DYNAMICS AND EFFECTS OF HEALTH STATUS ON LABOUR FORCE PARTICIPATION IN DELTA STATE

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ABSTRACT
Nigeria faces a high and rising burden of disease. A high disease burden would potentially erode positive externalities from a viable labour force. Specifically, Delta State of Nigeria is relying on its labour force to achieve projected economic growth. Despite the potential negative labour market effect of illness and the rising disease burden in Delta State, there is limited empirical evidence on the relationship between self-reported illness and labour supply. This paper investigates the relationship between health conditions and labour force participation. A household survey in the 25 local government areas of Delta State provided the data. The study utilized a probit model and found that ill-health conditions reduce the likelihood of labour force participation. Ill-health conditions reduce the likelihood of labour force participation among women by a greater magnitude than among men. Therefore, the Delta State government should vigorously pursue effective policies and interventions to reduce the prevalence of ill-health conditions within the State.
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1. INTRODUCTION

Health has now been universally accepted as an important determinant of long-term economic development and growth of nations since good health can raise the overall productivity of the labour force (Efayena & Olele, 2020). The end of all developmental goals is not only jump in growth statistics, but more crucially the living conditions of its people, of which health constitutes an important factor. Good health is not only the goal of all developmental policies, but also an important means to achieve economic development (Singh & Das, 2015).

The labour market is an important institution which mediates the relationship between health and the economy. Currie and Madrian (1999) stressed the importance of examining the health-labour market relationship, noting that it is a means of evaluating the cost-effectiveness of interventions designed to cure or prevent diseases. Arguably, a more compelling reason to engage in such a study lies in the potential for good health to readily enhance an individual's ability to enjoy improved economic wellbeing. As Jack and Lewis (2009) observed, the most obvious reason why healthier people are more likely to be richer than their sicker counterparts are that they have a greater capacity to work harder, longer and more consistently than the latter. This was corroborated by Burdorf et al. (2023).

This is even more important given the heavy health burden of African countries. In recent years, the prevalence of deadly communicable and non-communicable diseases has adversely affected the populace in these countries. Although macro aggregates of these effects have been provided, the need to explore the micro effects cannot be overemphasized. Carrying out such grassroots' analysis will highly impact on government's health and labour policies.

Nigeria faces a heavy and rising disease burden. Malaria, tuberculosis and HIV/AIDs and the raging Covid-19 virus continue to weigh negatively on the health status of the Nigerian population (Efayena & Buzugbe, 2019). A heavy disease burden is of concern because it erodes

health human capital. Illness may reduce total healthy time available to an individual, thus affecting their labour force participation. Ill health may also cause individuals to prefer leisure to work, again affecting their labour force participation. Despite the potentially adverse consequences of a rising disease burden on individual labour market outcomes, research on the relationship between adult health and labour market outcomes in Nigeria is relatively scarce, let alone at state or local government level. This study intends to fill this important gap. This study will analyze the effects of health on labour force participation at the state government level, precisely Delta State, to adequately capture the economic dynamics.

Delta State presents an interesting case study for analyzing the relationship between health and the labour market. Not only is evidence on this relationship largely lacking, the state has experienced high disease burden mainly due to the HIV/AIDS pandemic and other communicable diseases like tuberculosis (TB) as well as non-communicable diseases (NCDs) over the past decade, and in most recent times the Covid-19 pandemic. Delta State has face rising health burden through the years. Various governments have implemented policies and programmes to mitigate or alleviate the devastating effect of such health challenges. For instance, the state government recently earmarked N3 billion to equip 20 general hospitals across the state (Ochei, 2024). The government has also approved the immediate replacement of health officials who were involved in the recent brain drain, in order to ensure good health for citizens in the state. Furthermore, Delta State was among the epicenters for the COVID-19 health pandemic, with high fatalities and incidences. In addition, the state also suffered fatalities in the ravaging cholera outbreak with a total of 118 cases recorded, and has been collaborating with the Nigeria Centre for Disease Control and Prevention (NCDC) to check the spread of cholera in the State (Delta State Government, 2024).

The issue of labour force participation in Delta State has been a case of concern for past governments. For instance, the unemployment rate is high given that with a labour force of over 2.5 million, about 1.01 million are unemployed (National Bureau of Statistics, 2020). Delta State was ranked third among the South-South States with unemployment rate and underemployment rate standing at 40.36 per cent and 20.1 per cent, respectively. In a recent survey, health conditions were identified among factors resulting in the dismay employment status in the State (Foundation for Partnership in the Niger Delta, 2021).

This study is important in that it contributes to an important literature by examining how health relates to labour market outcomes. The importance of the labour market to economic growth cannot be over-emphasized and as a result, it is important to investigate factors necessary for improved labour market outcomes. Health plays an important role in fostering improved labour market outcomes, and ascertaining the nature of this relationship at a micro level will add to the richness of the debate on the determinants of labour market outcomes in the country.

Understanding the relationship between health and labour force participation is important for a number of reasons. First, if ill health reduces the probability of labour force participation, it may lead to productivity loss both to individuals and the economy. Secondly, information from this study can be used to estimate lost production due to illness. This can be used to design appropriate interventions to avoid such productivity losses.

