Health and Labour Force Participation: Empirical Evidence from Nigeria

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Abstract

This study examines the impact of life expectancy and ill-health on labour force participation in Nigeria using data from World Development Indicators. Two models of labour supply decision using two-stage instrumental variable estimation method with main predictors of health on labour market performance: life expectancy, incidence of malaria, tuberculosis, HIV/AIDS were employed to examine the effects of health on labour force market participation. The results show that increase in life expectancy will increase labour force participation by about 33% without controlling for other household characteristics and by about 83% when control for other household characteristics. Also, reduction in diseases like Malaria, HIV/AIDS and Tuberculosis will increase labour supply and productivity. Thus, it was concluded that ill-health has negative impact on industrialization through reduced economic output due to decline labour supply. It was therefore suggested that public sector must play an important role in key areas like labour market, education and rural-urban migration to improve the health of the labour force and hence overall productivity. Higher priority should also be given to tackling widespread diseases with low mortality burdens, but considerable effects on productivity.

Keywords: Ill-health, life expectancy, labour force participation
JEL Classification: H51, I18, J21

Introduction

The devastating effects of poor health on productivity and income are clear enough; poor health conditions impaired productivity. However, a healthy population is a prerequisite for sustainable socio-economic development. The importance of health in poverty reduction and economic development has been well documented in economic literature (Audibert, 2009; Thomas, 2009). Studies have also shown that health of the population is an indispensable factor for labour productivity, poverty reduction and economic development. This informed the importance of health in individuals' labour supply decision. Due to the fact that health is both a form of human capital (Becker, 1964; Grossman, 1972) and because individuals' preferences between work and leisure may change due to health shock, individuals may prefer more leisure to work as a result of ill-health. More so, since life expectancy depends on health, changes in health may

change the time horizon over which labour supply decisions are made (Chiricos, 1993). Evidences have also demonstrated that in spite of rapid economic growth, over a billion individuals still suffered from degrading poverty due to ill-health and low productivity. For example, Bloom et al, (2004) established HIV/AIDS and Malaria reduces growth in Sub-Saharan African (SSA) countries by over 1.5% per year and one-year improvement in life expectancy leads to 4% increase in output These inform an examination of the links between population health and productivity a major issue of concern (Tompa, 2002).

Labour force participation decisions are influenced by individuals' health status because the actors of the labour market value health as a part of human capital (Becker, 1964; Grossman, 1972). Individuals' with better health tend to get more education, have higher earnings; therefore, improving health could raise labour force participation (Holt, 2010a in Doğrul, 2015). However, a person with poor health may value leisure time more than the working hours by reducing working hours hence lowering productivity at work, which can further cause output loss. Also, the costs of improving poor health and value of lost output are the measures of the economic cost of poor health (Holt, 2010b 2010a in Doğrul, 2015). Studies on health and its impacts on labour markets outcome have been under extensive examination mostly in developed countries (Currie and Madrain, 1999; Suhrckeet al, 2005) based on the fact that these countries recognized labour market as the key determinant of economic performance. According to Matovu, Birungi and Sebaggala, (2012) this type of study is scanty in developing countries. Few available studies on ill-health and labour market include Bridges and Lawson (2008) who examined the effect of health status on participation in labour force and worker's choice between paid employment and self-employment in Uganda; Matovu, Birungi and Sebaggala (2012) on ill-health and labour market outcomes in Uganda. Other available studies mostly examined the determinants of labour market participation.

Labour force participation rate for ages 15-24, in Nigeria was about 37.6% as at 2014. Its highest value over the past 24 years was 37.6% in 2014, while its lowest value was 33.2% in 1990. Whether this low level of labour participation rate was connected to poor health remains unclear in Nigeria as empirical evidence appears to be lacking in this area. The paucity of analytical work on the subject in developing countries imply that the empirical understanding that is necessary for designing and evaluating policy interventions relating to the prevention and cure of disease is lacking in countries where the productivity consequences of poor health are worse. The consequences are worse in these countries because, physical labour is the critical input, the majority of population live in rural areas, engage in non-formal wage labour, and most work is directly or indirectly related to agriculture which relies on strength and stamina. Therefore, if public investment in health infrastructure yields benefits in terms of higher productivity, then an examination of the links between health and labour market outcomes is

important in a developing economy like Nigeria. Hence, this study investigates the effect of ill-health on labour market participation in Nigeria. The major contribution of this study (apart from being one of the first effort on investigating the link between ill-health and labour force participation in Nigeria) to the literature is that health was not proxy by life expectancy alone as done in most studies but also by the incidence of malaria, incidence of tuberculosis and prevalence of HIV/AIDS. This is necessary in shaping the future of health interventions in Nigeria. The rest of the paper is divided into five sections. Section two is pre-occupied with the review of literature on labour participation and health and section three contains theoretical framework and methodology. Section four is pre-occupied with data requirement and description and estimation procedure while section five contains presentation and discussion of results. Section six contains conclusion and policy implications.

