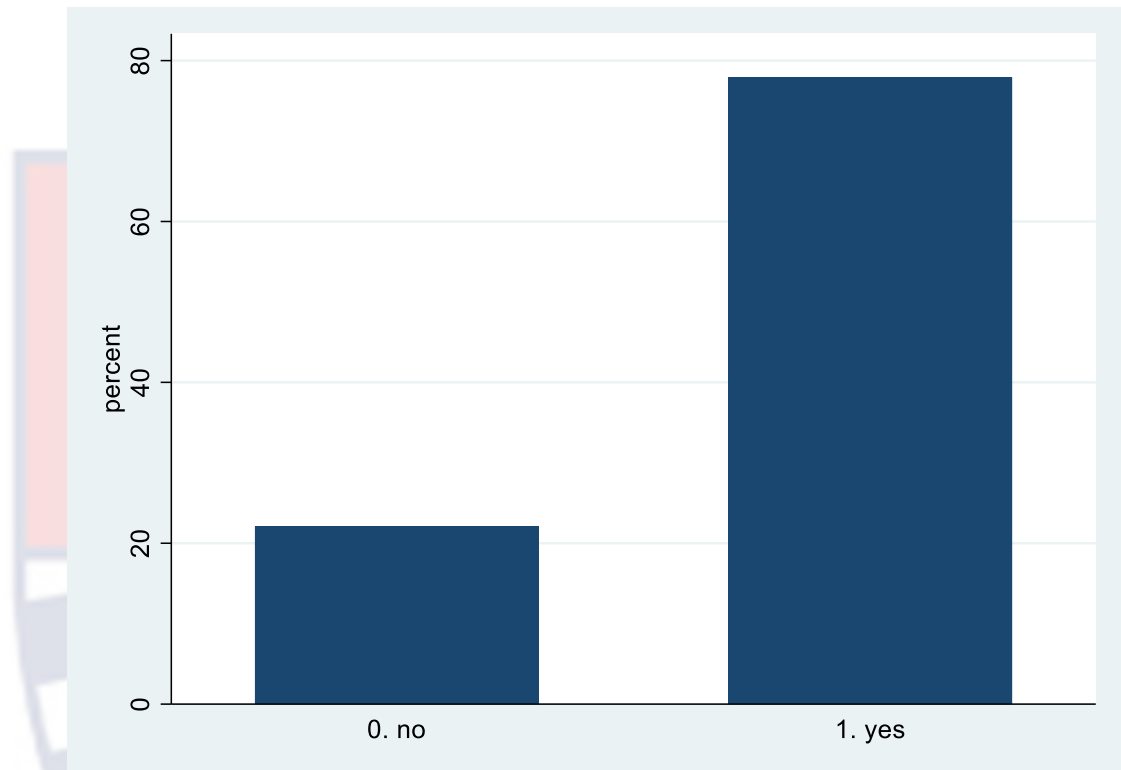
Figure 2: The levels of Reading skills

Source: Author's Construct

     Core literacy skills included a set of eight literacy items that could be used to differentiate between persons who were less literate from those who are more literate. After calculating the respondent's overall score on the Core items, interviewers either stopped the administration if they did not receive a passing score of at least three correct answers or gave the respondent a pre-assigned exercise booklet so they could continue in the case that the respondent passed (Valerio, 2014). Only passed scores were used in this analysis and these scored were calculated in percentages and categorized into the following levels: 1. Fail 2. Satisfactory 3. Good 4. Very good
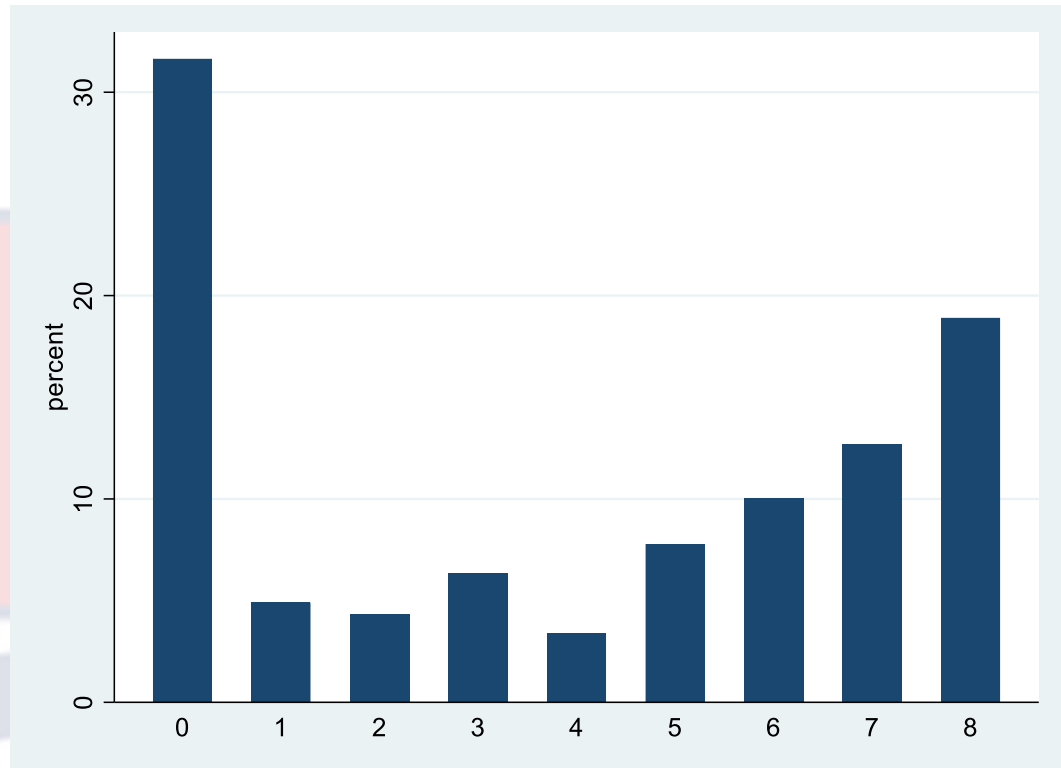
Figure 3: The levels of Core Literacy

Source: Author's Construct

The PIAAC literacy items used to evaluate proficiency "were developed and selected to represent three major aspects of processing continuous and noncontinuous texts and documents: accessing and identifying, integrating and interpreting, and reflecting on and evaluating information" (Tamassia & Lennon, 2013, p. 3). Proficiency was used to adequately measure the skills of adults with differing educational backgrounds and life experiences where he tasks which were included ranged from very easy to very challenging. For the present study, the average of the 10 plausible values was taken for each respondent and represented their final literacy score. Plausible values range from 0 to 500. The scores are divided into six categories: below level 1, level 1, level 2, level3, level 4 and level

78

5, corresponding with proficiency. The categories were recoded into five: below level 1, level 1, level 2, level 3 and level 4 in line with previous studies (Long & Jacobsen, 2018). Thus, level 5 is included in level 4 due to limited data. Belo level 1 represents the lowest proficiency score, while level 4 represents the higher score.
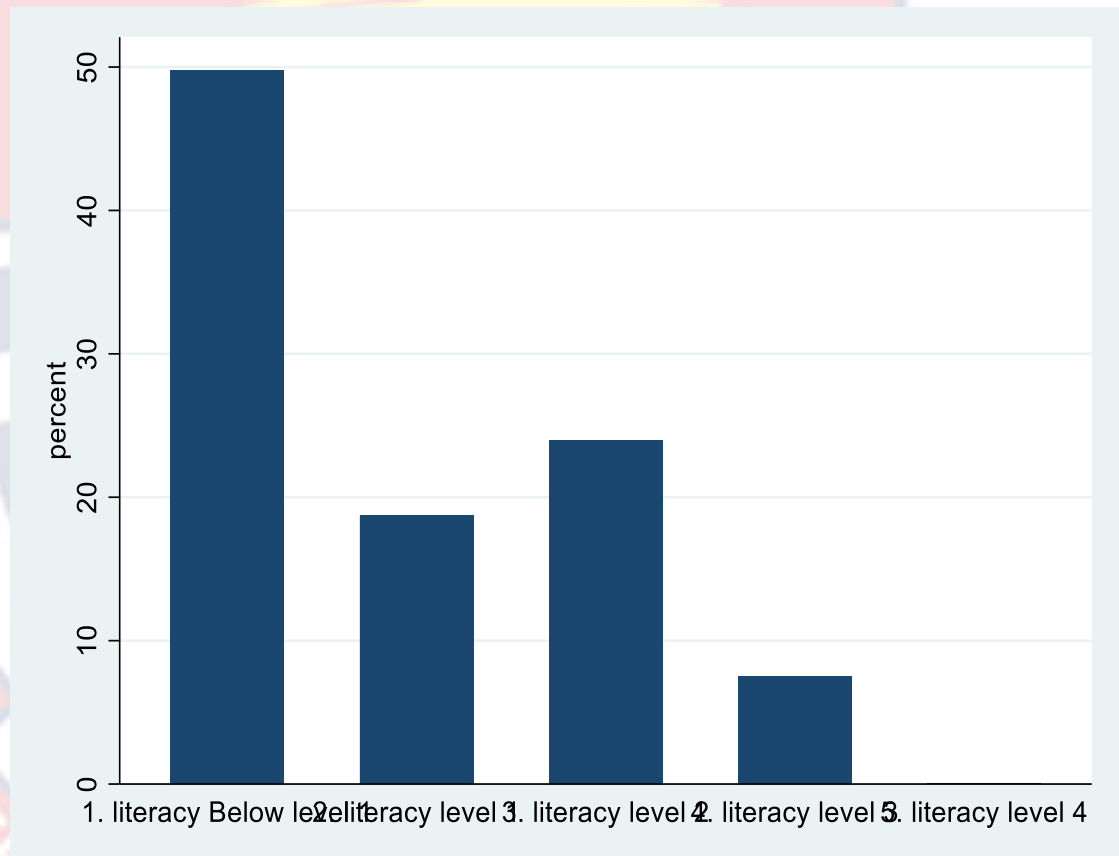
Figure 4: The levels of Proficiency

Source: Author's Construct

Four separate models have been carried out and the marginal effects are presented in Tables 7, 8 and 9. Again, the ordered logit estimations of literacy skills on the health and life satisfaction outcomes are reported in appendices. This is done together with the discussions of the results. That is, the models reflect the influence of literacy skills on body mass index, chronic illness and life satisfaction (Model 1), the influence of educational levels (Model 2), the influence of both literacy and educational levels (Model 3) and the interacting effect of literacy and educational levels (Model 4). Each regression model controls for the effect of educational level, age, gender, marital status, occupation type, wages, socioeconomic status, working hours, economic shocks, life insurance, health insurance and physical activity at work.

The tables report the value of the marginal effect of each variable on the probability of being an underweight, normal weight, overweight, obese, chronically ill, not chronically ill, sufferer, struggler or thriver. This allows a straightforward interpretation of the values in the tables as percentage point changes in these probabilities. The estimation for each of health and life satisfaction outcomes reports the coefficients, standard errors as well as their significance.