Several studies on health and employment exist in Nigeria (see Joseph & Agada, 2024; Adamu & Bulus, 2024; Idowu et al., 2024; Habib et al., 2024; Oburota, 2022; Ibrahim & Ditep, 2022; among others), although there is paucity in such studies at the state level. Therefore, this study aims to ascertain the relationship between health and the labour market in Delta State. Specifically, the study will ascertain, whether self-reported health (a proxy for actual health status) positively affects labour force participation in Delta State, and whether there exists a significant difference on the impact of health status between male and female in

Delta State, with the ultimate goal of drawing policy implications for increasing labour force participation in Delta State.

Following the introduction, sections 2 and 3 present the literature review and methodology of the study. Section 4 covers the discussion of the findings, while section 5 concludes the study.

2. LITERATURE REVIEW

2.1. Theoretical Literature

Several theories link health and labour supply. This study will succinctly examine five theories pertinent to the health-labour supply link. The following are: the nutrition-based efficiency wage hypothesis, human capital theory, the Grossman model (1972), and the Currie and Madrian (1999) model.

The nutrition-based efficiency wage hypothesis, which centres on labour productivity, health and wages, was pioneered by Leibenstein (1957). The philosophy of nutrition-based efficiency wage was predicated on the idea that productivity and wages go hand in hand. In developing economies, where wages set the level of consumption for workers, the amount of effort put in by those workers would be positively correlated with their state of health and nutrition. The quantity of work that a labourer can be expected to accomplish is determined by his energy, health, and vitality, all of which are influenced by his food intake and its nutritional value. According to Leibenstein's (1957) theory, workers who consume more calories are more productive than those who are undernourished, and improved nutrition is linked to enhanced output even at extremely low levels of intake. This theory makes the case that when wages and consumption rise, workers' output will progressively increase in units. It makes it rather obvious that rising levels of consumption will lead to higher levels of output.

The human capital theory framework views health as a human capital stock (Leibenstein, 1957; Schultz, 1961) that has the potential to raise wages and productivity. It is anticipated that those in poor health will make less money than those in better health since they will be less productive. People will spend more time working to make up for their lower pay, which will have a detrimental impact on leisure time. Employers of labour will interpret such lower compensation as an indication of inadequate productivity, which is the second effect of such salary reductions. As a result, fewer people will participate in the labour force.

In the Grossman (1972) model, health is a type of human capital that can affect labour supply in terms of time spent. This suggests that a healthy worker will have more healthy time overall, whereas a sick worker will have less healthy time. This is crucial to take into account because everyone's ability to balance work and play is limited by the quantity of time, they have available. The neoclassical theory of labour supply is based on this (Cahuc & Zylberberg, 2004). Consequently, a person's healthy time has a favourable or negative impact on the labour supply decisions he makes. It may also have an impact on a person's preferences for work and play (Cai & Kalb, 2006). Since one's health is considered a form of human capital, being unwell lowers one's health capital stock. This could have a domino effect on the person's leisure preferences. A person in such terrible health would probably need more medical care to get well again, which would mean raising his income to cover the additional costs of his care. In that instance, the person's propensity for labour has replaced leisure due to a bad state of health. There will be more labour available as a result.

The Currie and Madrian (1999) model highlighted the necessity to take potential endogeneity into consideration when evaluating the relationship between health and the labour market. Measurement issues such as justification bias, which can drive unemployed people to overstate the extent to which their health keeps them from getting or keeping a job, or reverse causality,

in which working either improves or deteriorates an employee's health, can give rise to endogeneity. The model examines the evidence that connects working-age persons' health and labour market results, assessing the relationship between health and labour market activity.

2.2. Empirical Literature

Several empirical studies have been carried out on the relationship between health and labour force participation in developing economies. While, one strand of empirical studies focuses on individuals in the working age bracket (Zhang, Zhao & Harris, 2009; Harris, 2008; Currie & Madrian, 1999; and others); another focuses on the proxies for health status (Civil, Ilhan & Yildirim, 2013; Fonseca & Zheng, 2011; Frijters, Johnston & Shields, 2010). While a number of studies examine labour force participation in Africa (Sackey, 2005; Lokshin et al., 2004; Mugume and Canagarajah, 2005; Siphambe and Motswapong, 2010; Ntuli and Wittenberg, 2013) comparatively few studies consider how health status affects labour force participation (Bridges and Lawson, 2008; Nanfosso and Zamo-Akono, 2010). In Nigeria, there is a dearth of labour market research on this issue.

There are two strands of literature on the relationship between health status and labour force participation. One strand analyzed the relationship between health status and labour force participation among the elderly (Zucchelli et al., 2010; Cai and Kalb, 2006; Mete and Schultz, 2002). Majority of these studies used individual self-reported/self-assessed health measures (Zucchelli et al., 2010; Cai and Kalb, 2006; Mete and Schutz, 2002; Rice et al., 2006). In addition, Mete and Schultz (2002) used activities of daily living (ADL) index and specific health conditions and illnesses, Au et al. (2005) used health utility index and Rice et al. (2006) used self-reported functional limitations. The health utility index was constructed from specific health conditions and health limitations that were aggregated using preference scores.