Literature Review

The importance of human capital has long been acknowledged in labour economics (Becker, 1964). Educated and healthy individuals have better performance in terms of labour market outcomes (Card, 1999). Grossman's (1972, 2000) model for health demand offers understandings of the relationship among health, human capital and consumption at the individual level, as well as a framework for modelling human capital accumulation and its relationship to productivity at the micro and macro levels. This model offers important contributions about human capital, health and education, and their relationship to labour supply, earnings and productivity. The model is premised on Becker's (1965) household-production framework that is based on the idea that utility is obtained from final consumption goods produced from market goods and services in conjunction with one's own time and not directly from market goods and services (Tompa, 2002). Tompa (2002) argued that in relating health and labour market behaviour, a formal approach treats health as human capital (Cai and Kalb, 2004 in Tompa, 2002). This approach, he argued was adopted from Grossman's (1972, 2000) model for health demand based on Becker's (1965) household production concept.

Human capital theory that has been widely used in studies of health and labour is based on the notion that an increase in a person's stock of knowledge and health increases individual's productivity in both market and non-market activities (Tompa, 2002). Thus, health has a significant effect on labour productivity and labour market outcomes. As a result, individual's health has impact on earning potential, the opportunity costs of leisure and the willingness to participate in the labour force (Cai and Kalb, 2004). Bloom and Canning (2000) in Matovu, Birungi and Sebaggala (2012) identify four pathways by which health can affect productivity: a healthy labour force may be more productive because workers have more physical and mental energy and are absent from work less often; individuals with a longer life expectancy may choose to invest more in education and receive greater returns from their investments; with longer

life expectancy, individuals may be motivated to save more for retirement, resulting in a greater accumulation of physical capital; and improvement in the survival and health of young children may provide incentives for reduced fertility and may result in an increase in labour force participation — which may, in turn, result in increased per capita income if these individuals are accommodated by the labour market (Tompa, 2002).

A large number of studies have estimated the relationship between health status and labour market outcomes. The theoretical notion in all of these studies is that health like education can be considered an endowment of human capital that deteriorates over time but is capable of enhancement as a result of household production (Becker 1964; Lancaster 1966; Grossman 1972; Currie and Madrian 1999; Grossman 1999 in Harris, 2008). This infers higher returns from work for healthy workers and that healthy people are more likely to work. Poor health may also have a direct effect on an individual's preference for paid employment through the relative utility of work or leisure as well as reduce the total amount of time available to earn money. Furthermore, sickness in most Western countries gives an entitlement to income from welfare benefits conditional on not working (Grossman 1999; Cai and Kalb 2006; Disney, Emmerson et al. 2006 in Harris, 2008). Therefore, there are many theoretical links between health status and work that suggest not only that better health improves labour outcomes but that poorer health is likely to be associated with lower labour supply.

Many studies have investigated the impact of health on labour market outcomes in high income countries. These studies took a microeconomic perspective and assess costs of ill-health at the individual or household level (Suhrcke, et al, 2008). Many of these studies suggest that health has effect on most labour market outcomes, including wages, earnings, labour force participation, hours worked, retirement, job turnover and benefit packages (Deschryvere, 2005). For instance, Karen, et. al, (2005), found that people who are unable to work or drop out of the workforce due to disability or health problems do not generate economic output, pay taxes on earnings, or assists in raising the nation's economic standard of living. Hence, poor health status is a significant predictor of absence from work among other important factors like wage rate, sick leave benefits, family structure, and age. Furthermore, they noted that worker who worried about a family member who is sick, reduce productivity or output.

Cai and Kalb (2004) examined literature on the effect of health on labour force participation in the United States (US) and discuss the endogeneity problems in the estimated models of health and labour force outcomes. The estimations for males aged 15 to 49, and aged 50 to 64, and for females aged 15 to 49 and aged 50 to 60 were conducted separately. The results show that better health increases the probability of labour force participation for all the four groups. It was also found that labour force participation has a significant positive impact on older females' health, and a significant negative effect on younger males' health in terms of the feedback effect. Another study

carried out in the United States in 1990 using 1978 United States Survey of Disability and Work found that arthritis reduced wages by 27.7% for men and 42.0% for women and reduced the number of hours worked by 42.1% and 36.7% for men and women respectively. Studies have also revealed that disability due to illness is one of the main reasons for early retirement. Deschryvere (2005) also submitted that health has an important effect on retirement, though there is no perfect method for estimating the magnitude of the effect.