80

Table 7: Marginal effects for respondents sampled at the various categories of Body Mass Index (indexed literacy skills) based on the 4 models

	(1) Underweight	(2)	(3)	(4)	(1) Normal weight	(2)	(3)	(4)
Literacy	-0.003		-0.008*	-0.003	-0.007		-0.020*	-0.006
	(0.004)		(0.005)	(0.004)	(0.010)		(0.012)	(0.010)
Educational level								
Basic		0.024***	0.025***	-0.011		0.080**	0.091***	-0.011***
		(0.009)	(0.008)	(0.007)		(0.033)	(0.034)	(0.004)
High School		0.022**	0.030***	-0.011		0.073**	0.102***	-0.013***
		(0.010)	(0.010)	(0.007)		(0.036	(0.039)	(0.004)
Tertiary		0.037***	0.048***	-0.007		0.109***	0.140***	-0.004
		(0.014)	(0.015)	(0.008)		(0.040)	(0.043)	(0.003)
Age								
25-34	0.031**	-0.029**	-0.032**	-0.031**	-0.048**	-0.045**	-0.049***	-0.048***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.019)	(0.019)	(0.019)	(0.019)
45-54	-0.061***	-0.059***	-0.063***	-0.063***	-0.139***	-0.136***	-0.140***	-0.140***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.021)	(0.021)	(0.021)	(0.021)
55-64	-0.074***	-0.071***	-0.076***	-0.075***	-0.198***	-0.195***	-0.199***	-0.196***
	(0.0154)	(0.014)	(0.014)	(0.014)	(0.033)	(0.034)	(0.033)	(0.033)
Gender								
Male	0.040***	0.037***	0.039***	0.039***	0.116***	0.106***	0.113***	0.114***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.018)	(0.019)	(0.019)	(0.019)
Marital status								
Divorced/Separated	0.016	0.016	0.016	0.016	0.038	0.036	0.038	0.038
/Widowed	(0.013)	(0.013)	(0.013)	(0.013)	(0.026)	(0.026)	(0.026)	(0.026)
Never	0.005	0.003	0.004	0.004	0.013	0.009	0.011	0.011
married/Single	(0.006)	(0.006)	(0.006)	(0.006)	(0.016)	(0.016)	(0.016)	(0.016)
Occupation type								
Low skilled white	-0.001	0.007	0.004	0.004	-0.004	0.019	0.011	0.011
collar	(0.008)	(0.008)	(0.009)	(0.009)	(0.023)	(0.025)	(0.026)	(0.025)
Crafts and trade	0.012	0.021**	0.017*	0.017	0.029	0.055**	0.044*	0.043
	(0.009)	(0.009)	(0.010)	(0.010)	(0.024)	(0.026)	(0.026)	(0.026)

81

Elementary occupations	0.017 (0.016)	0.030* (0.017)	0.028* (0.017)	0.026 (0.017)	0.041 (0.034)	0.073** (0.034)	0.065* (0.034)	0.062* (0.034)
Skilled Agriculture	0.005 (0.016)	0.021 (0.017)	0.015 (0.016)	0.013 (0.017)	0.014 (0.041)	0.056 (0.039)	0.039 (0.041)	0.035 (0.041)
Wages (log)	0.002** (0.001)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)	0.006** (0.003)	0.005* (0.003)	0.005* (0.003)	0.005* (0.003)
Socioeconomic status								
Middle SES	0.004 (0.008)	0.001 (0.008)	0.001 (0.008)	0.002 (0.008)	0.011 (0.020)	0.004 (0.019)	0.003 (0.020)	0.006 (0.020)
High SES	-0.010 (0.009)	-0.014 (0.009)	-0.014 (0.009)	-0.014 (0.009)	-0.030 (0.025)	-0.041 (0.025)	-0.041 (0.025)	-0.039 (0.025)
Working hours	0.000* (0.000)	0.000** (0.000)	0.000** (0.000)	0.000** (0.000)	0.001** (0.000)	0.008** (0.000)	0.001** (0.000)	0.001** (0.000)
Number of shocks								
One shock	0.002 (0.007)	0.002 (0.008)	0.002 (0.007)	0.001 (0.007)	0.006 (0.018)	0.004 (0.018)	0.004 (0.018)	0.004 (0.018)
Two or more shocks	-0.002 (0.008)	-0.002 (0.008)	-0.003 (0.008)	-0.003 (0.008)	0.004 (0.020)	-0.005 (0.020)	-0.008 (0.020)	-0.009 (0.020)
Life insurance								
Yes	0.012 (0.009)	0.008 (0.008)	0.009 (0.009)	0.010 (0.009)	0.029 (0.019)	0.019*** (0.021)	0.022 (0.020)	0.024 (0.020)
Health insurance								
Yes	-0.028*** (0.007)	-0.030*** (0.007)	-0.029*** (0.007)	-0.029*** (0.007)	-0.070*** (0.017)	-0.075*** (0.017)	-0.072*** (0.017)	-0.072*** (0.017)
Physical activity at work								
Low	0.028** (0.012)	0.026** (0.012)	0.026** (0.012)	0.028** (0.012)	0.076** (0.038)	0.070* (0.038)	0.071* (0.038)	0.073* (0.038)
Medium	0.007 (0.011)	0.006 (0.012)	0.006 (0.112)	0.006 (0.011)	0.022 (0.040)	0.019 (0.039)	0.018 (0.039)	0.020 (0.039)
High	0.012 (0.012)	0.012 (0.117)	0.012 (0.012)	0.013 (0.012)	0.039 (0.040)	0.038 (0.039)	0.037 (0.039)	0.039 (0.039)

Table 7 continued

	(1) Overweight	(2)	(3)	(4)	(1) Obese	(2)	(3)	(4)
Literacy	0.004		0.012*	0.004	0.005		0.015*	0.003
	(0.006)		(0.007)	(0.006)	(0.007)		(0.009)	(0.008)
Educational level								
Basic		-0.039***	-0.040***	0.015*		-0.065**	-0.076**	0.006**
		(0.013)	(0.012)	(0.008)		(0.029)	(0.031)	(0.003)
High School		-0.035**	-0.046***	0.016*		-0.059*	-0.085**	0.008**
		(0.015)	(0.015)	(0.010)		(0.031)	(0.035)	(0.003)
Tertiary		-0.059***	-0.074***	0.010		-0.087**	-0.114***	0.002
		(0.020)	(0.021)	(0.010)		(0.034)	(0.038)	(0.002)
Age								
25-34	0.045**	0.042**	0.046**	0.045**	0.034**	0.032**	0.035***	0.034**
	(0.019)	(0.019)	(0.019)	(0.018)	(0.013)	(0.014)	(0.013)	(0.013)
45-54	0.100***	0.097***	0.102***	0.101***	0.099***	0.098***	0.102***	0.102***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.015)	(0.015)	(0.015)	(0.015)
55-64	0.122***	0.119***	0.123***	0.122***	0.150***	0.148***	0.151***	0.149***
	(0.020)	(0.019)	(0.019)	(0.020)	(0.028)	(0.028)	(0.028)	(0.028)
Gender								
Male	-0.070***	-0.064***	-0.068***	-0.069***	-0.086***	-0.078***	-0.084***	-0.084***
	(0.012)	(0.011)	(0.012)	(0.012)	(0.014)	(0.014)	(0.014)	(0.014)
Marital status								
Divorced/Separated /Widowed	-0.025	-0.024	-0.025	-0.026	-0.029	-0.028	-0.029	-0.029
	(0.018)	(0.018)	(0.019)	(-0.019)	(0.020)	(0.019)	(0.020)	(0.020)
Never	-0.008	-0.006	-0.006	-0.007	-0.010	-0.007	-0.008	-0.009

married/Single	(0.010)	(0.010)	(0.010)	(0.010)	(0.013)	(0.013)	(0.013)	(0.013)
Occupation type								
Low skilled white collar	0.002	-0.011	-0.006	-0.006	0.003	-0.015	-0.009	-0.008
	(0.013)	(0.014)	(0.014)	(0.014)	(0.018)	(0.019)	(0.020)	(0.020)
Crafts and trade	-0.019	-0.034**	-0.028*	-0.027*	-0.022	-0.042**	-0.034*	-0.033
	(0.015)	(0.016)	(0.016)	(0.016)	(0.018)	(0.020)	(0.020)	(0.020)
Elementary occupations	-0.027	-0.048*	-0.043*	-0.041*	-0.031	-0.056**	-0.049*	-0.047*
	(0.024)	(0.025)	(0.025)	(0.025)	(0.025)	(0.026)	(0.026)	(0.026)
Skilled Agriculture	-0.009	-0.034	-0.024	-0.021	-0.011	-0.043	-0.030	-0.027
	(0.025)	(0.026)	(0.027)	(0.026)	(0.031)	(0.029)	(0.031)	(0.031)
Wages	-0.004**	-0.003*	-0.003*	-0.003*	-0.005**	-0.004*	-0.004*	-0.004*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.000)	(0.002)	(0.002)	(0.002)
Socioeconomic status								
Middle SES	-0.007	-0.003	-0.002	-0.004	-0.008	-0.003	-0.002	-0.004
	(0.012)	(0.013)	(0.013)	(0.012)	(0.015)	(0.015)	(0.015)	(0.015)
High SES	0.017	0.023	0.023	0.022	0.023	0.032	0.032	0.031
	(0.014)	(0.014)	(0.014)	(0.014)	(0.020)	(0.019)	(0.020)	(0.020)
Working hours	-0.0004*	-0.000**	-0.0005**	-0.0004**	-0.0005**	-0.000**	-0.001**	-0.001**
	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of shocks								
One shock	-0.004	-0.003	-0.003	-0.002	-0.005	-0.003	-0.003	-0.003
	(0.011)	(0.011)	(0.011)	(0.011)	(0.014)	(0.014)	(0.014)	(0.014)
Two or more shocks	0.003	0.003	0.005	0.005	0.003	0.004	0.006	0.007
	(0.012)	(0.012)	(0.012)	(0.012)	(0.016)	(0.016)	(0.016)	(0.016)
Life insurance								
Yes	-0.019	-0.012	-0.014	-0.015	-0.022	-0.015	-0.017	-0.018
	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.012)	(0.016)	(0.015)
Health insurance								

84

Yes	0.047***	0.050***	0.048***	0.048***	0.051***	0.055***	0.053***	0.053***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Physical activity at work								
Low	-0.045**	-0.042**	-0.042**	-0.043**	-0.059*	-0.054*	-0.055*	-0.056*
	(0.019)	(0.019)	(0.019)	(0.019)	(0.031)	(0.031)	(0.031)	(0.031)
Medium	-0.011	-0.009	-0.009	-0.010	-0.018	-0.015	-0.015	-0.017
	(0.019)	(0.019)	(0.019)	(0.019)	(0.032)	(0.032)	(0.032)	(0.032)
High	-0.020	-0.020	-0.020	-0.021	-0.031	-0.029	-0.030	-0.031
	(0.019)	(0.019)	(0.019)	(0.019)	(0.032)	(0.032)	(0.032)	(0.032)

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Base: Age=15-24; Gender=female; Educational level=no education; Marital status=married; Occupation type= highly skilled white collar; Socioeconomic status=low SES; Index of the number of shocks=no shocks; Life insurance=no; Health insurance=no; Physical activity=skill not used

Source: Author's Construct

85

Table 8: Marginal effects for respondents sampled at the various categories of Chronic illness (indexed literacy skills) based on the 4 models

	(1)	(2)	(3)	(4)
	Have Chronic illness			
Literacy	0.022**		0.025**	0.021**
	(0.009)		(0.010)	(0.009)
Educational level				
Basic		0.049**	0.045	-0.035
		(0.025)	(0.026)	(0.033)
High School		0.053**	0.024	-0.039
		(0.027)	(0.033)	(0.034)
Tertiary		0.057*	0.026	-0.039
		(0.033)	(0.038)	(0.034)
Age				
25-34	0.021**	0.020*	0.022**	0.022**
	(0.011)	(0.011)	(0.011)	(0.011)
45-54	0.116***	0.110***	0.114***	0.114***
	(0.015)	(0.015)	(0.015)	(0.015)
55-64	0.422***	0.414***	0.418***	0.420***
	(0.039)	(0.039)	(0.039)	(0.039)
Gender				
Male	-0.002	0.007	-0.002	-0.003
	(0.016)	(0.015)	(0.016)	(0.016)
Marital status				
Divorced/Separated /Widowed	0.019	0.018	0.017	0.018
	(0.023)	(0.022)	(0.023)	(0.023)
Never married/Single	0.034**	0.035**	0.033**	0.033**
	(0.015)	(0.015)	(0.015)	(0.015)
Occupation type				

Low skilled white collar	0.045**	0.029	0.042*	0.042*
	(0.019)	(0.022)	(0.022)	(0.022)
Crafts and trade	0.025	0.008	0.022	0.021
	(0.020)	(0.023)	(0.023)	(0.022)
Elementary occupations	0.098**	0.088*	0.099**	0.102**
	(0.047)	(0.049)	(0.049)	(0.049)
Skilled Agriculture	-0.004	-0.021	-0.003	-0.004
	(0.035)	(0.035)	(0.038)	(0.037)
Wages (log)	0.001	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Socioeconomic status				
Middle SES	-0.022	-0.023	-0.023	-0.025
	(0.020)	(0.020)	(0.020)	(0.020)
High SES	-0.014	-0.014	-0.015	-0.017
	(0.024)	(0.024)	(0.024)	(0.024)
Working hours	-0.000	-0.000.	-0.0004	-0.0003
	(0.003)	(0.000)	(0.000)	(0.000)
Number of shocks				
One shock	-0.021	-0.021	-0.020	-0.020
	(0.016)	(0.016)	(0.016)	(0.016)
Two or more shocks	0.044**	0.036*	0.039*	0.040*
	(0.021)	(0.021)	(0.021)	(0.021)
Life insurance				
Yes	-0.062***	-0.059***	-0.060***	-0.062***
	(0.014)	(0.015)	(0.015)	(0.014)
Health insurance				
Yes	0.055***	0.056***	0.054***	0.054***
	(0.015)	(0.014)	(0.015)	(0.015)
Physical activity at work				

Low	0.007	0.003	0.003	0.004
	(0.032)	(0.033)	(0.033)	(0.033)
Medium	0.018	0.016	0.017	0.018
	(0.033)	(0.034)	(0.034)	(0.034)
High	-0.040	-0.042	-0.042	-0.041
	(0.033)	(0.033)	(0.033)	(0.033)

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Base: Age=15-24; Gender=female; Educational level=no education; Marital status=married; Occupation type= highly skilled white collar; Socioeconomic status=low SES; Index of the number of shocks=no shocks; Life insurance=no; Health insurance=no; Physical activity=skill not used