However, irrespective of the approach, there is a general consensus that ill-health results in reduced labour force participation. For instance, the study of Reddy and James (2024) analyzes the impact of poor health on labour outcomes across various age groups in India. This study's labour outcomes encompass labour force participation, labour earnings, and hours worked. The study employed an instrumental variable methodology to address endogeneity concerns and find causal connections between health and labour outcomes. The study also employed the Heckman selection model to mitigate selection bias in the examination of wages and hours worked. The study found that illness continues to reduce labour market participation among middle-aged (28 percent) and elderly (36 percent) adults. This highlights the significant influence of health on workforce involvement, especially in an environment with inadequate social security provisions. The study also revealed significant disparities in the impact of ill health on wages and hours worked, depending on age. Poor health causes a significant decline in earnings and hours worked among senior citizens. Nonetheless, this effect is less significant in middle-aged individuals.

Further, Mussida and Patimo (2023) examines the nexus between health and labour market participation, taking into account the influence of children and elderly individuals (with or without disabilities) in Italian households. They use full-information maximum likelihood to estimate a two-equation model and use instruments to reduce the endogeneity of decisions about joining the labour force. Each gender independently estimates the model. The study indicated that the presence of children and elderly individuals, or both, positively impacts the health state of both sexes; however, the presence of impaired elderly individuals has a detrimental effect. Notable disparities in participation arise. The presence of children inhibits women's participation in the workforce, while it positively correlates with men's participation in the labour force.

The study of Feer et al. (2022) examines the interrelationship between individual trajectories of self-rated health (SRH) and working hours among older workers in Switzerland, as well as the variation of this association across different occupations. The study used data from the Swiss Household Panel to investigate the long-term trajectories of older workers, quantified by working hours and self-rated health (SRH), and used a bivariate response multilevel growth model to assess both inter- and intra-individual changes over time. The study revealed that, at the inter-individual level, upper non-manual workers had the greatest heterogeneity in working hours, whereas lower non-manual workers demonstrated the highest heterogeneity in health status. The study identified a substantial correlation between working hours and self-rated health across all occupational groups. The individual-level statistics consistently demonstrated the most pronounced consequences for manual labourers. This finding supports the hypothesis that labour force participation among individuals in the manual occupational category is more responsive to their health state.

Ebaidalla and Mohammed (2022) analyse the influence of chronic illnesses on labour force participation using labour market survey data from Egypt and Tunisia. The study additionally examines the inverse relationship between labour force participation and the prevalence of chronic diseases. The study employed simultaneous equation modelling to tackle the potential endogeneity of chronic illnesses in the labour participation equation. The findings indicated that individuals with chronic illnesses are less inclined to engage in the labour force in both Egypt and Tunisia. The study of sub-samples reveals variances among gender and age groups. The impact of chronic illnesses is notably greater and statistically significant for males than for females. Similarly, the feedback effect indicates that labour force involvement negatively affects chronic illness, particularly within the overall sample. Furthermore, in the elderly demographic, the influence of labour force participation on chronic diseases is more pronounced than its effect in the younger demographic.

Paweenawat and Liao (2021) employed the Socio-Economic Survey (SES) panel data from 2005 to 2012 and analyzed the determinants of the determinants of labour force participation among older people using the fixed-effect logit model (FE-logit). The study found that there was strong evidence that poor health status reduces labour force participation. Damrongplasit, Hsiao and Zhao (2018) employed data of eight waves of Australia Household, Income and Labour Dynamics to investigate the impact of health on labour force participation. Using the dynamic fixed effects logit model on a data disaggregated by gender, the study found that labour force participation is negatively impacted by ill-health for both males and female.

Carter, Gunasekara, Blakely and Richardson (2013) utilized seven waves from the longitudinal Survey of Family, Income and Employment (SoFIE) within a fixed effect conditional logistic regression framework and found that health shock was associated with a significantly increased risk of subsequent non-participation in the labour force. The study found that the association was largest in younger men and women.

In the same vein, Olayiwola, et al (2018) investigated the impact of health status (proxied by life expectancy, incidence of malaria, tuberculosis, HIV/AIDS) on labour force participation in Nigeria using data sourced from World Development Indicators. The study found that increase in life expectancy will increase labour force participation by about 33 percent, and this rate will increase to as much as 83 percent when other household characteristics are controlled. In addition, reduction in Malaria, HIV/AIDS and Tuberculosis will increase labour force participation.

Nanfosso and Zamo-Akono (2010) investigated the relationship between health (self-assessed health status and a disability index) and female labour force participation in urban Cameroon based on 2,096 women respondents aged 18 to 64. The study found that illness reduced the

likelihood of participating in the labour force. The study showed that health status (proxied by the number of children) increased the probability of female labour force participation in the public sector by 2.4 percent, formal private sector by 1.7 percent, and the informal sector by 7.5 percent.

Mohammed, Njiforti and Rafindadi (2020) employed women reproductive health (total fertility rate, child spacing and contraceptive prevalence rate) as a proxy for health status in Nigeria. By employing the National Demographic Health Survey reports for 2003, 2008 and 2013, the logistic regression results showed that health negative impacted labour force participation.

2.3. Gap in the Literature and Value Addition

The review showed that there is dearth of empirical studies on the impact of health status on labour force participation at the micro-level such as state governments or local government levels in Nigeria. This study is poised to fill this important gap.