Cole and Neumayer, (2005) argued that diseases that have fatal effect on individuals are the ones that can lower the amount of labour supplied. This implies that common diseases and illnesses like undernourishment, malaria and waterborne diseases may not have serious consequences on labour supply and productivity especially in the developing world. This may however not be true because the productivity of the affected persons with non-fatal illness may be severely affected. For instance, Matovu, Birungi and Sebaggala (2012)using UNHS 2005/06 data to examined the potential economic loss of ill-health and the effects of ill-health on labour market participation, productivity and labour supply across gender and residence and estimating three models of labour market participation, labour productivity and labour supply models with Ordinary Least Squares and two-stage Instrumental variable estimation methods in Uganda found that infectious diseases like malaria result in frequent incapacitating sessions of illness that precludes individuals from productively supplying their labour. Furthermore, other mild illness like diarrhoeal has also shown to be unfavourable to labour productivity. For example, diarrhoeal disease usually rendered affected individuals unproductive, even when it is not severe, as they cannot attend either school or work. The economic impact involved both absenteeism and weak functional body that has long term effects on person's ability to remain in work. Thus, non-severe illness also incapacitates workers and their dependents in ways similar to fatal diseases. Hempel and Najera (1996) also summarize the effects of malaria on labour supply and productivity and concluded that the extent to which labour time lost due to illness reduced output depends on whether it coincides with harvest time in agricultural areas, and whether other family members can compensate.

The life expectancy approach did not consider productivity as the only link between health and labour supply because individual's relative utility derived from income and time out of the labour market may also change due to health problems (Cai and Kalb, 2004). For example, poor health may cause individuals to value time out of the labour market more since the time required to care for one's health increases with ill health. Also, by affecting life expectancy, poor health may make withdrawal from the labour market more attractive by influencing the time horizon over which economic decisions are made. These arguments suggest that poor health reduces the probability of labour force participation. However, it could also be argued that low earnings associated with poor health may have an income effect, which could increase labour

supply (Cai and Kalb, 2004). Furthermore, the demand for health services as a result of poor health may mean that poor health may force individuals to do more work. Therefore, in theory, the connection between health and work is clear but explaining the causality is complex though most empirical studies find a positive impact (Cai and Kalb, 2004; Strauss and Thomas, 1998).

Cole and Neumayer (2005), in their study of the impact of poor health on factor productivity, argued that a key mechanism through which health affects growth is total factor productivity (TFP) and that individuals suffering from illness may be weak, unable to work and provide for children and other dependants. They first estimated TFP based on a production function and then estimate the determinants of TFP, paying particular attention to three indicators of health that are particularly problematic in developing regions: malnutrition, malaria and waterborne diseases and found the impact of poor health on TFP to be negative, significant, and robust across a wide variety of specifications. At macro level, high disease burden may have an adverse impact on a country's productivity growth and economic development. Fogel (1991, 1994) found that health and nutritional improvements alone can explain about 30 percent of British growth in per capita income since 1790. This is similar to estimates of the productivity impacts of health found in cross country studies using data from the last 50 years (World Health Organization, 1999). Also, macroeconomic research on productivity has emphasized the importance of human capital in the form of education and health which are durable, lasting, and subject to accumulation (Lucas 1988; Romer 1986).

In developing countries, studies on labour force participation have tried to explain the predictions of labour force participation studies in the developed countries into models for empirical studies. Efforts have been made to find measurable variables to mirror the determinants of labour force participation using individual characteristics such as age, marital status, education, household size, wage/income, migration status, health and household characteristics such as relationship to head, husband's occupation, husband's income, husband's employment status-for married women; and the labour market macro-variables such as, the level of unemployment, level of urbanization, type of employment, agricultural employment, proportion of children enrolled in school (Standing and Sheehan, 1978; Magidu, 2010). For example, Aromolaran (2004) examined the influence of education on labour force participation of married women in Nigeria in wage market employment, self-employment and overall labour market participation. The study confirms that both own and husband's education positively influenced the labour force participation of married women in different degrees in wage, self and total employment in Nigeria.

Aminu (2010) using the General Household Survey (GHS) data of 1998/99 and 2007/2008 to estimate the determinants of labour force participation and earnings in wage employment in Nigeria with Probit model, Multinomial logit model and the

Mincerian human capital model and including household variables such as the presence/absence of an elderly female in the household which is hypothesized to have a positive effect on both male and female participation rate in the wage employment sector of Nigeria to verify his hypotheses. The study found that the presence of elderly female persons increases the probability of labour force participation across all sectors of wage employment for males and females in the 2007/08 GHS data set while it has negative and positive influences in private and public sectors respectively in 1998/99 data sets. The estimation from the Mincerian human capital model shows the influence of the traditional human capital variables – education (both total and disaggregated by levels), experience and its square, and urban/rural residence) – on the different wage employment sectors studied for the 1998/99 and 2007/08.

Sackey (2005), using data from the Ghana Living Standard Survey (GLSS4 and GLSS3) to estimate the female labour force participation and fertility models found that labour force participation and fertility decisions are strongly linked and hence, should be studied together. The study found that education has a negative effect on fertility while education and reduced family size increase labour force participation rate in Ghana. H'madoun (2010) also found that religious women participate less in labour market activities than the non-religious women after controlling for other social-economic variables in the estimation. Thus, literature agrees that health and socio-economic variables affects economic growth and poverty by affecting labour force participation, labour supply and labour productivity. However, the effect may be worse in developing countries with weak health systems. Therefore, given the enormous impact of health on economic activity, promoting health programs to improve the health of the labour force may be a viable poverty-reducing strategy for a developing country like Nigeria.