Source: Author's Construct

Table 9: Marginal effects for respondents sampled at the various categories of Life satisfaction (indexed literacy skills) based on the 4 models

	(1) Suffering	(2)	(3)	(4)	(1) Struggling	(2)	(3)	(4)
Literacy	-0.019*		-0.007	-0.016**	-0.003*		-0.001	-0.010***
	(0.011)		(0.013)	(0.010)	(0.002)		(0.002)	(0.003)
Educational level								
Basic		-0.019	-0.016	0.003		-0.001	-0.001	0.002
		(0.038)	(0.038)	(0.007)		(0.002)	(0.002)	(0.006)
High School		-0.039	-0.029	0.003		-0.004	-0.003	0.004
		(0.040)	(0.044)	(0.008)		(0.003)	(0.004)	(0.007)
Tertiary		-0.124***	-0.112**	-0.008		-0.034***	-0.031**	-0.018*
		(0.045)	(0.049)	(0.007)		(0.012)	(0.013)	(0.010)
Age								
25-34	0.004	0.014	0.012	0.009	0.000	0.001	0.001	0.001
	(0.028)	(0.028)	(0.028)	(0.028)	(0.002)	(0.003)	(0.003)	(0.002)
45-54	-0.037	-0.031	0.033	-0.034	-0.006	-0.005	-0.005	-0.005
	(0.027)	(0.027)	(0.027)	(0.027)	(0.004)	(0.004)	(0.004)	(0.004)
55-64	-0.148***	-0.136***	-0.138***	-0.141***	-0.060***	-0.055***	-0.055***	-0.056***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.017)	(0.016)	(0.016)	(0.017)
Gender								
Male	0.025	0.019	0.022	0.022	0.005	0.004	0.004	0.004
	(0.019)	(0.019)	(0.019)	(0.019)	(0.004)	(0.003)	(0.004)	(0.004)
Marital status								
Divorced/Separated /Widowed	0.036	0.032	0.036	0.037	0.004	0.004	0.004	0.004
	(0.032)	(0.026)	(0.032)	(0.032)	(0.003)	(0.003)	(0.003)	(0.003)
Never married/Single	-0.005	-0.003	-0.002	-0.004	-0.001	-0.000	-0.0004	-0.001
	(0.018)	(0.018)	(0.018)	(0.018)	(0.003)	(0.003)	(0.003)	(0.003)

Occupation type								
Low skilled white collar	0.060**	0.032	0.029	0.035	0.017**	0.008	0.007	0.009
	(0.023)	(0.026)	(0.026)	(0.025)	(0.008)	(0.007)	(0.007)	(0.007)
Crafts and trade	0.065**	0.033	0.029	0.036	0.018**	0.008	0.007	0.009
	(0.026)	(0.028)	(0.028)	(0.028)	(0.008)	(0.007)	(0.007)	(0.008)
Elementary occupations	0.147***	0.115***	0.113**	0.123***	0.019**	0.012*	0.011	0.012*
	(0.043)	(0.044)	(0.044)	(0.044)	(0.008)	(0.007)	(0.007)	(0.007)
Skilled Agriculture	0.186***	0.160***	0.153**	0.162***	0.013	0.006	0.006	0.007
	(0.055)	(0.054)	(0.056)	(0.055)	(0.012)	(0.010)	(0.010)	(0.011)
Wages (log)	0.005	0.007	0.007	0.006	0.001	0.001	0.001	0.001
	(0.004)	(0.005)	(0.005)	(0.004)	(0.001)	(0.000)	(0.001)	(0.001)
Socioeconomic status								
Middle SES	-0.203***	-0.198***	-0.198***	-0.204***	0.013	0.012	0.012	0.014
	(0.028)	(0.028)	(0.028)	(0.028)	(0.008)	(0.008)	(0.008)	(0.008)
High SES	-0.259***	-0.253***	-0.254***	-0.260***	-0.010	-0.010	-0.010	-0.010
	(0.030)	(0.031)	(0.031)	(0.031)	(0.012)	(0.012)	(0.012)	(0.012)
Working hours	0.001***	0.001***	0.001***	0.001***	0.000***	0.000***	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of shocks								
One shock	0.050**	0.050**	0.051**	0.052***	0.011**	0.011***	0.011***	0.011***
	(0.020)	(0.019)	(0.020)	(0.020)	(0.004)	(0.004)	(0.004)	(0.004)
Two or more shocks	0.090***	0.091***	0.091***	0.092***	0.013***	0.013***	0.013***	0.013***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.004)	(0.004)	(0.004)	(0.004)
Life insurance								
Yes	0.018	0.023	0.025	0.023	0.003	0.003	0.003	0.003
	(0.024)	(0.023)	(0.024)	(0.024)	(0.003)	(0.003)	(0.003)	(0.003)
Health insurance								
Yes	-0.045**	-0.038**	-0.038*	-0.038**	-0.007**	-0.006**	-0.006**	-0.006**

	(0.019)	(0.019)	(0.019)	(0.019)	(0.003)	(0.003)	(0.003)	(0.003)
Physical activity at work								
Low	-0.023	-0.021	-0.021	-0.021	-0.002	-0.002	-0.002	-0.002
	(0.040)	(0.039)	(0.040)	(0.040)	(0.002)	(0.002)	(0.002)	(0.002)
Medium	-0.041	-0.039	-0.040	-0.040	-0.004	-0.004	-0.004	-0.004
	(0.041)	(0.041)	(0.041)	(0.041)	(0.003)	(0.003)	(0.003)	(0.003)
High	-0.069*	-0.069*	-0.070*	-0.068*	-0.011**	-0.011**	-0.011	-0.011**
	(0.040)	(0.040)	(0.040)	(0.040)	(0.004)	(0.004)	(0.004)	(0.004)
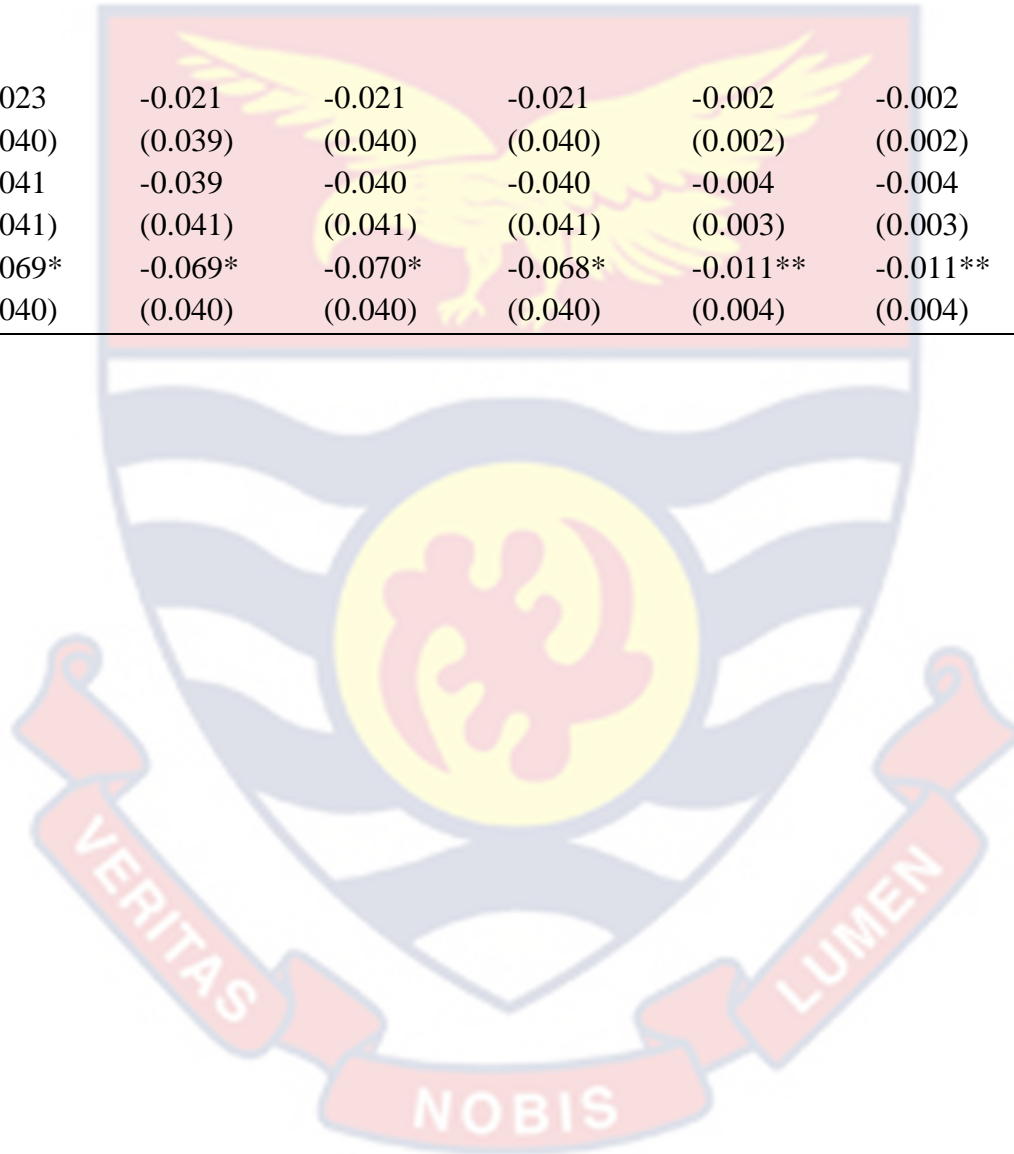
Table 9 continued

	(1)	(2)	(3)	(4)
			Thriving	
Literacy	0.023*		0.009	0.025**
	(0.013)		(0.015)	(0.013)
Educational level				
Basic		0.021	0.017	-0.005
		(0.039)	(0.040)	(0.013)
High School		0.044	0.032	0.007
		(0.043)	(0.048)	(0.015)
Tertiary		0.157***	0.143**	0.026
		(0.053)	(0.059)	(0.016)
Age				
25-34	-0.005	-0.15	-0.013	-0.010
	(0.030)	(0.030)	(0.030)	(0.030)
45-54	0.043	0.036	0.039	0.040
	(0.031)	(0.030)	(0.031)	(0.031)
55-64	0.208***	0.191***	0.193***	0.197***
	(0.044)	(0.045)	(0.045)	(0.044)
Gender				
Male	-0.030	-0.023	-0.026	-0.026
	(0.023)	(0.022)	(0.023)	(0.023)
Marital status				
Divorced/Separated /Widowed	-0.040	-0.039	-0.040	-0.041
	(0.035)	(0.035)	(0.035)	(0.035)
Never married/Single	0.006	0.003	0.003	0.004
	(0.021)	(0.021)	(0.021)	(0.021)
Occupation type				
Low skilled white collar	-0.077**	-0.039	-0.036	-0.044

	(0.031)	(0.032)	(0.033)	(0.033)
Crafts and trade	-0.082**	-0.041	-0.036	-0.045
	(0.033)	(0.035)	(0.036)	(0.035)
Elementary occupations	0.167***	-0.127***	-0.124***	-0.136***
	(0.043)	(0.045)	(0.045)	(0.045)
Skilled Agriculture	0.200***	-0.165***	-0.159***	-0.169***
	(0.049)	(0.049)	(0.051)	(0.050)
Wages (log)	-0.006	-0.008	-0.008	-0.007
	(0.005)	(0.006)	(0.006)	(0.005)
Socioeconomic status				
Middle SES	0.190***	0.185***	0.186***	0.190***
	(0.022)	(0.022)	(0.022)	(0.022)
High SES	0.269***	0.263***	0.264***	0.270***
	(0.032)	(0.032)	(0.032)	(0.032)
Working hours	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Number of shocks				
One shock	-0.061**	-0.061***	-0.061***	-0.063***
	(0.024)	(0.024)	(0.024)	(0.024)
Two or more shocks	-0.103***	-0.104***	-0.103***	-0.105***
	(0.026)	(0.026)	(0.026)	(0.026)
Life insurance				
Yes	-0.021	-0.026	-0.028	-0.026
	(0.027)	(0.026)	(0.027)	(0.027)
Health insurance				
Yes	0.052**	0.044**	0.043**	0.044**
	(0.022)	(0.022)	(0.022)	(0.022)
Physical activity at work				
Low	0.025	0.023	0.023	0.022

	(0.042)	(0.042)	(0.042)	(0.042)
Medium	0.045	0.044	0.045	0.044
	(0.044)	(0.044)	(0.043)	(0.043)
High	0.079*	0.080*	0.081*	0.089*
	(0.043)	(0.043)	(0.043)	(0.043)

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Base: Age=15-24; Gender=female; Educational level=no education; Marital status=married; Occupation type= highly skilled white collar; Socioeconomic status=low SES; Index of the number of shocks=no shocks; Life insurance=no; Health insurance=no; Physical activity=skill not use