3. METHODOLOGY

3.1. Theoretical Framework

This study hinges on the model of Currie and Madrian (1999), which opined that the nexus between health and LFP is endogenous (Mete & Schuttz, 2002). The endogenous relationship between health and LFP stems from at least two sources. Firstly, health can influence individuals' decision to work, while work can also impact health. Secondly, unobserved individual characteristics, such as ability, may affect both the likelihood of working and health status.

According to Currie and Madrian (1999), individuals at a particular time derive utility from health, leisure, and other commodities. Investing in health inputs enhances an individual's health status, thereby increasing their available time for leisure and market activities. At the same time, hours of work are necessary in order to increase the available income, which allows the acquisition of material health inputs and other commodities from which individuals also derive utility.

The intertemporal utility function of the consumers is given below:

$$U_t = \sum_{t=1}^{T} E_t \left(\frac{1}{1+\lambda}\right)^t U_{it} + B(A_{T+1}) \quad (4.1)$$

Where λ is the discount rate, *B(.)* is a bequest function, *A* denotes assets, and U_t is given by

$$U_t = U(Q_t, C_t, L_t; \boldsymbol{X}_t, u_1, \varepsilon_{1t}) \quad (4.2)$$

Where *Q*, *C*, *L*, *X*, u_1 and ε_1 represent stock of health, consumption of other goods, leisure, vector of exogenous taste shifters, vector of permanent individual specific taste shifters and a shock to preferences, respectively.

The health variable was incorporated into the utility maximization problem through either the budget constraint, time constraint (by increasing sick days, hence reducing the maximum time available for leisure), or the utility function (given that people derive direct disutility from being in poor health). In such a model, health, together with labour supply and consumption of

other goods, enters the utility function as an endogenous choice variable. Specifically, the model can be solved to obtain a conditional labor supply function, where the labor supply is dependent on the endogenous health variable and a range of other exogenous variables. This is appropriate in this study given the array of variables, such as socio-economic and demographic variables, at our disposal.

The Currie and Madrian (1999) model is best suited for the present study since it adequately captures all the variables of interest. For example, the model captures variables such as health status, employment characteristics, and other demographic characteristics such as age, marital status, and region, thus making the Currie and Madrian (1999) model an appropriate theoretical framework for the study.

3.2. Model Specification

Individuals will participate in the labour force if the marginal rate of substitution between consumption good and leisure is lower than the market wage. Let the observed labour force participation variable be defined as follows

$$y = \begin{cases} 1\ (if\ an\ individual\ is\ in\ the\ labour\ force) \\ 0\ (if\ an\ individual\ is\ not\ in\ the\ labour\ force) \end{cases} \quad (1)$$

An individual's propensity to be in the labour market represented by an unobservable variable y^* is related to a vector of explanatory variables (x) by the following equation

$$y^* = \beta x + \varepsilon \quad (2)$$

Where β, ε are parameters and error tem respectively. The probability of an individual participating in the labour force can be expressed as follows:

$$\Pr(y = 1|x) = \Pr(y^* > 0|x) \quad (3)$$

Substituting equation (3) into equation (2) yield the following equation

$$\Pr(y = 1|x) = \Pr(\varepsilon > -\beta x|x) = \Pr(\varepsilon > \beta x|x) = F(\beta x) \quad (4)$$

The probability of labour force participation depends on the distribution of the error term, ε.

Assuming that the error term follows a normal distribution leading to a probit model while assuming the error term follows a logistic distribution and leads to a logit model (Long and Freese, 2006). The probit model is widely applied in estimating the labour force participation equation. This study followed in that tradition.

Following Wooldridge (2002) and Mwabu (2009), the model estimated can be specified as follows:

$$y = [\beta x_1 + \alpha H + \varepsilon_1 > 0]$$
$$H = [\beta_2 x + \varepsilon_2 > 0] \quad (5)$$

where, H is health status, y is the observed labour force participation status. x is a vector of exogenous variables that includes x_1 exogenous variables that belong to the labour force participation equation and a vector of instrumental variables, x_2 that affect the health variable. β_1, β_2, α are parameters to be estimated and ε_1, ε_2 are disturbance terms.

3.3. Estimation Issues

- ***Endogeneity***

Health status is potentially endogenous in labour force participation models because of three reasons: simultaneity between the health status variable and labour force participation, measurement and reporting error and omitted variable bias (Bound, 1991; Stern, 1989).

- ***Unobserved heterogeneity***

Unobserved heterogeneity will exist in this study if there is nonlinear interaction between the health variables and unobservable factors causing the effect of health on labour force participation to vary by individual workers. Failure to take into account unobserved heterogeneity and simultaneity leads to underestimation of the direct effects of health status on labour force participation (Cai and Kalb, 2006).

In this study, the instrumental variables used for chronic and acute illness are average distance in kilometers to the nearest weekly market and number of health facilities in the district of residence. Distances are proxies of time costs of health care (Strauss and Thomas, 1998). Longer distances also mean higher transport cost. Number of health facilities in the district is a proxy for availability of health services (Strauss and Thomas, 1998). Higher costs of seeking care may lead to reduced consumption of health care. Similarly, lack of health facility may equally reduce consumption of health care yet health care is an input in the production of health. The instrumental variables must satisfy three conditions: they must not be correlated with ε_1, must not have a direct influence on *y* and must be highly correlated with *H*.