Theoretical Framework and Methodology

The theoretical framework for labour market analysis is usually based on the neoclassical theory of utility maximization in which the individual or the household chooses between work or leisure or a suitable combination of both given the going wage rate. Conventionally, economists analyse labour supply with the use of the neoclassical model of time allocation or the model of labour-leisure choice, which is an extension of the consumer theory. The framework analyses how individuals make choices in deciding how to spend a fixed amount of time among the competing work-hour and leisure. Individuals must decide how many hours to work to earn income for consumption of goods and services and how many hours to spend on leisure. Therefore, the theoretical framework for this study is a conventional household labour supply theory in which individual member of household is assumed to make a trade-off between labour and leisure subject to a constraint of full income. The decision to enter the labour force is the first part in a two part decision on hours supplied. The final outcome of hours

worked depend on both labour supply and the demand for that individuals labour. Following Harris (2008), we do not model the second part of the decision in this study and restrict the analysis to the participation part of the labour supply decision. This is required to simplify the model to allow a system of equations to estimate the relationship between health and labour force participation. Therefore, the utility maximizing agent compares the utility from work and leisure and makes a choice under the usual assumption of rationality. Thus the random utility model is defined as:

$$U^k = U^k(X_i b^k) \text{- - - - - - -} \quad (1)$$

In equation 1, $k = 1$ if the individual decides to work and zero otherwise; U is the utility being maximized and X is the vector of factors determining U. Since U^K and b^k ($k = 0, 1$) are not directly observable, the final outcome (whether to work or not) is observed while the coefficients of β's are estimated using appropriate econometric technique. Two vectors (X_i and H_i) of variables are assumed to influence the dichotomous participation rate which is the dependent variable LFP_i. The vector X_i is a set of exogenous socio-economic variables that influence labour force participation such as age, educational status, marital status, sex, region of residence, location of residence (whether rural or urban), gender and the size of the household. The vector H_i is the individual's health status proxy by life expectancy and incidence of ill-health such as incidence of malaria, diabetes prevalence, and incidence of tuberculosis and prevalence of HIV/AIDS. The final solution to the utility maximization in equation 1 will result in labour force participation (equation 2) as:

$$LFP_i = l(H, X_i, q) \text{- - - - -} \quad (2)$$

In equation 2, H is the individual's health status proxy by life expectancy and incidence of ill-health such as incidence of malaria, diabetes prevalence, incidence of tuberculosis and prevalence of HIV/AIDS; X is the exogenous observable individual characteristic that affects economic productive activities; θ is the unobserved individual characteristic that affects labour market outcomes. Individuals with a longer life expectancy may decide to invest more in education and earn higher returns from their investments; with longer life expectancy, individuals may be motivated to save more for retirement, resulting in a greater accumulation of physical capital and survival and health of young children may provide incentives for reduced fertility and result in an increase in labour force participation, which may lead to increased per capita income (Tompa, 2002). Furthermore, ill-health will reduce the probability of employment for several reasons. According to Disney and Emmerson et al. (2006), poor health may raise the current disutility of work; it may also reduce productivity, and through demand, the return from work and consequently wages. Poor health may also entitle the individual to non-wage income, such as disability benefits. It may lower life expectancy, raising the present value of current wealth and inducing earlier retirement.

Therefore, the following basic models were estimated in this study:

$$LPF = a_0 + a_i H + e_1 \quad \text{----------(3)}$$

$$LPF = b_0 + b_i X_i + b_v H_v + e_2 \quad \text{----------(4)}$$

In equation 3, we examined the effects of standard exogenous predictor variables on labour force participation. These variables were the measures of health, which in our case, were proxy by life expectancy, incidence of malaria, prevalence of HIV/AIDS and incidence of tuberculosis. Expectedly, the higher the life expectancy, the greater the labour force participation. Also inverse relationships were expected between other measures of ill-health and labour force participation. In equation 4, we added the households characteristics, which include female population ages of 15-64 years, male population ages of 15-64 years, birth rate, GDP per capita, female rural population, male rural population, female urban population, male urban population, female-headed households, rural poverty headcount ratio at national poverty lines, urban poverty headcount ratio at national poverty lines, ages 15-64 years and ages 15 – 64 year square to the standard exogenous variables that affect labour supply to determine their effects on participation. It should be noted that the definition of $b_v H_v$ in equation 4 and $a_i H_i$ in equation 3 are the same. They both represent the measures of health and their coefficients.