Source: Author's Construct
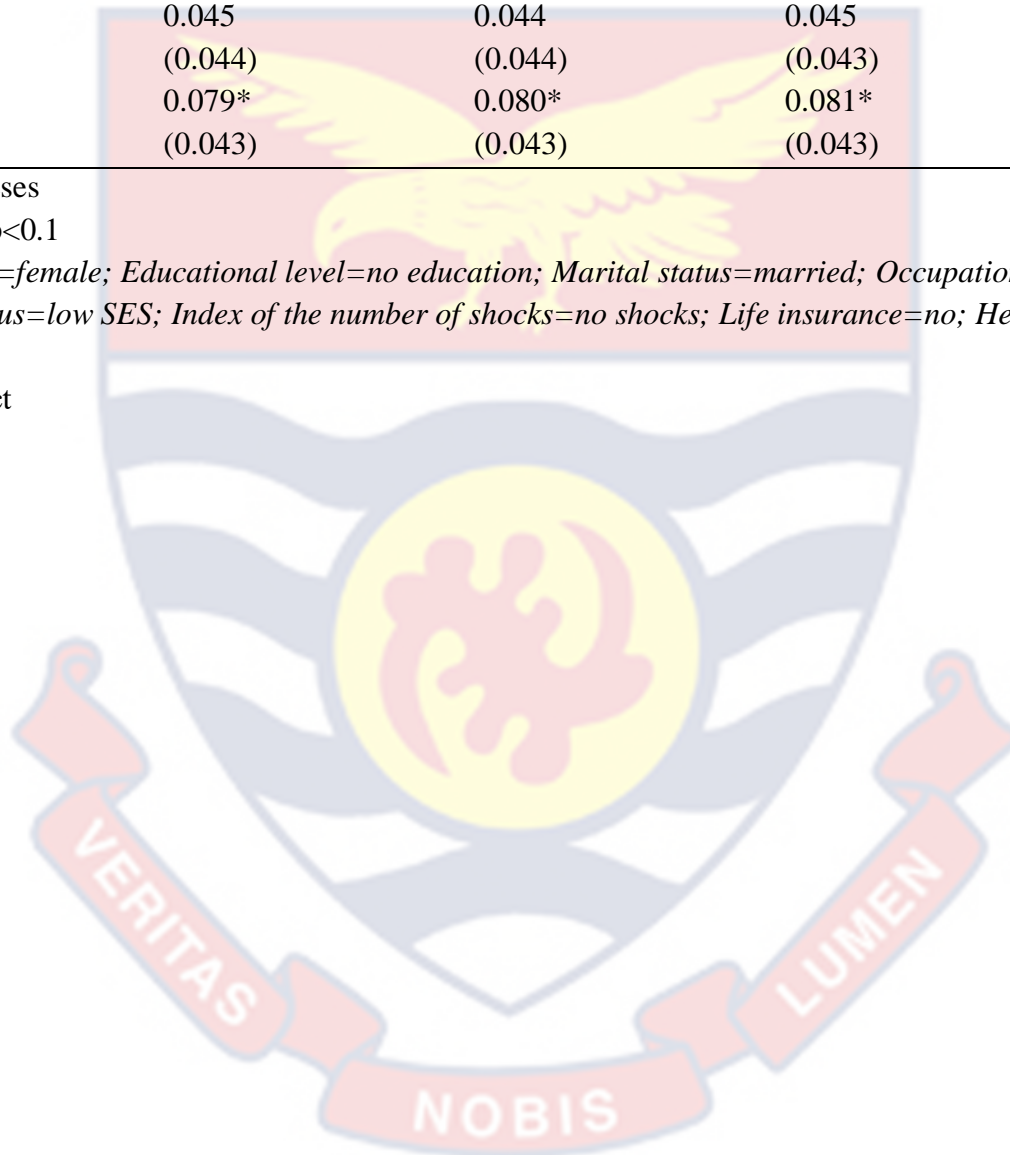
The relationship between literacy skills and health

Main Findings

For the second objective of this study, this section focuses on the results presented in the tables D to F in the appendices section. As a first step, the analyses of this study reaffirmed the education-health gradient and examined the better measure of education. Irrespective of the measure of education, the study has proved its association with health and life satisfaction. Although literacy skills and education are related, their correlation cannot be stated to be perfect because literacy is a good indicator of health (Roberts & Fawcett, 1998). In other words, even those with the same educational background could have varying levels of literacy skills, and these levels would affect their health in different ways. Several research (Grossman & Kaestner, 1997; Weiss, 2001; OECD, 2000; Smith-Greenway, 2015;) have suggested that literacy abilities predict health outcomes and life satisfaction even more reliably than the other measures of education.

From Table D, From the results, it can be observed that the higher literacy skills increases the prevalence of higher BMI. From the estimated marginal effect results on Table 7, additional increase of literacy skills among respondents is found to increase the probability of being in a higher BMI. The results suggest literacy skills can only significantly affects the probability of being in any of the categories of BMI when the variable levels of education are controlled for in the model. After controlling for educational level in model 2, literacy skills significantly affects the probability of reporting any of the categories of BMI at

10% significance level. An instant change in literacy skills is 0.8 percentage point less likely to be underweight and 2 percentage points to be normal weight, whilst an increase in the literacy skills of respondents are 1.2 percentage points more likely to be overweight and 1.5 percentage points more likely to be obese.

These results are not consistent with the health economic theories as the Grossman (1972) model explains that education increases the efficiency with which one produces health outcome. This can be attributed to a situation where individuals with higher literacy skills being employed in jobs involving sedentary tasks rather than physical activity and involving in sedentary leisure-time activities such as reading, watching TV, socializing with friends, etc. would contribute to excess weight gain.

Overweight and obesity increase the risk of various chronic diseases, including cardiovascular disease, type 2 diabetes, certain types of cancer, respiratory disorders, and musculoskeletal problems and can have detrimental effects on mental health leading to lower life satisfaction. Economically, the direct healthcare costs associated with treating obesity-related diseases are significant, as individuals with higher body mass indexes (BMIs) generally require more medical care, such as doctor visits, medications, and hospitalizations. Furthermore, the indirect costs related to reduced productivity and disability are substantial, as overweight and obese individuals may experience limitations in physical functioning, reduced work productivity, and higher rates of absenteeism.

Other Findings

Meanwhile, educational levels significantly affect the probability of being in higher BMI whether or not literacy skills is controlled for in the models. In particular, educational level affects the body mass index of individuals (Table 7, model 2); those with higher levels of education are significantly less likely to be overweight and obese compared to individuals possessing no education. Individuals with tertiary education are almost 5.9 percentage points less likely to be overweight and 8.7 percentage points less likely to be obese in comparison to individuals with no education. Meanwhile, individuals with higher levels of education are more likely to be underweight or normal weight compared to individuals with no education. That is, individuals with tertiary education are 3.6 percentage points more likely to be underweight compared to those with no education. The effect is even higher for normal weight: the probability of being normal weight is 10.9 percentage points lower for individuals with tertiary education in comparison to those with no education at all.

On the other hand, the higher the educational level (tertiary education) of the respondents, the lesser the prevalence of being overweight and obese. This contradicts the findings by Tetteh *et al.,* (2022), Ofori-Asenso, Agyeman, Laar and Boateng (2016) and Amoah (2003) which suggested that Ghanaians with tertiary education have been found to have the highest prevalence of overweight and obesity compared to Ghanaians with no educational level.

The findings indicate that higher literacy skills increases the prevalence of higher BMI whilst higher educational levels decrease the prevalence of higher

BMI and this because literacy skills was measured as a continuous variable which can capture subtle variations in education allowing for more nuanced understanding of its impact on the body mass indexes of the individuals especially since the relationship between education and health is non-linear.

From Table A, 1-unit increase in literacy for respondents with no education decreases the log odds of being in a higher BMI by 0.325 at 10% significance level. A unit change in literacy for respondents with basic, high and tertiary education has no significant effects on higher BMI while all other variables are held constant.

Table D indicate that age played significant role in the determination of the various outcomes in this study. All the age groups were statistically significant predictors of BMI. Respondents aged of 55-64 years had the highest increased risk of being overweight and obese. That is, older people are more likely to be overweight and obese compared to the younger ones. This is similar to other studies where there is significant increase of BMI with age (Tetteh *et al.,* 2022; Asil *et al*, 2014; Fouad, Rastam, Ward & Maziak, 2006; Stene, Giacaman, Abdul-Rahim, Husseini, Nirum, & Holmboe-Ottesen 2001). The relationship between age and body weight can be explained that increasing age exposes individuals at the risk of overweight, obesity and other non-communicable diseases (Reas, Nygård, Svensson, Sørensen, & Sandanger, 2007). Also, advancing age is linked with parity (number of full-term births) is an important risk factor for overweight and obesity (Li, Wang, Shen, Song Li, *et al.,* 2016).

98

Gender is a significant predictor of BMI at a 1% significance level. Males are less likely to find themselves in higher BMI compared to females. That is, women are more likely to be overweight and obese. The log odds of being in a higher BMI for male respondents is decreased by 0.660. The estimated odds ratio (OR = 0.517) reveals that the odds of higher BMI as opposed to lower BMI for males is lower than females by 52%. This is consistent with the study done by Ofori-Asenso *et al.,* (2016) and Abubakari, Lauder, Agyeman, Jones, Kirk, and Bhopal (2008).

Marital status of respondents is not a significant predictor of BMI. The marital status of individuals does not significantly influence the BMI of respondents. This is in contrast to finding by Asil *et al.,* (2014) who found that marital status significantly affects the BMI of individuals.

Majority of the respondents are involved in low skilled white-collar job yet it does not have any significant effect on BMI. Skilled agriculture is also not a significant predictor of BMI. Crafts and trade jobs and elementary occupations have negative significant effects on BMI. The log odds of higher BMI for crafts and trade workers is decreased by 0.273. The estimated odds ratio (OR = 0.761) shows that the odds of crafts and trade workers is 23.9% lower than high skilled white-collar workers, as the odds of overweight and obesity as opposed to underweight. The decreases in log odds of higher BMI for elementary occupation workers is 0.414. The estimated odds ratio (OR = 0.661) implies that the odds of overweight and obesity (as opposed to normal weight and underweight) for elementary occupation workers is lower than high skilled white-collar workers by

99

33.1%, as the odds of normal weight, overweight or obesity (as opposed to underweight). That is to say respondents involved in crafts and trade and elementary jobs have lower risks of being overweight or obese.

The wages (log) received by respondents positively influence underweight and normal weight but negatively influence overweight and obese significantly. Increase in wages in these results decrease the likelihood of having higher BMI. This is consistent with the study by Kim and Leigh (2010) and Meltzer and Chen (2011) which suggested that low wages increase overweight and obesity prevalence.

The socioeconomic status of respondents and the economic shocks in the economy do not have significant influence the BMI of respondents. This finding was otherwise in the studies done by Appiah, Steiner-Asiedu and Otoo (2014) and Amoah (2003) who found high prevalence of overweight and obesity amongst Ghanaians with high SES. The number of hours spent at work significantly reduces higher BMI in this study. That is, longer working hours decreases the likelihood of having higher BMI and it is in line with the study by Wada, Katoh, Arakate, Furukawa, Hayashi, Satoh, *et al.,* (2006). The type of occupations most of the respondents are involved in are manual or trade-related labour which requires longer working hours, therefore, reducing the likelihood of having higher BMI.

The number economic shocks experienced by individuals does not significantly influence the BMI of individuals. Though Antelo Suarez,

Magdalena, Reboredo Nogueira, & Reyes, Santias (2020) suggested economic shocks can increase BMI due to low physical activity and neglected health.

Possessing life insurance does not significantly affect the BMI and life satisfaction of respondents. This may be attributed to the fact that about 83% of Ghanaians do not own life insurance according to the STEP data. This may be due to low awareness. Health insurance is a significant predictor of BMI. Respondents who are covered by health insurance were at 43.5% decreased odds to be overweight and obese those who are not covered by health insurance (OR = 1.565). The possession of health insurance is more likely to lead to higher BMI as indicated by Zhou (2014) that individuals who are likely to be heavier than non-insurers. Having health insurance affects obesity much more than overweight. Intuitively, high physical activity has been identified to be significantly associated with a lower prevalence of overweight and obesity (Liu, Wang, Ma, Sa, & Zhuang, 2018; Oliveira, Ferrari, Araújo, & Matsudo, 2017; Lee, Lee, Lee, & Kim, 2016). As such, low physical activity significantly increases the likelihood of having higher BMI in this study.