3.4. Research Instrument

A questionnaire will be constructed following the structure of that of the General Households Survey (GHS) of the World Bank. The questionnaire will include the following variable definitions:

The dependent variable is observed labour force participation. It takes the value 1 if an individual reported to work for pay, to be on leave, to be in non-agricultural self-employment, to be in agricultural self-employment or seeking work. It takes a value 0 if an individual reported that they were doing nothing, retired, homemakers or incapacitated. The independent variables in the labour force participation equation are health status, education, age, marital status, number of children below 5 years in a household, transfers, region and area of residence.

Health status variable equals 1 if an individual reported having an illness or injury and zero if an individual reported having no illness or injury. Education enters the labour force participation model because it is considered a form of human capital that influences wages and hence labour force participation (Mincer, 1958). In this study education is measured in four levels to capture the highest level of education attained: no formal education, primary education, secondary education and tertiary education. A dummy variable is created for each level of education. It takes a value 1 if an individual reported having that particular level of education and 0 if otherwise.

Marital status is measured as a dummy variable which equals 1 if an individual reported being married and 0 if otherwise. Three dummies were created for presence of children below 5 years in the household. The first is the no child dummy which equals 1 if there is no child in the household and 0 if otherwise. The second is the one child dummy which equals 1 if there is 1 child in the household and 0 if otherwise. The third is more than 1 child dummy which equals 1 if a household had two or more children and 0 if otherwise. Presence of children is included in the model to capture familial environment (Cahuc and Zylberberg, 2004). It is expected that individuals coming from families with children below 5 years especially women are less likely to participate in the labour force. Women may opt to take care of their young children and so

exit the labour force (Lokshin et al., 2004; Bridges and Lawson, 2008). Dummy variables for area of residence and regions are included in the labour force participation model.

3.5. Method of Data Analysis

The data from the survey will be analyzed using descriptive analysis and the Probit (Marginal effects) econometric technique.

3.6. Scope of the Study

The study covers the Delta State of Nigeria. Delta State has 25 local government areas (Ethiope East, Ethiope West, Okpe, Sapele, Udu, Ughelli North, Ughelli South, Uvwie, Aniocha North, Aniocha South, Ika North East, Ika South, Ndokwa East, Ndokwa West, Oshimili North, Oshimili South, Ukwuani, Bomadi, Burutu, Isoko North, Isoko South, Patani, Warri North, Warri South and Warri South-West). The research instrument will be distributed across local government areas to elicit robust information on labour and health statistics of the populace.

4. DISCUSSION OF FINDINGS

4.1. Descriptive statistics

Table 1 presents the mean and standard deviation of the variables used in the analysis. A higher proportion of women than men reported illness and injury. While 12% of men reported having health issues, 19% of women reported having health conditions.

According to the sample, the majority of men and women reported having no formal education (30% and 39% for men and women, respectively). Those with a primary level of education were also many, at 32% and 31% for both men and women, respectively. About 16% of the men reported having tertiary education, compared to only 11% of the women. Generally, a higher proportion of women reported lower levels of education (no formal education and primary education) than men, while a higher fraction of men reported higher levels of education (secondary and tertiary education).

The mean age of men was 35 years, whereas that of women was 39 years. A smaller fraction of women in the sample reported being married (63%) compared to 67% for men. Similarly, a larger proportion of men in the sample reported living in rural areas (73%), compared to 61% of the women. Almost the same fraction of both men and women reported having no child below 5 years old. Labour force participation also varied by region.

Table 1. Descriptive Statistics

Variable	**Mean (Standard deviation)**		
Health Status	**Male sample**	**Female sample**	**Full sample**
Health status (=1 if an individual reported having injury or illness, 0 otherwise)	0.12 (0.28)	0.19 (0.37)	0.14 (0.33)
Education			
No formal education (=1 if an individual reported to have no formal education, 0 otherwise)	0.30 (0.45)	0.39 (0.49)	0.36 (0.50)
Primary education (=1 if an individual reported having primary education, 0 otherwise)	0.32 (0.45)	0.31 (0.48)	0.33 (0.49)

Secondary education (=1 if an individual reported having secondary education, 0 otherwise)	0.22 (0.41)	0.19 (0.39)	0.19 (0.40)
Tertiary education (=1 if an individual reported having tertiary education, 0 otherwise)	0.16 (0.37)	0.11 (0.34)	0.12 (0.37)
Age	35 (14)	39 (14)	33 (14)
Marital status (=1 if an individual reported to be married, 0 otherwise)	0.67 (0.47)	0.63 (0.50)	0.61 (0.48)
Children below 5 years			
No children (=1 if a household reported having no child under 5 years, 0 otherwise)	0.60 (0.49)	0.58 (0.51)	0.55 (0.49)
A child (=1 if a household reported having 1 child under 5 years, 0 otherwise)	0.25 (0.42)	0.27 (0.45)	0.26 (0.42)
> Two children (=1 if a household reported having 2 or more children under 5 years, 0 otherwise)	0.15 (0.38)	0.15 (0.40)	0.19 (0.41)
Rural area (=1 if an individual reported to be living in the rural area, 0 otherwise)	0.73 (0.45)	0.61 (0.42)	0.71 (0.46)