Data Requirement, Description and Estimation Procedure

The data used in this paper come from the World Development Indicators database. Study of this nature is more appropriately done with survey data. But in the absence of a survey, data from the World Development Indicators database provide the best alternative. Therefore, the World Bank development indicator provides data on total labour force participation (% of total population ages 15+, modelled ILO estimate), life expectancy, incidence of malaria, prevalence of HIV/AIDS and incidence of tuberculosis. Data on the households characteristics which include female population ages 15-64, male population ages 15-64, birth rate, GDP per capita, female rural population, male rural population, female urban population, male urban population, female headed households, rural poverty headcount ratio at national poverty lines, urban poverty headcount ratio at national poverty lines, ages 15-64, and ages 15 – 64 square were also from the World Development Indicators database. However, age-square was compute from the population ages got from the World Development Indicators database. Table 1 shows the variables used, its description and a priori expectations.

Table 1: Variables Used and A priori Expectations

Variables	*Derived Variables*	*Variables Label*	*Apriori Expectations*
Dependent Variable			
Labour Force Participation(LFP)	-	Labour force, total	-
Independent Variables			
Life Expectancy (LE)	-	Life expectancy at birth, total (years)	Positive
Education (EDUC)	-	Educational attainment, at least completed lower secondary, population 25+, total (%) (cumulative)	Positive
Log Total Population (LTP)	-	Log of Total Population	
Gender (GD)	-	Population ages 15-64, female	Positive
		Population ages 15-64, male	Positive
Age (AGE)	-	Ages 15-64 (% of total)	Undefined
Age2 (AGESQD)	Age sqd	Square of Ages in Years	Negative
Birth Rate (BR)	-	Birth rate, crude (per 1,000 people)	Negative
GDP Per Capita (GDP)	-	GDP per capita growth (annual %)	Positive
Location (LCT)	-	Rural population, female (% of total)	Undetermined
		Rural population, male (% of total)	Undetermined
		Urban population, female (% of total)	Undetermined
		Urban population, male (% of total)	Undetermined
Female Headed Households (FHH)	-	Female headed households (% of households with a female head)	Positive
Poverty (PVT)	-	Rural poverty headcount ratio	Undetermined
		Urban poverty headcount ratio	Undetermined
Malaria (MAL)	-	Incidence of malaria (per 1,000 population at risk)	Negative
HIV/AIDS (HIV)	-	Prevalence of HIV, total (% of population ages 15-49)	Negative
Tuberculosis (TB)	-	Incidence of tuberculosis (per 100,000 people)	Negative

The sample is restricted to working-age Nigerian men and women, which comes down to men and women aged between 18 and 64 years inclusive. People aged over the upper age bound are eligible for the age pension and are expected to behave differently as a result. We exclude people under 18 years from the analysis because many of them would not have completed their studies. The sample was from 1999 to 2015 to cover the first sixteen years of the present democratic dispensation in Nigeria.

Table 2: Summary Statistics of the Variables used for Estimation

Variables		*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
Labour Force Participation(LFP)		17	55.6	0.5	54.8	56.3
Life Expectancy (LE)		17	49.7	2.3	46.4	53
Education (EDUC)		17	80.1	5.6	69.6	94.7
Log Total Population (LTP)		17	18.8	0.1	18.6	19.0
Gender	Population ages 15-64, female	17	59.3	0.2	58.7	59.9
	Population ages 15-64, male	17	56.9	4.4	49.1	59.3
Age (AGE 15+)		17	18.2	0 .1	17.9	18.4
Age2 (AGESQD)		17	36.5	0.3	35.9	4096
Birth Rate (BR)		17	41.6	1.3	39.1	43
GDP Per Capita (GDP)		17	4.4	7.1	-2	30.3
Location(LCT)	Rural population, female (% of total)	17	29.4	1.2	26.2	32.6
	Rural population, male (% of total)	17	29.3	1.2	25.9	32.5
	Urban population, female (% of total)	17	19.8	1.1	16.8	22.8
	Urban population, male (% of total)	17	21.5	1.3	18.1	24.9
Female Headed Households (FHH)		17	16.9	1.0	14.6	19.3
Poverty (PVT)	Rural poverty h eadcount ratio (RPVT)	17	54.7	0.7	52.8	56.6
	Urban poverty headcount ratio (UPVT)	17	36	34.1	34.1	37.9
Malaria (MAL)		17	444.4	23.9	380.8	497.8
HIV/AIDS (HIV)		17	3.6	0.3	3.1	4
Tuberculosis (TB)		17	336.3	7.0	322	343

Table 2 shows the summary statistics of the variables used in the estimation. The average labour force participation rate was 55.6 while the minimum was 54. 6 while the maximum was 56.3. The average life expectancy was 49.7 while at least 80 individuals completed lower secondary school during years considered. At 59 persons were females while at least 56 persons were males out of a thousand individuals in the years under consideration. The average age was about 18 years while mean birth rate was 41.6. The mean GDP growth rate was 4.4, mean rural poverty count was 54.7 and urban poverty count was 36 respectively. The mean incidence of malaria was around 444, mean HIV/AIDS was around 3.6 and average incidence of tuberculosis was about 336.3. For the rural urban population, at least 29.9 female lives in the rural areas while about 29.3 males lives in the rural areas on the average. The distribution of urban population shows that the mean female urban population was about 19.8 while the mean male urban

population was around 21.5.