Main Findings

The model is well specified as the regressors adequately explain the variation in the dependent variable. Table E shows that literacy skills has higher statistical significance effect on chronic illness. From Table 8, the index of literacy skills (model 1) does significantly affect the probability of having chronic illness in all the three models that this variable was included. An increase in literacy skills of respondents is 2.5 percentage points more likely to have chronic

101

illness. Aa explained above, highly literate individuals are likely to be involved in sedentary occupations and leisure activities which can lead to high body weight gain and the development of chronic illness. The high prevalence of chronic illness amongst Ghanaians leads to production inefficiency which stunts the gross domestic product of the economy. The high mortality rates associated with chronic illness leads to decrease in labour force.

Other Findings

The effect of levels of education on chronic illness is significant when used in regression model where literacy skills is not controlled for. Table 7, model 2 indicate that the marginal effect of the educational levels among individuals is significant on the prevalence of chronic illness though the significance level moves from 5% significance level (basic education) to 10% significance level (tertiary education). The marginal effect of educational levels of respondents with basic education, high school education and tertiary are 4.9 percentage points 5.3 percentage points and 5.7 percentage points respectively. Relative to no education individuals with basic education, high school education as well as tertiary education, significantly increase the probability of having chronic illness.

Table B shows that 1-unit increase in literacy for respondents with no and basic education increases the log odds of having chronic illness by 1.057 and 0.319 at 10% significance level. A unit change in literacy for respondents with high school and tertiary education have no significance effects on chronic illness

102

though they increase the log odds of having chronic illness by 0.156 and 0.166 respectively while all other variables are held constant.

There is no effect of educational levels on chronic illness, this finding is relatable to the research of Nyarko, Agyarko, Nyarko, and Brew (2021) which suggested that educational level is a not a determinant of chronic illness amongst the aged in Ghana. Also, Tian, Chen, Zhao, Chen, Chen, Feng, and Feng (2011) discovered that educational levels have no significant effect on the chronic disease knowledge among the chronically ill adults. These studies are in contrast to the study done by Singh *et al.,* (2019) which revealed that adults who have attained higher level of education are less likely to develop chronic illness.

The results on Table E indicate that all the age groups: 25-34 years (OR= 2.459, 95% CI=0.898-6.737); 45-54 years (OR= 9.690, 95% CI=3.736-25.131) and 55-64 years (OR= 58.069, 95% CI=21.541-156.544) are statistically significant predictors of chronic illness. Respondents who are within the age range of 55-64 years, that is, the oldest adults in this study have the highest increased risk of developing chronic illness. The development of chronic illness is not determined by the gender of the respondents. That is, sex differences do not have any significant effect on the prevalence of chronic illness. The increment to the log odds of developing chronic illness for respondents who are single or never married is 0.415. The estimated odds ratio (OR = 1.515) reveals that unmarried respondents are 1.515 times more likely to develop chronic illness than married respondents. This is in line with the study by Singh *et al.,* (2019) who found that adults who have never been married are likely to have chronic illness compared to

103

the married adults as marriage is seen to provide a social support system to cope with daily issues.

The log odds of respondents who are involved in elementary occupations is increased by 1.124. The estimated odds ratio (OR = 3.077) indicates that elementary occupations respondents are 3.077 times more likely to develop chronic illness than high skilled collar workers. Compared to high skilled white-collar jobs, individuals involved in elementary occupations are required some level of physical effort which may cause chronic pains. This study suggests wages do not significantly affect the prevalence of chronic illness though Singh *et al.,* (2019) indicated that adults with higher wages are at risk of developing chronic illness as they are prone to sedentary lifestyle.

The socioeconomic status of respondents does not statistically affect their status of chronic illness as indicated by this study. Meanwhile, Dugravot, Fayosse, Dumurgier *et al.,* (2019) suggests that socioeconomic status has an impact on chronic illness. The number of hours spent working does not have any significant effect on the individuals having chronic illness in this study. This is in contrast to the study done by Dembe and Yao (2016) which indicated long working hours over many years increases the risk of developing chronic illness especially for women.

Respondents who have experienced two or more economic shocks are likely to have chronic illness. This finding is supported by the study conducted by Janke, Lee, Propper, Shields and Shields (2020) which reveals that chronic illness increase in poor economic times as unemployment increases during these times.

104

Life insurance decreases the likelihood of having chronic illness significantly according to this study. The log odds for the prevalence of chronic illness among respondents is decreased by 0.891. The estimated odds ratio (OR = 0.410) shows that the odds of having chronic illness for respondents who are covered by life insurance is 10.9% lower than respondents who are not insured.

Health insurance increases the likelihood of having chronic illness as Smolen, Thorpe, Bowie, Gaskin and LaVeist, (2014) suggested that both the insured and uninsured individuals have statistically similar likelihood of reporting chronic illness. According to this study, the level of physical activity respondents are involved with at work does not significantly affect the status of chronic illness though Anderson and Durstine (2019), suggest that involvement in physical activity helps with chronic illness prevention.

According to the findings obtained in this study, only 0.06% of the respondents fall into the highest level of proficiency (Level 4) with 49.74% of them falling into the lowest level of proficiency (Below level 1). The results indicate that the functional literacy in this country is extremely low. Literacy skills compared to levels of education is also a good measure of education in this country regarding the effects it has on the various health outcomes and life satisfaction. Regarding the body weight mass of respondents, literacy skills has positive significant impact when educational level is controlled for. That is, higher literacy skills increases the likelihood of respondents to be overweight and obese when the impact of educational levels are considered in the regression. The results

105

confirm how important education is in the determination of health (BMI and Chronic illness).

The relationship between literacy skills and life satisfaction

Main Findings

From Table F, higher level of literacy skills does not significantly lead to higher life satisfaction. Literacy skills when used in the regression equation alone (Table 9, model 1) is negatively significant on suffering and struggling but positively significant on thriving. Individuals who have acquired higher literacy skills are 1.9 percentage points less likely to suffer, 0.3 percentage points less likely to struggle and 2.3 percentage points more likely to thieve in life. In model 3 where both the index of literacy skills and educational levels are used in the same regression model, the index of literacy skills is insignificant on the satisfaction with life. The insignificant effect suggests literacy skills may not be a strong predictor of life satisfaction though it is more likely to increase life satisfaction. Higher life satisfaction increases labor force participation, decreased reliance on social welfare programs, and lower healthcare costs due to healthy mental health higher levels of innovation, creativity, and entrepreneurial activity, which are crucial drivers of economic growth and development.

Other Findings

The results show only respondents with tertiary education have significant effect on life satisfaction. However, only individuals with tertiary education have significantly increase the probability of being in a higher level of life satisfaction.

The marginal effect of tertiary education on life satisfaction among respondents are -11.2 percentage points -3.1 percentage points and 14.3 percentage points for the various categories of life satisfaction. This means the probability of suffering and struggling in life among respondents who have attained up to the tertiary education is reduced by 11.2 percentage points and 3.1 percentage points respectively. And the probability of thriving in life is increased by 14.3 percentage points. In the interaction term, the component literacy skills has significant effect in that model. Higher educational level significantly influences the life satisfaction of the respondents. The findings in this study align with existing studies which discovered that more educated individuals are more satisfied in life compared to the less educated individuals (Hassan, Hina & Qayyum, 2021; Powdthavee *et al.,* 2015; Salinas-Jiménez *et al.,* 2011; Stanca, 2009; Borooah, 2006; Gerdtham & Johannesson, 2001; Frey & Stutzer, 2000). The life satisfaction status of highly educated individuals may be higher because such individuals enjoy better standard of living and a more stable life. That is, education increases the possibility of being employed and having higher wages.

Results from Table F indicate that older people are more likely to enjoy happier and satisfied lives as suggested by Seo, Hwang, Sun, and Chen (2022). Findings from this study indicate that only respondents aged 55-64 years are more likely to be satisfied in life. The increment of log odds of higher life satisfaction for respondents who are aged is increased by 0.873. The estimated odds ratio (OR = 2.394) suggests that older respondents are 2.394 times more likely to be satisfied in life than respondents aged 15-24 years. The results suggest that the

107

level of satisfaction with life is not determined by the gender of the respondents. Ahn (2020) who observed otherwise indicated that being a female increases the likelihood of being satisfied in life. The findings of this study also suggest that marital status of individuals does not significantly affect their level of life satisfaction of respondents. This is contrast to the studies by Owusu Ansah *et al.,* (2022), Ahn (2020) and Salinas-Jiménez *et al.,* (2011) who pointed out that people who were found to be married or living with somebody are more satisfied than the single, divorced or widowed.

Elementary occupations and skilled agriculture jobs have negative significant effects on life satisfaction. That is to say, respondents involved in elementary occupations and skilled agriculture are less likely to be satisfied in life. The insignificant effect of wages on the life satisfaction of respondents contrasted the studies done by Ahn (2020) and Salinas-Jiménez *et al.,* (2011) which indicated that individuals who earn higher wages are more satisfied in life than those who earn lower wages. Caporale, Georgellis, Tsitsianis and Yin (2009) suggested wages may not have strong correlation with life satisfaction when variables such as education, unemployment and other mediating variables are controlled for in the regression.

The socioeconomic status of respondents is seen to statistically decrease the possibility of suffering and increase the possibility of thriving in life. Higher SES causes higher satisfaction with life as this is supported by the study by Lee (2021). This study's findings indicate that longer working hours reduces the likelihood of being satisfied in life. This is in line with the studies by Shao (2022)

108

and Lee (2021) as reduced working hours create leisure, reduce stress and promote good health for working groups which in turn increases overall life satisfaction.

The number economic shocks experienced by individuals decreases the likelihood of enjoying higher life satisfaction. It is reported that individuals who have a normal body weight are more satisfied in life (Wee, Cheung, Loke, Tan, Chow, *et al.,* 2008) therefore economic shocks which has the potential of causing overweight and obesity decreases life satisfaction. Individuals who take the step of securing their lives and that of their family by patronizing life insurance are reported to be satisfied in life (NobleOak, 2021). This is in contrast to the finding in this study where the possession of life insurance does not significantly affect the life satisfaction of individuals.

Health insurance significantly increases the likelihood of being satisfied in life as this result is supported with the findings by Luo, Zeng and Wang (2022); Tran, Wassmer and Lascher (2017); and Gu, Feng and Jin (2017). This is because, establishing and improving health insurance creates equal medical security which in turn increases life satisfaction. That is, health insurance reduces medical costs, increases health seeking behaviours, prompts medical support in the case of poor health and affords medical screening which increases life satisfaction. High physical activity increases satisfaction in life (Angoorani, Mahmoodi, Ejtahed, Heshmat, Motlagh, Qorbani & Kelishadi, 2022) and this is in line with this study's findings.

Correcting Endogeneity

The Table 10 below provides the estimated results on the relationship between literacy skills and BMI, chronic illness and life satisfaction using the Lewbel (2012) IV approach to correct endogeneity. The estimates of both TSLS and GMM were presented in alternate specifications. The endogeneity issues controlled for or corrected in the model which may as a result of the possibility of reverse or simultaneous causality. The estimates obtained using the TSLS Lewbel IV approach are consistent with the estimates obtained from the GMM Lewbel IV approach. The TSLS and GMM estimates are negative and significant when finding the relationship between literacy skills and BMI. This implies that higher literacy skills leads lower BMI. These results are consistent with the health economic theories which were reviewed.

The coefficient of literacy skills is positive and insignificant when chronic illness is the dependent variable, implying that higher literacy skills has no systematic effect on the development of chronic illness. The TSLS and GMM estimates are negative and significant when finding the relationship between literacy skills and life satisfaction. This implies that higher literacy skills leads lower life satisfaction. Literacy skills can be said to have endogenous effect on BMI and life satisfaction but not on chronic illness due to the significant coefficients of the literacy skills observed in the results. The first stage (FSTAGE) estimates show the significance of the relationship between literacy skills and the internally generated instruments. Hansen's (1982) J statistic and the

110

corresponding p-values of the support the validity of the IV over-identifying restrictions.