Source: Author's computation based on field survey

4.2. Effect of health conditions on labour force participation

The study presents empirical results separately for men and women. Table 2 presents the marginal effects of the probit model. According to the probit estimates, people with health conditions are less likely to participate in the labour force than those who are not ill. Health conditions, in particular, reduce the likelihood of participating in the labour market by three percentage points. Furthermore, women are more affected by health conditions than men. These findings are in line with theory. Illness may reduce an individual's wage (Leibenstein, 1957; Becker, 1962; Mushkin, 1962; Schultz, 1961), affect an individual's preference between leisure and work (Cai & Kalb, 2006), or reduce total healthy time (Grossman, 1972). The findings in this study add to those of studies in other countries that found a negative effect of ill health on labour force participation (Bridges & Lawson, 2008; Brown et al., 2010; Mete & Schultz, 2002; Cai & Kalb, 2006). However, findings in this study contradict Zhang et al. (2009), who found that men were more likely than women to reduce their likelihood of participating in the labour force due to illness.

Table 2. Probit estimates

	Marginal effects		
Variable	**Full sample**	**Male sample**	**Female sample**
Health status	-0.0313** [0.011]	-0.0104* [0.010]	-0.0300** [0.013]
Age	0.0331*** [0.001]	0.0219*** [0.001]	0.0471*** [0.002]
Age square	-0.0004*** [0.000]	-0.0002*** [0.000]	-0.0005*** [0.000]
Gender (male=1)	0.2057***		

	[0.006]		
Education (reference category = no formal education			
Primary	0.0062 [0.008]	-0.0028 [0.008]	0.0115 [0.013]
Secondary	0.0041 [0.010]	-0.0036 [0.010]	0.0141 [0.017]
Tertiary	0.0637*** [0.010]	0.0200* [0.011]	0.1163*** [0.022]
Marital status (married = 1)	-0.0472*** [0.008]	0.0617*** [0.011]	-0.1382*** [0.013]
Presence of children 0-5 years (reference category = none)			
1 child 0-5 years	0.0015 [0.008]	0.0122 [0.008]	-0.0257 [0.012]
2 or more 0-5 years	-0.0211*** [0.013]	-0.0085 [0.015]	-0.0513*** [0.017]
Rural	0.0618*** [0.008]	0.0080 [0.008]	0.1295*** [0.014]
Wald $\chi 2$	1415***	298***	582***
Pseudo R-square	0.1315	0.1004	0.1098

Source: Author's computation

Note: Robust standard errors in brackets

As expected, the results show that an individual's probability of participating in the labour market increases with age. However, a turning point occurs at a maximum from which we observe a negative relationship between age and labour force participation. This finding supports outcomes of some previous studies (see Mugume & Canagarajah, 2005; Nanfosso & Zamo-Akono, 2010).

Relative to no formal education, tertiary education has a significant positive effect on labour force participation. The study reveals no significant effects of primary and secondary education on labour force participation. Individuals who have attained tertiary education are six percentage points more likely to participate in the labour market compared to those who have no formal education. This may reflect the impact of investments in education and human capital on wages. This finding supports the studies of Mugume and Canagarajah (2005) and Bridges and Lawson (2008), who found primary and/or secondary levels of education to have insignificant effects on labour force participation. Similarly conclusion was reached in the study of Ebaidalla and Mohammed (2022) carried out using Egypt and Tunisia data.

According to the estimates, the effect of education on the probability of participating in the labour market varies by gender. The effect of tertiary education compared to having no formal education is greater for women than for men. While women with tertiary education are 11 percentage points more likely to participate in the labour market, men with a similar level of education are only 2 percentage points more likely to participate in the labour market relative to their counterparts with no formal education. Organizations strive to maintain gender equity, which increases the employment chances of educated women.

Marriage reduces the likelihood of an individual being in the labour force by 4 percentage points compared to their unmarried counterparts. The impact of marital status on participation varies across genders. While being married reduces the probability of participation for women, it increases the probability of participating in the labour market for men. Married women are 13 percentage points less likely to be in the labour force compared to their unmarried counterparts, while married men are actually 5 percentage points more likely to be in the labour

force compared to their unmarried counterparts. A lower participation rate on the part of married women compared to men was found in the study of Feer et al. (2022) which utilized Indian data and that of Bridges and Lawson (2008) that utilized Ugandan survey data.

Women who live in households with children under the age of 5 are less likely to participate in the labour market compared to those who live in households with no children. This may be because when children are young, women tend to play a bigger role in child care, which may reduce the chance of participating in the labour market. At times, women opt to stay out of the labour market completely until their children have grown to become independent. They found that the higher the number of young children (0–5 years old) in a household, the lower the likelihood of participating in the labour force, especially for women. Lokshin et al. (2004) also found that married women with children were less likely to participate in the labour market in Kenya.

Labour force participation also varies by area of residence. Individuals living in rural areas are more likely to participate in the labour market compared to their counterparts in urban areas. At first glance, this may seem counterintuitive, but data reveals that agriculture, a sector primarily found in rural areas, Mugume and Canagarajah (2005) also found that being in rural areas increased the likelihood of participating in the labour force in Uganda. Similar conclusion was reached in the study of Burdorf et al. (2023), as well as that of Reddy and James (2024).