When estimating the effect of health on productivity the problem of endogeneity of health must be addressed. There are two sources of endogeneity; correlation in unmeasured factors in the health and productivity equations due to likely unmeasured ability (Strauss and Thomas, 1998) and the potential reverse causality (simultaneous feedback) from higher productivity to better nutrition and hence health (Deolalikar, 1988). The problem in accounting for endogeneity is again the availability of good instruments. Strauss and Thomas (1998), comment on the lack of good instruments in addressing the problem. Hence, in this paper we focus only on endogeneity caused from spurious correlation between health and labour market outcome and not on the simultaneous feedback possibility. Therefore, we employed instrumental variables regression for our estimation of equations 3 and equation 4.

Presentation and Discussion of Results

Table 3 reports the instrumental variable regressions of the effects of health proxy by life expectancy, incidence of malaria, prevalence of HIV/AIDS and incidence of tuberculosis on labour force participation in Nigeria. Column I of Table III shows the effects of standard exogenous predictor variables which are life expectancy, incidence of malaria, prevalence of HIV/AIDS and incidence of tuberculosis on labour force participation. These standard exogenous variables give the expected results. For example, life expectancy has a positive effect on labour force participation with value of 0.3 and this is significant at 10% level of significance. This supports the hypothesis that the higher the life expectancy, the greater the labour force participation. Also, both prevalence of HIV/AIDS, incidence of tuberculosis and malaria negatively affect labour force participation. But only incidence of tuberculosis and malaria are significant at 5% and 10% level respectively. More so, Figure I and Figure II corroborate the results of life expectancy, HIV/AIDS and labour force participation. Figure shows that the labour force participation rate of those who expect to live above 48 years was on increase compare to those that expect to live below 48 year and HIV/AIDS has a declining effect on labour force participation for most of the years.

Column 2 of table 3 shows the estimation results in which individuals or households' characteristics are added to the main exogenous predictor in the regression. Expectedly, labour force participation and age, education and GDP per capita move in the same direction until higher when participation decrease as shown by the result of the age square. Being a female or a male also has positive effect on labour force participation but male has higher effect on labour force participation than female. However, only female effect on labour force participation was significant. Birth rate, female rural population and rural poverty have negative effects on labour force participation however female headed households has an increasing effect on labour force participation. Total population also has a positive but a minute effect on labour

force participation and this is significant at 1% level. The results of the analysis confirm results of the findings in the literature that good health has positive and increasing effect on labour force participation while ill-health and poverty have negative and decreasing effect on labour force participation.

Table 3: Instrumental variable estimation of impact of health on labour force participation

Dependent Variable: LFP	A		B
Constant	91.3		40.10
	(0.08)***		(9.89)
LE	0.33	0.83	
	(0.08)***		(0.25)
HIV	-3.09		-4.03
	(0.63)		(0.76)
TB	-0.02		-0.01
	(-0.02)**		(0.01)*
MAL	-0.001		-0.05
	(-0.001)*		(0.01)*
AGE		0.04	
			(0.03)*
AGESQD			-0.02
			(0.01)*
EDUC			0.01
			(0.03)*
GDP			0.03
			(0.02)**
Male			1.06
			(0.13)
Female			0.06
			(0.01)*
BR			-0.97
			(0.22)
TP			0.01
			(0.01)*
Female Rural Pop			-1.03
			(0.17)
FHH			0.09
			(0.01)*
RPVT			-0.17
			(0.02) **
Observation	17		17
R^2	0.89		0.99
Prob > F	0.00		0.00
Durbin (score)	chi2(0) = 10.436 (p = 0.001)		
Wu-Hausman	F(0,12) = 2.5202 (p = 0.001)		

Note: Robust standard error are in parenthesis, *,**,*** significant at 1%, 5% and 10% respectively