Table 10: Literacy skills and BMI, Chronic illness and Life satisfaction using Lewbel IV method

	BMI		Chronic illness		Life satisfaction	
	TSLS	GMM	TSLS	GMM	TSLS	GMM
Literacy	-1.043***	-1.074***	0.014	0.003	-0.002*	-0.001*
	(0.358)	(0.328)	(0.019)	(0.017)	(0.001)	(0.001)
Age	0.629***	0.608***	0.118***	0.108***	0.079***	0.078***
	(0.230)	(0.219)	(0.012)	(0.011)	(0.022)	(0.022)
Gender	0.403	0.189	0.017	0.010	-0.009	-0.008
	(0.516)	(0.458)	(0.025)	(0.023)	(0.047)	(0.046)
Educational level	1.668**	1.665**	-0.028	-0.006	0.181***	0.165***
	(0.760)	(0.701)	(0.042)	(0.039)	(0.056)	(0.055)
Marital status	0.158	0.160	0.024***	0.023***	0.015	0.014
	(0.172)	(0.165)	(0.008)	(0.008)	(0.020)	(0.020)
Occupation type	-0.828***	-0.800***	0.005	-0.008	-0.104***	-0.107***
	(0.197)	(0.190)	(0.011)	(0.010)	(0.025)	(0.024)
Log of wages	-0.124**	-0.117**	-0.0001	-0.001	-0.005	-0.004
	(0.050)	(0.047)	(0.004)	(0.004)	(0.006)	(0.003)
Socioeconomic status	0.291	0.455**	0.004	-0.002	0.251***	0.257***
	(0.238)	(0.221)	(0.012)	(0.012)	(0.031)	(0.031)
Working hours	-0.017**	-0.021***	0.001	0.0001	-0.002**	-0.002**
	(0.007)	(0.007)	(0.003)	(0.004)	(0.001)	(0.001)
Number of shocks	-0.249	-0.243	0.008	0.007	-0.091***	-0.088***
	(0.210)	(0.197)	(0.010)	(0.010)	(0.025)	(0.025)
Life insurance	0.525	0.528	-0.063***	-0.052**	-0.027	-0.020
	(0.440)	(0.424)	(0.022)	(0.021)	(0.052)	(0.051)
Health insurance	1.196***	1.284***	0.049***	0.041***	0.093**	0.105**
	(0.341)	(0.318)	(0.014)	(0.013)	(0.042)	(0.042)
Physical activity	-0.163	-0.222	0.020***	-0.021***	0.042**	0.042**
	(0.200)	(0.189)	(0.008)	(0.007)	(0.020)	(0.019)
Constant	26.002***	26.006***	-0.113**	-0.055	1.621***	1.626***
	(1.301)	(1.281)	(0.055)	(0.052)	(0.168)	(0.165)
First-Stage *F*-Statistics	6.274	6.274	6.274	6.274	15.972	15.972
Hansen p-value	0.1766	0.1766	0.0031	0.0031	0.1173	0.1173
Number of Observations	1,735		1.735		1,735	
Standard errors in parentheses	***p<0.01	**p<0.05	*p<0.1		F-statistics are Cragg-Donald	

Source: Author's Construct

From the results presented in this study, it can be indicated that the older the adults, the higher the risk of being obese. Older adults who are highly literate may have been at risk of being obese would be at a higher risk since they cannot be physically active. Naturally females have more body fat than males, putting females at high risk of being overweight and obese. Females who are highly literate are therefore at higher risk of being overweight and obese. Unmarried adults are likely to develop chronic illness though literate. Spouse and children are a good support system which has the potential to significantly help individuals manage their health well. Respondents involved in Crafts and trade and elementary occupations who are skilled in their field of work which involve the use of physical effort reduces the risk of higher BMI. Yet individuals involved in low skilled and elementary occupations are at a risk of high prevalence of chronic illness as this type of occupations are associated with work stress. Adults who are involved in the elementary occupations and skilled agriculture are less likely to be satisfied with life due to the work stress associated with such occupations. Higher wages earned by respondents with high literacy skills put them in a high socioeconomic status where it is easier to afford healthier food and better medical help therefore reducing the prevalence of higher BMI and chronic illness.

Highly literate adults tend to fall in the middle and high socioeconomic status, enabling them afford goods and services which make life a better one. Longer working hours reduces the number of hours adults can have for leisure and social life therefore reducing their satisfaction in life. Economic shocks put

113

literate adults at the risk of high prevalence of chronic illness and low life satisfaction since the rate of unemployment and low wages rise in such periods.

Life insurance coverage for literate respondents decreases the prevalence of chronic illness as such insurances provide financial help when insured adults are treating and managing chronic illness. People with health insurance coverage are more likely to be highly literate and have higher incomes. The coverage reduces the responsibilities of individuals thereby reducing their health consciousness. Intuitively, respondents who are highly literate with highest educational levels may be involved in low physical activity jobs which require them to sit for very long hours at work have a risk of being obese and developing chronic illness such as cardiovascular disease and cancer.

Conclusion

This chapter has presented the analysis and discussion of results based on the ordered logistic regression model and the Lewbel IV regression model for correcting endogeneity. The results from both models are quite different as the effects of literacy skills are positively significant on the health outcomes but insignificant on life satisfaction for the ordered logistic regression. However, the effects of literacy skills are negatively significant on higher BMI and life satisfaction but insignificant on chronic illness for the Lewbel IV regression

114

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter of the study presents the summary, conclusions drawn and policy recommendations made based on the findings of the study. On that basis, further research and policy recommendations for the study are analysed.

Summary of the Findings

Limited literacy skills has been a major problem being faced in the educational system in Ghana. The projected results from this study is expected to contribute to educational and health economics literature by studying the relationship literacy skills has with physical health and life satisfaction in Ghana. Possible socio-economic and demographic factors that have been observed to influence the health and life satisfaction of individuals were also examined in this study. To estimate this relationship, the study adapts a theoretical framework developed by Smith and Kington (1997), which is a refined model of the Grossman's (1972) health demand theory which is primarily based on simplified household utility function. The model is adopted as the model for education-health/life satisfaction gradient within the framework of the ordered logistic regression model. Lewbel IV regression is also used to correct endogeneity. Body Mass Index, chronic illness and life satisfaction were the dependent variables used in this study. The ordered logistic regression model developed for this study included literacy skills as the main independent variable and other independent

variables such as household and individual socio-economic and demographic characteristics.

Recognising the effect of the various levels of education, age, gender, marital status, types of occupation, wages, socioeconomic status, number of working hours, economic shocks, life insurance, health insurance and level of physical activity on the physical health and life satisfaction of individuals, the model controls for all these variables.

In the case of BMI, high literacy skills is found to significantly increase the prevalence of obesity in the country. Though high literacy skills for respondents with no education significantly reduce the probability of higher BMI, high literacy skills for respondents with basic, high school and tertiary education are insignificant determinants of higher BMI. The descriptive statistics done indicated that substantial number of individuals fall within the lower levels of literacy skills which affect the quality of knowledge individuals have regarding body weight issues. Age, gender, crafts and trade occupations, elementary occupations, wages, number of working hours, health insurance, and low physical activity were all estimated to strongly affect the prevalence of higher BMI.

The effect that literacy skills has on the prevalence of chronic illness was found to be positively significant. High literacy skills for respondents with no and basic education were found to significantly increase the probability of the prevalence of chronic illness. High literacy for respondents with high school and tertiary education were found to insignificantly determine the prevalence of chronic illness. The estimates from this study find age, unmarried individuals, low

116

skilled occupations, elementary occupations, two or more economic shocks, life insurance and health insurance to significantly predict the probability of the prevalence of chronic illness.

Higher life satisfaction is not significantly determined by high literacy skills of respondents. The study's analysis reveals that high literacy skills for respondents with high school and tertiary education significantly increase the probability of being at the higher position on the life satisfaction ladder. High literacy for respondents with no and basic education do not significantly determine higher life satisfaction. The study also discovered that characteristics such as older adults, elementary occupations, skilled agriculture occupations, socioeconomic status, number of working hours, economic shocks, possession of health insurance and high physical activity at work predict the probability of higher life satisfaction.

Conclusions

In this study, the relationship that literacy skills has with body mass index, chronic illness and life satisfaction has been examined. As already mentioned, reading, listening and writing and speaking abilities as well as higher capacities for information processing are all related to literacy skills. Literacy skills can be seen as a significant component of education that is frequently improved through work and education training, and it may change over the course of time. This study contributes to the growing body of research which has examined and explored the relationship that exist between literacy skills and physical health and

117

life satisfaction and extends knowledge regarding empirical literature on this relationship.

There are societal and individual repercussions to a country's literacy skills distribution. In a society where a substantial percentage of adults have acquired lower literacy skills, there is a tendency of the society being characterised by lesser health knowledge, higher health care costs and lower economic productivity level (WHO, 2013; Eichler, Wieser, & Brügger, 2009). The data reflected the fact the Ghanaian populace is an average literate population as literacy skills of majority is quite low irrespective of the high levels of reading at and outside work. This means reading abilities cannot be solely used to define literacy skills.

As prior studies have shown, literacy skills predicts health more accurately than educational level, as such, significant level of literacy skills is required to make good use of information which is health-related. In this study, however, there is difference in the effect of literacy skills and educational level on health and life satisfaction. The results indicate that the higher levels of education are important factors in the generation of healthier body weight in the Ghana. Literacy skills on the other hand does not facilitate the generation of healthy body mass weight and its effect is significant when educational level is controlled for. This finding does not mean literacy skills does not have impact on body mass weight but it is possible the literacy skills is missing out the plausible body weight improving skills beyond the skills which have already been evaluated by levels of education.

The study presents findings suggesting that educational level, age, gender, single people, types of occupation, wages, socioeconomic status, working hours, economic shocks, health insurance, low and high physical activities are determinants of BMI, chronic illness and life satisfaction among Ghanaians.

Literacy skills is a potential endogenous variable. Being overweight or obese and chronically ill as a child is a substantial risk factor for access to any type of education (Datar & Sturm, 2006). On the other hand, literacy skills is expected promote health awareness and expose people to a lot of information, which tend to affect BMI. Also, the use of both literacy skills and levels of education in the same model causes endogeneity as these two variables are highly correlated (OECD, 2013). Using instrumental variables is a common solution for this endogeneity issue. However, it might be challenging to identify variables that are both strong and truly exogenous to serve as instrumental variables for the endogenous variables in question. The study tackles this issue by applying the heteroskedasticity-based IV approach suggested by Lewbel (2012), which replaces out the conventional IV instrumental variables and satisfies the exclusion restrictions (assumptions about coefficients) and assumptions about the covariance of error terms. After correcting the endogeneity problem, literacy skills significantly reduces the possibility of body weight at a very high magnitude and significantly reduces higher life satisfaction at very minimal magnitude.

The findings indicate that the effect of literacy skills on health differs across on different aspects of health and this necessitate further theoretical and empirical research on literacy skills. This is because, literacy skills is associated

119

with socioeconomic factors such income levels and jobs which contribute to health outcomes in areas such as overall general health, chronic disease management and preventive care. That is, continuous research should be done on the use and development of literacy skills over the life course of individuals in Ghana. Further research should investigate the significance of the factors that affect the health and life satisfaction of individuals.

Recommendations

This study aimed to add to the body of knowledge about the relationship that education has with health and life satisfaction by adopting a new theoretical perspective. Any level of government can embrace a new dimensional perspective on how education affects health and life satisfaction. Even though the major contribution of this study is theoretical, it offers some policy implications and recommendations.

First, programmes and policies that support literacy skills acquisition at the various primary schools and workplaces should be introduced in the country so that health-related outcomes and life satisfaction can be improved. The need for adult literacy education is partly driven by inefficiency of the primary education sector, where most primary school leavers exit without developing the necessary proficiency in literacy. The study recommends that, the educational service in Ghana should introduce and implement a home-based program to strengthen children's emergent literacy skills before they even begin school. The service should provide educated parents of young children with either children's

storybooks or storybooks and training on how to read the storybooks with children. Doing this will increase vocabulary skills of the children.

The curriculum proposed and used the Ghanaian Education system requires innovation. Much attention should be given to recommendations outlined in the educational reform review of 2007 that suggest that the primary level should be concentrated on developing proficiency in literacy, numeracy, and problem-solving abilities.

These would encourage increased levels of literacy for a greater portion of the population, improving their health and satisfaction with life in the process. According to Grossman and Kaestner (1997), education initiatives for underdeveloped and developing populations may help to lessen some of the current health disparities that exist among countries globally. Additionally, several researchers (Salinas Jiménez, Artés & Salinas Jiménez, 2011; Ferrante, 2009) claimed that education could enhance people's expectations which increases the level of satisfaction in life. However, if these goals are not achieved, it could cause frustration.

Third, to enhance health outcomes, health-promoting initiatives should be created in accordance with the discovered relationship between literacy skills and health. There should be increased health awareness, and promotion of healthy lifestyles, including exercising and general healthy living by the Ghana Health Service.

121

Given the relationships that exist between the determinants of life satisfaction and life satisfaction identified in this study, policies designed to increase life satisfaction among Ghanaians should be delivered equally across gender. The government can help increase the life satisfactions levels of Ghanaians by providing high-quality and affordable healthcare, living-wage jobs, affordable by quality higher education and support family-friendly policies.