5. CONCLUSION

This study investigates the effects of health status on labour force participation in Delta State. The study utilizes household data from the 25 local government areas in Delta. Utilizing the probit estimation technique, the study found that factors such as tertiary education, health status, and individual attributes influence labour force participation. Implementing policies that focus on enhancing accessibility to higher education will result in a rise in the number of individuals actively participating in the workforce. Given that health conditions have a negative impact on individuals' engagement in the workforce, it is important to supplement education programs with measures aimed at decreasing the occurrence and prevalence of illness among the population. Specifically, the findings suggested that chronic illnesses have a greater impact on the ability to participate in the labour force compared to acute illnesses. By providing this knowledge, we can potentially reduce the occurrence and prevalence of chronic illnesses, as lifestyle modifications, appropriate dietary choices, and medication can effectively control them. Expanding the availability of management medications is necessary to retain individuals in the workforce. Women experience a greater negative impact from disease compared to men, therefore emphasizing the importance of addressing gender in health policy. These findings have implications for health interventions' costs and benefits. Health policy makers should understand that promoting good health not only yields benefits but also plays a crucial role in preventing poorer productivity due to ill health, thereby decreasing the likelihood of participating in the labour market.

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REFERENCES

Adamu, M. B., & Bulus, B. T. (2024). Impact of population growth on unemployment in Nigeria: A dynamic OLS approach. *Journal of Economics and Allied Research*, *9*(2), 133–149.

Au, D. W. H., Crossley, T. F., & Schellhorn, M. (2005). The effect of health changes and longterm health on the work activity of older Canadians. *Health Economics*, *14*, 999-1018.

Becker, G. S. (1962). Investment in human capital: A theoretical analysis. *The Journal of Political Economy*, *70*, 9-49.

Bound, J. (1991). Self-reported versus objective measures of health in retirement models. *Journal of Human Resources*, *26*, 106–138.

Bridges, S., & Lawson, D. (2008). A gender-based investigation into the determinants of labour market outcomes: Evidence from Uganda. *Journal of African Economies*, *18*, 461-495.

Brown, S., Roberts, J., & Taylor, K. (2010). Reservation wages, labour market participation and health. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *173*, 501-529.

Burdorf, A., Fernandes, R. C., & Robroek, S. J. (2023). Health and inclusive labour force participation. *The Lancet*, *402*(10410), 1382-1392.

Cahuc, P., & Zylberberg, A. (2004). *Labor Economics.* Cambridge: MIT Press.

Cai, L., & Kalb, G. (2006). Health status and labour force participation: Evidence from Australia. *Health Economics*, *15*, 241-261.

Carter, K. N., Gunasekara, F. I., Blakely, T., & Richardson, K. (2013). Health shocks adversely impact participation in the labour force in a working age population: A longitudinal analysis. *Australian and New Zealand Journal of Public Health*, *37*(3), 257-263.

Civil, E. F., Ilhan, M. N., & Yildirim, J. (2013). Impact of cardiovascular disease on labour force participation: Bivariate probit analysis. *Value in Health*, *16*(7). DOI: https://doi.org/10.1016/j.jval.2013.08.1314.

Currie, J., & Madrian, B. C. (1999). Health, health insurance and the labor market. In: Ashenfelter, O. and Card, D. (eds) *Handbook of Labor Economics, Elsevier Science BV,* 3309-3416.

Damrongplasit, K., Hsiao, C., & Zhao, X. (2018). Health status and labour market outcome: Empirical evidence from Australia. *Pacific Economic Review*, 1-24.

Delta State Government (2024). *Delta reiterates commitment to curbing Cholera outbreak.* https://deltastate.gov.ng/2024/07/09/11060/

Ebaidalla, M. E., & Mohammed, E. M. A. (2022). Chronic illnesses and labor market participation in the Arab countries: Evidence from Egypt and Tunisia. *Middle East Development Journal*, *14*(2), 303-322.

Efayena, O. O., & Buzugbe, P. N. (2019). Impact of healthcare expenditure on economic growth in Nigeria: A GMM approach. *Journal of Economics and Finance*, *3*(1), 163-171.

Efayena, O. O., & Olele, E. H. (2020). Modelling the economic impact of Covid-19: Implications for African countries. *African Journal of Social and Behavioural Sciences*, *10*(2), 422-433.

Feer, S., Lipps, O., Dratva, J., & Baumann, I. (2022). Health and labor force participation among older workers in Switzerland: A growth curve analysis. *European Journal of Ageing*, *19*(4), 1395-1406.

Fonseca, R., & Zheng, Y. (2011). *The effect of education on health*. RAND labor and population Working Paper Series WR-864

Foundation for Partnership in the Niger Delta (2021). *Delta State Labour Market Assessment Report*. https://pindfoundation.org/delta-state-labour-market-assessment-report/

Frijters, P., Johnston, D. W., & Shields, M. A. (2010). *Mental health and labour market participation: Evidence from IV panel data models*. IZA Discussion Paper No. 4883.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy*, *80*, 223-255.

Habib, A. O., Awolaja, G. O., & Aworinde, O. B. (2024). Health spending and life expectancy disparities: A gender analysis in Nigeria. *Journal of Economics and Allied Research*, *9*(2), 214-225.

Harris, A. (2008). Chronic disease and labour force participation in Australia: An endogenous multivariate probit analysis of clinical prevalence data. *Research Paper 2008 (25).* Center for Health Economics, Monash University.