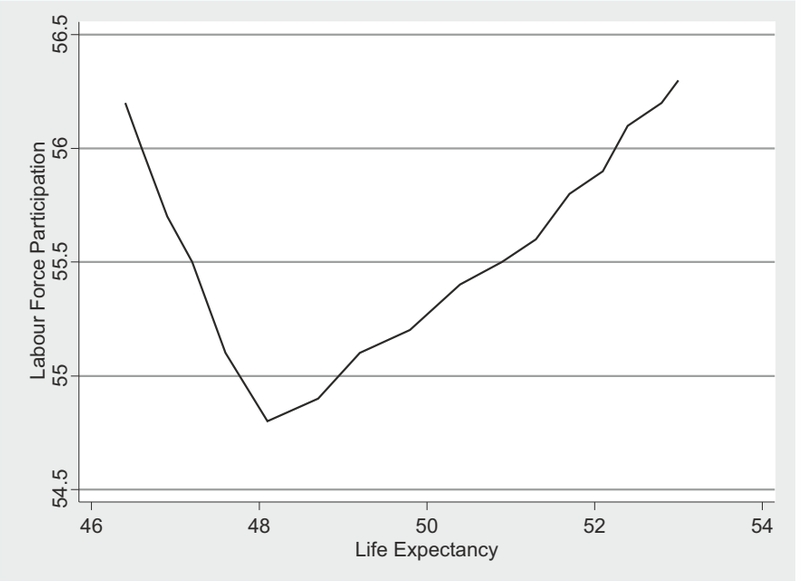

Figure 1: Life Expectancy and Labour Force Participation

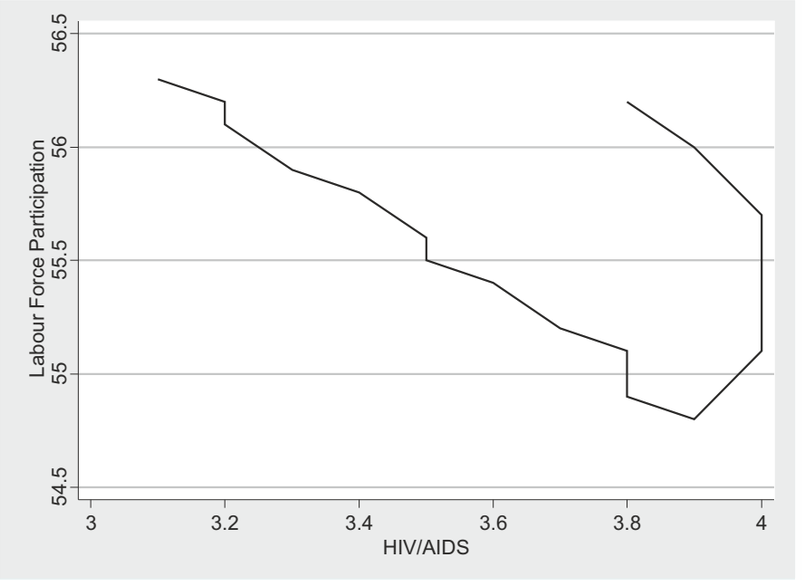

Figure 2: HIV/AIDS and Labour Force Participation

Conclusion and Policy Implications

This paper provides empirical evidence that health is a significant determinant of labour force participation in Nigeria. Our results show increasing life expectancy has an increasing effect on labour force participation rate. Also, household's characteristics like age, education and gender are significant determinant of labour force participation in Nigeria. Rural poverty also has a declining effect on labour force participation in Nigeria and age and age-squared show that individual labour supply decline as they get old. Therefore, it can be concluded that improvement in life expectancy and increasing efforts to reduce the prevalence of diseases like malaria, tuberculosis and HIV/AIDS, all things being equal, will increase labour supply in Nigeria. The policy implication of this is that public sector has an important role to play in improving the health of the labour force and population as a whole and, in turn, overall productivity. The many-sided nature of the factors that influence health suggests that policies in many areas conventionally considered outside the purview of health policy may be important avenues by which the Nigerian government can have an impact on population health. Such key areas are labour market policy, education policy and rural-urban migration policy. Higher priority could be given to tackling widespread diseases with low mortality burdens, but considerable effects on productivity. Furthermore, though improving population health is an important societal objective, there are other objectives competing for scarce public resources. Therefore, there is a need for a good understanding of the impacts of the policy options on achieving optimal balance societal objectives.

References

Aminu A. (2010). Determinants of participation and earnings in wage employment in Nigeria. Paper at the 5th IZA/World Ban Conference on Employment and Development. 3rd – 4th May.

Aromolaran, A. (2004). Female schooling, non-market productivity, and labour market participation in Nigeria. Economic Growth Centre, Discussion Paper 879. Yale University, USA.

Audibert, M. (2009). Issues and challenges of measurement of health: Implications for economic research. Prepared for the African Economic Research Consortium on Health, Economic Growth and Poverty Reduction in Africa. Framework paper for workshop. Accra, Ghana.

Becker, G.S. (1964). *Human Capital*. New York, Columbia University Press.

Becker, G. (1965). A theory of allocation and time. *Economic Journal*, 75 (299): 493– 517.

Bloom, D.E., Canning D. and Sevilla J. (2004). The effect of health on economic growth: A production function approach. *World Development*, 32: 1–13.

Bloom, D.E. and Canning D. (2000). The health and wealth of nations. *Science Compass*, 287:1207-1209.

Bridges, S. and Lawson, D. (2008). Health and labour market participation in Uganda.

Discussion Paper No.2008/07. World Institute for Development Economic Research.

Cai, L.X. and Kalb G. (2006). Health status and labour force participation: Evidence from Australia. *Health Economics*, 15(3): 241-261.