The findings discovered in this study also urge the government of the country to start monitoring the body weight, chronic illness and life satisfaction status of its residents.
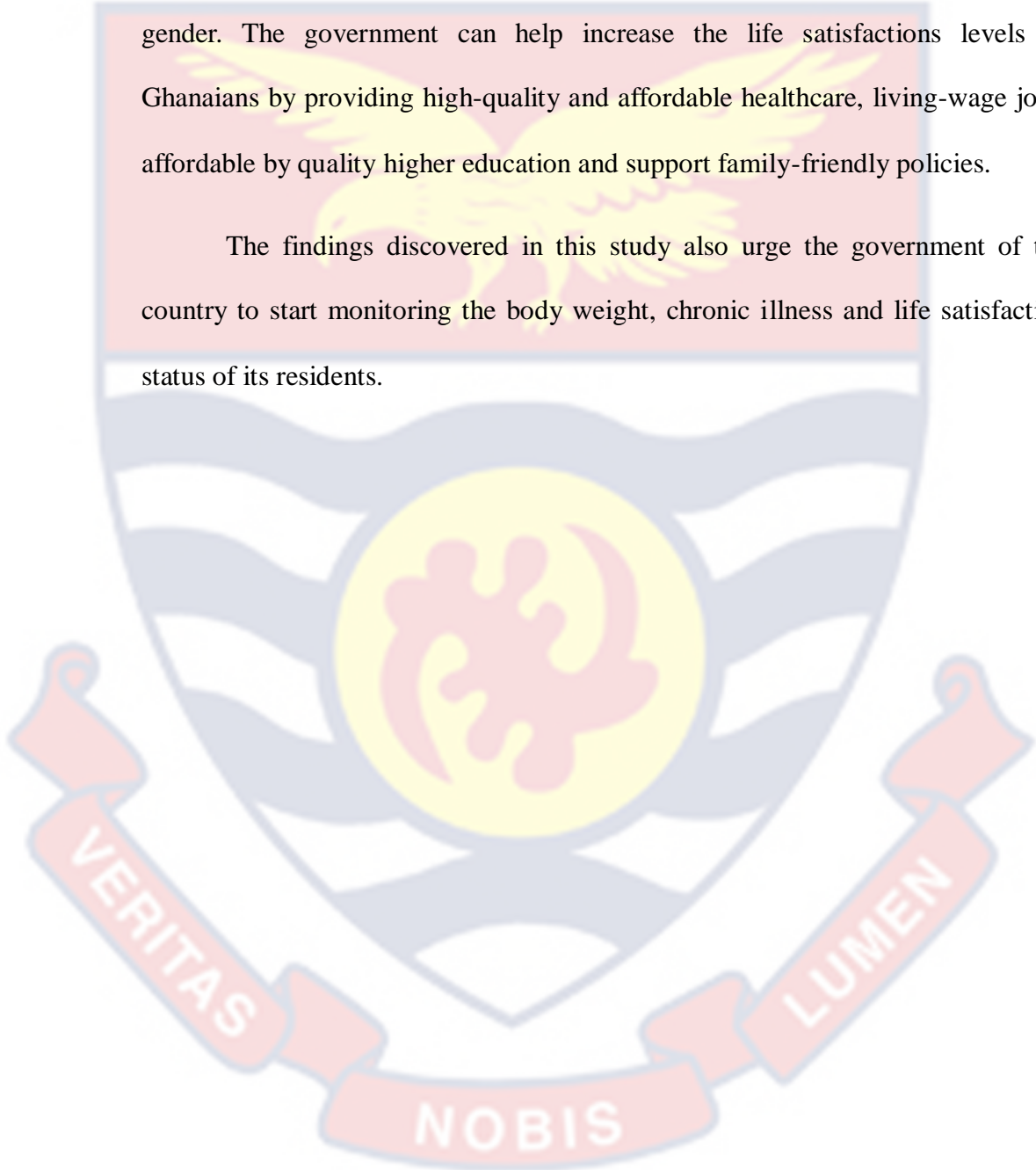
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126

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APPENDICES

Table A: Ordered logistic regression examining the effect of literacy skills on the body mass index of working individuals (4 Models).

BMI Class	(1)	(2)	(3)	(4)
Literacy	0.044		0.122*	
	(0.059)		(0.071)	
Educational level				
Basic		-0.462**	0.515***	
		(0.185)	(0.188)	
High School		-0.416**	-0.582***	
		(0.198)	(0.220)	
Tertiary		-0.644***	-0.838***	
		(0.239)	(0.264)	
Educational level # Literacy				
No education				-0.325*
				(0.195)
Basic				0.084
				(0.089)
High School				0.123
				(0.079)
Tertiary				-0.096
				(0.117)
Age				
25-34	0.363**	0.341**	0.377**	0.366**
	(0.152)	(0.152)	(0.154)	(0.153)
45-54	0.886***	0.866***	0.906***	0.902***
	(0.152)	(0.151)	(0.152)	(0.153)
55-64	1.196***	1.178***	1.212***	1.198***
	(0.201)	(0.200)	(0.202)	(0.202)
Gender				
Male	-0.675***	-0.617***	-0.660***	-0.665***
	(0.109)	(0.106)	(0.109)	(0.109)
Marital status				
Divorced/Separated /Widowed	-0.244	-0.233	-2.245	-0.246
	(0.174)	(0.174)	(0.175)	(0.175)
Never married/Single	-0.077	-0.056	-0.065	-0.070
	(0.100)	(0.101)	(0.101)	(0.101)
Occupation type				
Low skilled white collar	0.024	-0.115	-0.065	-0.063
	(0.174)	(0.147)	(0.150)	(0.149)
Crafts and trade	-0.179	-0.337**	-0.273*	-0.264
	(0.149)	(0.157)	(0.161)	(0.159)
Elementary	-0.258	-0.462**	-0.414*	-0.395

134

occupations	(0.221)	(0.228)	(0.229)	(0.229)
Skilled Agriculture	0.085	-0.343	-0.239	-0.215
	(0.248)	(0.248)	(0.256)	(0.256)
Wages (log)	-0.038**	-0.033*	-0.034*	-0.034*
	(0.018)	(0.018)	(0.018)	(0.018)
Socioeconomic status				
Middle SES	-0.065	-0.026	-0.018	-0.036
	(0.122)	(0.123)	(0.123)	(0.122)
High SES	0.175	0.241	0.246	0.232*
	(0.149)	(0.150)	(0.151)	(0.151)
Working hours	-0.004*	-0.005**	-0.005**	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)
Number of shocks				
One shock	-0.038	-0.026	-0.027	-0.023
	(0.111)	(0.111)	(0.111)	(0.111)
Two or more shocks	0.027	0.031	0.047	0.053
	(0.124)	(0.124)	(0.125)	(0.125)
Life insurance				
Yes	-0.186	-0.121	-0.139	-0.149
	(0.129)	(0.104)	(0.132)	(0.131)
Health insurance				
Yes	0.429***	0.462***	0.448***	0.443***
	(0.104)	(0.104)	(0.105)	(0.104)
Physical activity at work				
Low	-0.460**	-0.426**	0.428**	-0.439**
	(0.217)	(0.217)	(0.217)	(0.217)
Medium	-0.124	-0.107	-0.104	-0.119
	(0.223)	(0.223)	(0.223)	(0.223)
High	-0.225	-0.219	-0.218	-0.228
	(0.223)	(0.222)	(0.222)	(0.223)
/cut1	-2.819	-3.359	-3.396	-2.879
	(0.313)	(0.339)	(0.352)	(0.322)
/cut2	0.162	-0.373	-0.410	0.107
	(0.303)	(0.339)	(0.341)	(0.312)
/cut3	1.769	1.238	1.203	1.717
	(0.306)	(0.341)	(0.342)	(0.315)

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Base: Age=15-24; Gender=female; Educational level=no education; Marital status=married; Occupation type= highly skilled white collar; Socioeconomic status=low SES; Index of the number of shocks=no shocks; Life insurance=n o; Health insurance=no; Physical activity=skill not used

Table B: Logistic regression examining the effect of literacy skills on chronic illness of working individuals (4 Models).

Chronic illness	(1)	(2)	(3)	(4)
Literacy	0.279**		0.314**	
	(0.110)		(0.130)	
Educational level				
Basic		0.776*	0.620	
		(0.469)	(0.474)	
High School		0.810*	0.354	
		(0.491)	(0.528)	
Tertiary		0.859	0.379	
		(0.549)	(0.583)	
Educational level # Literacy				
No education				1.057**
				(0.511)
Basic				0.319**
				(0.157)
High School				0.156
				(0.173)
Tertiary				0.166
				(0.229)
Age				
25-34	0.856*	0.798	0.900*	0.876*
	(0.513)	(0.510)	(0.514)	(0.513)
45-54	2.271***	2.151***	2.271***	2.266***
	(0.485)	(0.481)	(0.486)	(0.487)
55-64	4.060***	3.938***	4.062***	4.068***
	(0.505)	(0.499)	(0.506)	(0.506)
Gender				
Male	-0.023	0.093	-0.031	0.042
	(0.194)	(0.194)	(0.201)	(0.201)
Marital status				
Divorced/Separated /Widowed	0.249	0.238	0.223	0.233
	(0.283)	(0.284)	(0.285)	(0.285)
Never married/Single	0.418**	0.429**	0.415**	0.411**
	(0.188)	(0.188)	(0.189)	(0.188)
Occupation type				
Low skilled white collar	0.591**	0.372	0.550*	0.543*
	(0.262)	(0.288)	(0.298)	(0.296)
Crafts and trade	0.349	0.108	0.306	0.291
	(0.282)	(0.310)	(0.322)	(0.319)
Elementary occupations	0.937**	0.959**	1.124**	1.141**
	(0.449)	(0.468)	(0.476)	(0.474)

Skilled Agriculture	1.122	-0.331	-0.041	-0.066
	(0.451)	(0.571)	(0.593)	(0.589)
Wages (log)	0.013	0.014	0.011	0.011
	(0.020)	(0.021)	(0.021)	(0.021)
Socioeconomic status				
Middle SES	-0.272	-0.283	-0.283	-0.301
	(0.234)	(0.235)	(0.236)	(0.235)
High SES	-0.169	-0.170	-0.178	-0.205
	(0.286)	(0.287)	(0.287)	(0.287)
Working hours	-0.0002	-0.000	-0.001	-0.0004
	(0.004)	(0.004)	(0.004)	(0.004)
Number of shocks				
One shock	-0.289	-0.293	-0.286	-0.282
	(0.226)	(0.227)	(0.227)	(0.228)
Two or more shocks	0.498**	0.413	0.443*	0.461**
	(0.231)	(0.234)	(0.235)	(0.233)
Life insurance				
Yes	-0.934***	-0.872***	-0.891***	-0.931***
	(0.262)	(0.266)	(0.265)	(0.263)
Health insurance				
Yes	0.803***	0.782***	0.756***	0.751***
	(0.228)	(0.228)	(0.229)	(0.229)
Physical activity at work				
Low	0.082	0.041	0.037	0.045
	(0.385)	(0.386)	(0.388)	(0.389)
Medium	0.204	0.183	0.195	0.199
	(0.393)	(0.393)	(0.395)	(0.396)
High	-0.570	-0.592	-0.599	-0.584
	(0.419)	(0.417)	(0.421)	(0.421)
Constant	-5.017***	-5.469	-5.401***	-4.676***
	(0.700)	(0.815)	(0.818)	(0.719)

Standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Base: Age=15-24; Gender=female; Educational level=no education; Marital status=married; Occupation type= highly skilled white collar; Socioeconomic status=low SES; Index of the number of shocks=no shocks; Life insurance=no; Health insurance=no; Physical activity=skill not used

137

Table C: Ordered logistic regression examining the effect of literacy skills on the life satisfaction working individuals (4 Models).