Ibrahim, T. M., & Ditep, N. R. (2022). The impact of public health expenditure on health indicators in Nigeria. *Journal of Economics and Allied Research*, *7*(1), 25-34.

Idowu, D. O., Sunday, B. S.-I., Ike, F. E., & Dorathy, P. N. (2024). Impact of female labour force participation on economic growth in Nigeria. *Journal of Economics and Allied Research*, *9*(2), 178-188.

Jack, W., & Lewis, M. (2009). *Health investments and economic growth: Macroeconomic evidence and microeconomic foundations*. World Bank Policy Research Working Paper no.4877.

Joseph, P., & Agada, M. (2024). Public health expenditure and life expectancy in Nigeria. *Journal of Economics and Allied Research*, *9*(2), 33-44.

Leibenstein, H. (1957). The theory of underemployment in backward economies. *Journal of Political Economy*, *65*, 91-103.

Lokshin, M., Glinskaya, E., & Garcia, M. (2004). The effect of early childhood development programming on women's labor force participation and older children's schooling in Kenya. *Journal of African Economies*, *13*, 240-276.

Long, J. S. & Freese, J. (2006). *Regression models for categorical dependent variables using Stata*. Texas: Stata Press publication

Mete, C., & Schultz, T. P. (2002). *Health and labour force participation of the elderly in Taiwan*. Economic Growth Center, Yale University Discussion Paper No. 846.

Mincer, J. (1958). Investment in human capital and personal income distribution. *Journal of Political Economy*, *66*(4), 281-302.

Mohammed, O. A., Njiforti, P. P., & Rafindadi, S. A. (2020). Analysis of the impact of reproductive health outcome on women labour force participation and earnings in Nigeria. *International Journal of Educational Research*, *8*(1), 93-116.

Mugume, A., & Canagarajah, S. (2005). *Employment, labor markets, and poverty in Uganda*. Mimeo: World Bank.

Mushkin, S. J. (1962). Health as an investment. *Journal of Political Economy*, *70*, 129-157.

Mussida, C., & Patimo, R. (2023) Care, labour force participation and health: The case of Italy. *International Journal of Manpower*, *44*(9), 91-107.

Mwabu, G. (2009). The production of child health in Kenya: A structural model of birth weight. *Journal of African Economies*, *18*, 212-260.

Nanfosso, T. R. A., & Zamo-Akono, C. M. (2010). Fertility, health and female labour force participation in urban Cameroon. *International Business Research, 17*, 34-50.

Ntuli, M., & Wittenberg, M. (2013). Determinants of black women's labour force participation in post-apartheid South Africa. *Journal of African Economies, 22*, 347-374.

Oburota, C. S. (2022). Inequality trends in maternal health care service utilization: Evidence from Nigeria. *Journal of Economics and Allied Research*, *7*(2), 194-205.

Ochei, M. (2024, April 1). Delta health insurance gets over two million enrollees. *Punch*. https://punchng.com/delta-health-insurance-gets-over-two-million-enrollees/

Olayiwola, S. O., Adedokun, B., & Abiodun, S. O. (2018). Health and labour force participation: Empirical evidence from Nigeria. *Journal of Economics and Policy Analysis, 3*(1), 1-18.

Paweenawat, S. W., & Liao, L. (2021). *Labor supply of older workers in Thailand*: *The role of co-residence, health, and pensions.* ADBI Working Paper 1224. Tokyo: Asian Development Bank Institute.

Reddy, U. S., & James, K. S. (2024). The impact of health on labour outcomes among middle-aged and elderly: Insights from India. *PLoS ONE, 19*(7), e0303194. https://doi.org/10.1371/journal. pone.0303194

Rice, N., Roberts, J., & Jones, A. (2006). *Sick of work or too sick to work? Evidence on health shocks and early retirement from the BHPS*. Health, Econometrics and Data Group Working Paper 06/13. University of York.

Sackey, H. A. (2005). *Female labor force participation and fertility in Ghana: The effects of education*. AERC Research Paper No. 150. Nairobi: African Economic Research Consortium (AERC).

Schultz, T, W. (1961). Investment in human capital. *American Economic Review*, *51*, 1-17.

Singh, P. A., & Das, M. (2015). Impact of health status on economic Growth: A study of different income group countries. *International Journal of Humanities & Social Science*, *11*(111), 233-240.

Siphambe, H., & Motswapong, M. (2010). Female participation in the labor market of Botswana: Results from the 2005/06 Labor Force Survey Data. *Botswana Journal of Economics*, *7*, 65-78.

Stern, S. (1989). Measuring the effect of disability on labour force participation. *Journal of Human Resources*, *24*, 361-395.

Strauss, J., & Thomas, D. (1998). Health, nutrition, and economic development. *Journal of Economic Literature*, *36*, 766-817.

Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. Cambridge: The MIT Press.

Zhang, X., Zhao, X., & Harris, A. (2009). Chronic diseases and labour force participation in Australia. *Journal of Health Economics*, *28*, 91-108.

Zucchelli, E., Jones, A. M., Harris, A., & Rice N. (2010). The effects of health shocks on labour market exits: Evidence from The HILDA Survey. *Australian Journal of Labour Economics*, *13*, 191-218.