Cai, L. and Kalb, G. (2004). Health status and labour force participation: Evidence from the HILDA data. Melbourne Institute Working Paper No.4/04. University of Melbourne.

Currie, J. and Madrian, B. (1999). Health, health insurance and the labour market. In: O. Ashenfelter and D. Card (eds) *Handbook of Labour Economics* (Vol. 3). Amsterdam: Elsevier. 3309–416.

Chirikos, T.N. (1993). The relationship between health and labour market status. *Annual review of Public Health*, 14: 293-312.

Cole, M.A. and Neumayer, E. (2005). The impact of poor health on factor productivity. *Journal of Development Studies*, 42 (6): 918-938.

Deschryvere, M. (2005). Health and Retirement Decisions an Update of the Literature. ENEPRI Research Report No. 6.

Deschryvere, M. (2005). Health and retirement decisions: An update of the literature. European Network of Economic Policy Research Institutes (ENEPRI). Research Report No.6.

Disney, R., Emmerson, C. et al. (2006). Ill health and retirement in Britain: A panel data-based analysis. *Journal of Health Economics* 25(4): 621-649.

Doğrul, H.G. (2015). The effects of health on labour force participation: Evidence from Turkey. *International Journal of Economics and Finance,* 7(8).

Fogel, R.W. (1991). The conquest of high mortality and hunger in Europe and America: Timing and mechanisms. In: D. Lander, C. Higgonet and H. Rosovsky (eds) *Favourite of Fortunes: Technology, Growth and Economic Development since the Industrial Revolution*. Cambridge MA: Harvard University Press.

Fogel, R.W. (1994). Economic growth, population theory and physiology: The bearing of long-term processes on the making of economic policy. Working Paper No. 4638. Washington DC: National Bureau of Economic Research.

Grossman, M. (2000). The human capital model. In: A.J. Culyer and J.P. Newhouse (eds) *Handbook of Health Economics*. Amsterdam: Elsevier.

Grossman, M. (1999). The human capital model of the demand for health. National Bureau of Economic Research Working Paper No.7078.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy*, 80: 223–55.

Harris, A. (2008). *Chronic Disease and Labour Force Participation in Australia: An Endogenous Multivariate Probit Analysis of Clinical Prevalence*. USA; Data Centre for Health Economics.

Hempel, J. and Najera, J. (1996). *The Burden of Malaria*. Geneva: World Health Organization.

H'madoun, M. (2010). Religion and labour force participation of women. Unpublished thesis, Faculty of Applied Economics, University of Antwerp.

Holt, H. (2010b). The cost of ill health. New Zealand Treasury Working Paper 10/04.

Holt, H. (2010a). Health and labour force participation. New Zealand Treasury Working Paper No10/03, New Zealand.

Lancaster, K.J. (1966). A new approach to consumer theory. *Journal of Political Economy*, 74: 32-157.

Lawanson, O.I. (2008). Female labour force participation in Nigeria: Determinants and trends. Presented at the Oxford Business and Economic Conference Programme, Oxford, United Kingdom. June 22-24.

Lucas, R.E. Jr. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22:3-42.

Magidu, N. (2010). Socioeconomic investigation into determinants of labour force participation in labour markets: Evidence from Uganda. Mimeo. Economic Policy Research Centre, Makerere University, Uganda.

Matovu F., Birungi P. and Sebaggala R. (2012). Ill-health and labour market outcomes in Uganda: Evidence from 2005/06 national household survey. Paper presented at the 2012 CSAE Conference on Economic Development in Africa, Oxford University, 18th -20th March.

Ogwumike, F.O., Alaba A.A., Alaba O.B., Alayande B.A. and Okogie C.E.E. (2006). Labour force participation, earnings and inequality in Nigeria. A report.

Romer, P.M. (1986). Increasing returns and long-run growth. *Journal of Political Economy*, 94(5): 1002-1037.

Sackey, H.A. (2005). Female labour force participation in Ghana: The effects of education. AERC Research Paper 150, Nairobi.

Standing, G. and Sheehan G. (eds) (1978). *Labour Force Participation in Low-Income Countries*. ILO Office; Geneva.

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

Suhrcke, M., Sauto-Aarce R., McKee M. and Rocco L. (2008). *Economic Costs of Ill-health in the European Region*. World Health Organization; Geneva.

Suhrcke, M., McKee M., Sauto-Arce R. and Mortensen J. (2005). *The Contribution of Health to the Economy of the European Union.* European Commission: Brussels.

Thomas, D. (2009). The causal effect of health on social and economic prosperity: Methods and findings. A paper prepared for the AERC Health, Economic Growth and Poverty Reduction in Africa Framework Workshop, Accra.

Tompa, E. (2002). The impact of health on productivity: Empirical evidence and policy implications. *Review of Economic Performance and Social Progress*.

World Health Organization (1999). *Definition, Diagnosis and Classification of Diabetes Mellitus and its Complications (Part 1)*. Department of Non-Communicable Disease Surveillance, World Health Organization; Geneva.