Life Satisfaction	(1)	(2)	(3)	(4)
Literacy	0.106*		0.042	
	(0.060)		(0.072)	
Educational level				
Basic		0.102	0.084	
		(0.193)	(0.200)	
High School		0.209	0.152	
		(0.206)	(0.229)	
Tertiary		0.719***	0.652**	
		(0.248)	(0.274)	
Educational level # Literacy				
No education				0.053
				(0.206)
Basic				-0.037
				(0.090)
High School				0.161*
				(0.095)
Tertiary				0.422***
				(0.121)
Age				
25-34	-0.023	-0.072	-0.061	-0.049
	(0.145)	(0.153)	(0.150)	(0.145)
45-54	0.201	0.168	0.179	0.186
	(0.148)	(0.151)	(0.145)	(0.145)
55-64	0.937***	0.862***	0.873***	0.891***
	(0.202)	(0.207)	(0.204)	(0.203)
Gender				
Male	-0.139	-0.111	-0.124	-0.121
	(0.107)	(0.109)	(0.109)	(0.109)
Marital status				
Divorced/Separated /Widowed	-0.194	-0.189	-0.193	-0.199
	(0.170)	(0.175)	(0.171)	(0.170)
Never married/Single	0.029	0.150	0.012	0.020
	(0.100)	(0.099)	(0.100)	(0.100)
Occupation type				
Low skilled white collar	-0.350**	-0.181	-0.165	-0.204
	(0.139)	(0.152)	(0.150)	(0.148)
Crafts and trade	-0.374**	-0.186	-0.167	-0.208
	(0.150)	(0.162)	(0.163)	(0.160)
Elementary occupations	-0.788***	-0.611***	-0.599***	-0.652***
	(0.216)	(0.214)	(0.224)	(0.222)

138

Skilled Agriculture	-0.969***	-0.821***	-0.788***	-0.836***
	(0.263)	(0.240)	(0.269)	(0.267)
Wages (log)	-0.027	-0.036**	-0.037	-0.034
	(0.023)	(0.018)	(0.026)	(0.026)
Socioeconomic status				
Middle SES	0.969***	0.948***	0.951***	0.977***
	(0.125)	(0.131)	(0.126)	(0.126)
High SES	1.312***	1.289***	1.292***	1.325***
	(0.157)	(0.167)	(0.159)	(0.159)
Working hours	-0.006***	-0.006***	-0.006***	-0.006***
	(0.002)	(0.002)	(0.002)	(0.002)
Number of shocks				
One shock	-0.279**	-0.283**	-0.284***	-0.294***
	(0.110)	(0.111)	(0.110)	(0.110)
Two or more shocks	-0.486***	-0.493***	-0.489***	-0.497***
	(0.125)	(0.131)	(0.126)	(0.126)
Life insurance				
Yes	-0.100	-0.126	-0.134	-0.126
	(0.128)	(0.122)	(0.129)	(0.129)
Health insurance				
Yes	0.246**	0.209*	0.206**	0.210**
	(0.104)	(0.111)	(0.105)	(0.105)
Physical activity at work				
Low	0.121	0.113	0.113	0.110
	(0.207)	(0.195)	(0.208)	(0.208)
Medium	0.229	0.213	0.217	0.215
	(0.214)	(0.209)	(0.216)	(0.215)
High	0.379	0.386*	0.388*	0.377*
	(0.213)	(0.202)	(0.214)	(0.214)
/cut1	-0.476	-0.270	-0.285	-0.353
	(0.290)	(0.328)	(0.331)	(0.299)
/cut2	1.126	1.336	1.322	1.253
	(0.291)	(0.333)	(0.333)	(0.300)

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Base: Age=15-24; Gender=female; Educational level=no education; Marital status=married; Occupation type= highly skilled white collar; Socioeconomic status=low SES; Index of the number of shocks=no shocks; Life insurance=no; Health insurance=no; Physical activity=skill not used

Table D: Factors associated with BMI using ordered logistic regression. (Coefficients and odds ratio estimates).

BMI Class	Coefficient	Std Err	Odds ratio	95% CI		P-value
Literacy	0.122	0.071	1.130	0.983	1.299	0.085
Educational level						
Basic	0.515	0.188	0.597	0.413 0.864		0.006
High School	-0.582	0.220	0.559	0.363 0.861		0.008
Tertiary	-0.838	0.264	0.433	0.258 0.726		0.002
Age						
25-34	0.377	0.154	1.457	1.078 1.970		0.014
45-54	0.906	0.152	2.475	1.835 3.338		0.000
55-64	1.212	0.202	3.360	2.262 4.992		0.000
Gender						
Male	-0.660	0.109	3.517	0.417 0.640		0.000
Marital status						
Divorced/Separated /Widowed	-2.245	0.175	0.783	0.556 1.103		0.162
Never married/Single	-0.065	0.101	0.937	0.769 1.142		0.520
Occupation type						
Low skilled white collar	-0.065	0.150	0.937	0.698 1.257		0.664
Crafts and trade	-0.273	0.161	0.761	0.555 1.044		0.091
Elementary occupations	-0.414	0.229	0.661	0.422 1.036		0.071
Skilled Agriculture	-0.239	0.256	0.787	0.477 1.300		0.350
Wages (log)	-0.034	0.018	0.967	0.933 1.001		0.058
Socioeconomic status						
Middle SES	-0.018	0.123	0.982	0.772 1.250		0.885
High SES	0.246	0.151	1.279	0.952 1.718		0.102
Working hours	-0.005	0.002	0.995	0.991		0.026

				0.999	
Number of shocks					
One shock	-0.027	0.111	0.973	0.783	0.808
				1.210	
Two or more shocks	0.047	0.125	1.048	0.821	0.707
				1.339	
Life insurance					
Yes	-0.139	0.132	0.870	0.672	0.290
				1.126	
Health insurance					
Yes	0.448	0.105	1.565	1.274	0.000
				1.921	
Physical activity at work					
Low	0.428	0.217	0.652	0.426	0.048
				0.997	
Medium	-0.104	0.223	0.902	0.582	0.642
				1.396	
High	-0.218	0.222	0.804	0.520	0.327
				1.243	
/cut1	-3.396	0.352	-3.397	-4.086	-
				2.708	
/cut2	-0.410	0.341	-0.410	-1.077	
				0.258	
/cut3	1.203	0.342	1.203	0.534	
				1.873	

Base: Age=15-24; Gender=female; Educational level=no education; Marital status=married; Occupation type= highly skilled white collar; Socioeconomic status=low SES; Index of the number of shocks=no shocks; Life insurance=no; Health insurance=no; Physical activity=skill not used

141

Table E: Factors associated with chronic illness using logistic regression. (Coefficients and odds ratio estimates).

Chronic illness	Coeffi-cient	Std Err	Odds ratio	95% CI		P-value
Literacy	0.314	0.130	1.369	1.061	1.767	0.016
Educational level						
Basic	0.620	0.474	1.859	0.734	4.711	0.191
High School	0.354	0.528	1.425	0.506	4.012	0.502
Tertiary	0.379	0.583	0.752	0.466	4.588	0.516
Age						
25-34	0.900	0.514	2.459	0.898	6.737	0.080
45-54	2.271	0.486	9.690	3.736 25.131		0.000
55-64	4.062	0.506	58.069	21.541 156.544		0.000
Gender						
Male	-0.031	0.200	0.969	0.654	1.436	0.876
Marital status						
Divorced/Separated /Widowed	0.223	0.285	1.249	0.715	2.192	0.434
Never married/Single	0.415	0.189	1.515	1.047	2.192	0.028
Occupation type						
Low skilled white collar	0.550	0.298	1.734	0.967	3.111	0.065
Crafts and trade	0.306	0.322	1.358	0.722	2.554	0.342
Elementary occupations	1.124	0.476	3.077	1.211	7.820	0.018
Skilled Agriculture	-0.041	0.593	0.959	0.300	3.069	0.944
Wages (log)	0.011	0.021	1.011	0.971	1.053	0.586
Socioeconomic status						
Middle SES	-0.283	0.236	0.754	0.475	1.196	0.230
High SES	-0.178	0.287	0.837	0.477	1.469	0.535
Working hours	-0.001	0.004	0.999	0.992	1.007	0.879
Number of shocks						
One shock	-0.286	0.227	0.752	0.481	1.173	0.209
Two or more shocks	0.443	0.235	1.558	0.983	2.468	0.059
Life insurance						
Yes	-0.891	0.265	0.410	0.244	0.689	0.001
Health insurance						
Yes	0.756	0.229	2.129	1.358	3.338	0.001
Physical activity at work						
Low	0.037	0.388	1.038	0.485	2.219	0.924

	Coefficient	Std Err	Odds ratio	95% CI		P-value
Medium	0.195	0.394	1.215	0.560	2.634	0.622
High	-0.599	0.421	0.549	0.241	1.252	0.154
Constant	-5.401	0.818	0.005	0.0001 0.022		0.000

Base: Age=15-24; Gender=female; Educational level=no education; Marital status=married; Occupation type= highly skilled white collar; Socioeconomic status=low SES; Index of the number of shocks=no shocks; Life insurance=no; Health insurance=no; Physical activity=skill not used

Table F: Factors associated with life satisfaction using ordered logistic regression. (Coefficients and odds ratio estimates).

Life Satisfaction	Coeffi-cent	Std Err	Odds ratio	95% CI		P-value
Literacy	0.042	0.072	1.042	0.905	1.201	0.565
Educational level						
Basic	0.084	0.200	1.087	0.741 1.596		0.669
High School	0.152	0.229	1.164	0.743 1.825		0.507
Tertiary	0.652	0.274	1.919	1.122 3.284		0.017
Age						
25-34	-0.061	0.150	0.940	0.706 1.252		0.674
45-54	0.179	0.145	1.197	0.900 1.590		0.216
55-64	0.873	0.204	2.394	1.606 3.570		0.000
Gender						
Male	-0.124	0.109	0.884	0.714 1.093		0.255
Marital status						
Divorced/Separated /Widowed	-0.193	0.171	0.824	0.590 1.153		0.259
Never married/Single	0.012	0.100	1.013	0.832 1.233		0.901
Occupation type						
Low skilled white collar	-0.165	0.150	0.848	0.631 1.138		0.272
Crafts and trade	-0.167	0.163	0.846	0.615 1.138		0.306

Elementary occupations	-0.599	0.224	0.549	0.354 1.165	0.007
Skilled Agriculture	-0.788	0.269	0.455	0.269 0.770	0.003
Wages (log)	-0.037	0.026	0.964	0.915 1.015	0.161
Socioeconomic status					
Middle SES	0.951	0.126	2.587	2.010 3.315	0.000
High SES	1.292	0.159	3.640	2.667 4.967	0.000
Working hours	-0.006	0.002	0.994	0.990 0.998	0.005
Number of shocks					
One shock	-0.284	0.110	0.753	0.607 0.934	0.010
Two or more shocks	-0.489	0.126	0.613	0.479 0.784	0.000
Life insurance					
Yes	-0.134	0.129	0.874	0.679 1.126	0.298
Health insurance					
Yes	0.206	0.105	1.229	1.001 1.509	0.059
Physical activity at work					
Low	0.113	0.208	1.119	0.745 1.683	0.588
Medium	0.217	0.216	1.242	0.814 1.895	0.314
High	0.388	0.214	1.474	0.969 2.243	0.070
/cut1	-0.285	0.331	-0.285	-0.933 0.363	
/cut2	1.322	0.333	1.322	0.670 1.974	

Table G: Tests of the parallel regression assumption for the ordered logistic regression

	Chi2	Df	P>Chi2
Wolfe Gould	112.8	28	0.000
Brant	22.66	28	0.750
Score	124.8	28	0.000
likelihood ratio	118.7	28	0.000
Wald	138.8	28	0.000

Table H: Test of model specification

BMI class	Coef.	Std. Err.	Z	P>z	[95%Conf.	Interval]
_hat	0.856	0.097	8.75	0.000	0.656	1.035
_hatsq	0.227	0.091	2.49	0.013	0.049	0.405
/cut1	-2.358	0.099			-2.553	-2.164
/cut2	0.588	0.061			0.468	0.708
/cut3	2.204	0.083			2.041	2.367

Number of obs	=	1,735	LR chi2(2)	=	186.17
Log likelihood = -1967.1376			Prob > chi2	=	0.0000
Pseudo R2	=	0.0453			

Tabel I: Principal Components Analysis

Principal components/correlation

Number of obs	= 9,486
Number of comp.	= 3
Trace	= 3

Rotation: (unrotated = principal) Rho = 1.0000

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.29385	1.72524	0.7646	0.7646
Comp2	0.56861	0.431068	0.1895	0.9542
Comp3	0.137542		0.0458	1.0000

Principal components (eigenvectors)

Variables	Comp1	Comp2	Comp3	Unexplained
Core Literacy	0.6259	-0.2021	-0.7532	0
Proficiency	0.05901	-0.5087	0.6269	0
Reading	0.5099	0.8369	0.1992	0

Principal components/correlation

Number of obs	= 9,486
Number of comp.	= 3
Trace	= 3

145

Rotation: orthogonal varimax (Kaiser off)   Rho   =   1.0000

Component	Variance	Difference	Proportion	Cumulative
Comp1	1.00002	0.0000232369	0.3333	0.3333
Comp2	0.999993	1.38962e-06	0.3333	0.6667
Comp3	0.999993		0.3333	1.0000

Rotated components

Variables	Comp1	Comp2	Comp3	Unexplained
Core Literacy	1.0000	-0.0000	-0.0000	0
Proficiency	0.0000	1.0000	-0.0000	0
Reading	0.0000	0.0000	1.0000	0

Component rotation matrix

Variables	Comp1	Comp2	Comp3
Comp1	0.6259	0.5901	0.5099
Comp2	-0.2021	-0.5087	0.8369
Comp3	-0.7532	0.6269	0.1992

Predict Literacy

Variables	Comp1	Comp2	Comp3
Core Literacy	1.0000	-0.0000	-0.0000
Proficiency	0.0000	1.0000	-0.0000
Reading	0.0000	0.0000	1.0000

Table J: Correlation between the index of literacy skills and the individual components of literacy skills.

	Literacy skills	Core Literacy
Literacy	1.0000	
Core Literacy	1.0000	1.0000

	Literacy skills	Proficiency
Literacy	1.0000	
Proficiency	0.8438	1.0000

	Literacy skills	Reading
Literacy	1.0000	
Reading	0.5182	1.0000

1