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## Effect of Health Status on Labour Productivity in Adamawa State: A Multinomial Logistic Approach

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**ABSTRACT:** This study examined the effect of health status on labour productivity in Adamawa state, Nigeria. The analysis is based on a sample of 440 observations generated by questionnaire across 10 Local Government Areas (LGAs) in 55 communities. Multinomial logistic regression and descriptive statistics were used to analyze the data. Descriptive statistics revealed that the respondents fall within the age brackets 18-61 years and majority have tertiary education as their highest educational qualification. Monthly income of the respondents falls between 18, 000 – 100, 000 naira. Key finding of logistic regression shows positive effect of health status on worker productivity per hour (WPhour). Specifically, health status has a significantly positive coefficient (0.31) at 5% level of significance. Therefore, 1 unit increase in positive health status positively affects the log odds of those workers who work between 1-6 hours by 31% (outcome 1) compared to the base outcome. This indicates that a positive health status is associated with increased probability of productivity. Therefore, the study concludes that positive health status increases the likelihood of higher worker productivity. Based on this finding, the study therefore recommends that policy makers and stakeholders in the health sector should implement practical measures to encourage access to healthcare services to boost health status of citizens.

**KEYWORDS:** Health Status, Labour Productivity, Multinomial Logistic Regression, Adamawa state.

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### 1.0 INTRODUCTION

Health status is an important factor in labour supply if improvement in economic productivity is to be achieved. For instance, the World Bank (1993), Bloom and Canning (2004) and Alhassan and Abdu (2017) are of the opinion that health status is a major determinant of economic growth. Erçelik (2018) identified health as a crucial indicator useful in explaining the improvement in the standard of living in any country. However, Brownie (2018) opined that poor health affects the ability of people to work, generate income and care for their families. Therefore, there is sufficient evidence from scholarly literatures that links health and labour productivity.

Health is identified as a crucial indicator useful in explaining the improvement in the standard of living in any country (Erçelik 2018). Health is identified as a crucial indicator useful in explaining the improvement in the standard of living in any country (Erçelik 2018). Health status can therefore have direct effect on labour productivity just like technology and other determinants of labour productivity such as level of education. Lustig (2004) observed that health can directly impact economic growth via productivity of labour, while Ajayi and Akinbobola (2020) argued that healthy workers will be present at work place because their health permits them to do so and will mostly be more productive than those workers who are sick. They further argued that increase in labour productivity could be as a result of enriched mental and physical activities. Suhreke, McKee, Sauto, Tsolava and Mortensen (2005) for instance, opined that good health increases the prospect of individuals to participate in the labour force. They argued that the number of days that a sick individual takes as leave reduces the total number of days that the individual would have spent at work being productive. Bloom and Canning (2000) also observed that healthy labour force may be more productive because workers have more physical and mental energy and are absent from work less often. Therefore, the major challenge associated with poor health is reduction in labour productivity which is required to facilitate economic growth. The Organization for Economic Co-operation and Development and Asian Productivity Organization (2022) view productivity growth as a central driver of long-term economic growth and living standards.

There is consensus among scholars that health status is an important factor in labour supply. Health status is seen to be closely linked to productivity growth, competitiveness, and living standards in an economy (ILO, 2023). For instance, the Nigeria Malaria Indicator Survey (2015) observed that malaria incidence overburdens the health system and exerts a severe social and economic burden, retarding the gross domestic product (GDP) by 40% annually and costing approximately 480 billion naira in out-of-pocket treatments, prevention expenditures and loss of man hours.

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The prevalence of diseases and low productivity among citizens in Adamawa state is worrisome. Labourforce is inundated by rising cases of morbidity and poor state of healthcare facilities which are required to boost health status. Many healthcare facilities are not in functional state and the functional ones are usually overstretched due to displaced population and areas where the facilities are non-functional, people have no access to health services (HeRams, 2023). Lack of staff has been identified as a major impediment to access health care consequently, treatment of diseases and other healthcare services are not adequately covered. Lack of adequate services and functional facilities tend to result in high proportion of workers who lack access to basic health care services. Therefore, lack of healthcare utilization especially among workers can worsen health outcomes in the State. Thus, it is becoming increasingly difficult for labourforce to perform optimally in view of the need to grow productivity. Understanding the specific relationship between health status and labour productivity is crucial for effective policy intervention to increase access to healthcare and accelerate productivity growth. Therefore, the study examined the effect of health status on labour productivity in Adamawa state.

### 2.0 EMPIRICAL LITERATURES

Myriads of literatures have recognized health status as a veritable tool for enhancing labour productivity. For instance, Omon (2021) examined the effect of health status on labour productivity in Nigeria for the period 2000Q1 to 2018Q4. Health status was proxied by malaria cases, the proportion of undernourished Nigerians and life expectancy rate at birth. Vector auto-regression and the granger causality were used for the analysis. The empirical results showed that output per man has self-cumulative effect. Malaria cases constituted drag to labour productivity during the study period. Similarly, Andrew, Jed and Pieter (2021) observed that malaria can adversely impact the productivity and labour supply of workers. The authors estimated the impact of malaria infection on worker earnings, labor supply, daily productivity and tasks selection by using a phased-in design during a study week randomly chosen in which piece-rate workers at a large sugarcane plantation in Nigeria are offered malaria testing and treatment. For workers who test positive for malaria, the treatment of illness principally increases labour supply, leading to higher earnings. For workers who test negative, the health information leads to increased earnings via augmented daily productivity. The results underline the importance of medical treatment but also of improved access to information about one's health status, as the absence of either leads workers to work less or choose lower return tasks when working.

In a different study and considering kidney disease, Savira, Ademi, Wang, Kompa, Owen, Liew and Zomer (2021) stated that kidney disease is associated with impaired work productivity. The authors constructed a dynamic life table model for the Australian working-age population (aged 15-69 years) over 10 years (2020-2029), stratified by kidney-disease status. The projections indicate that, from 2020 to 2029, the estimated number of new kidney-disease cases will exceed 161,000. Preventing 10% of new cases of kidney disease during this period would result in averting more than 300 premature deaths and approximately 550 years of life.

Diseases generally retard productivity growth as opined by Mbonigaba and Akinola (2021) where they observed that women's breast cancer (BC) is detrimental to Africa's development, given the role women play in their families and society's well-being. The study described the impact of breast cancer and assesses factors that influence income and productivity among women with BC. A cross-sectional data was collected using questionnaires on 200 women with clinically confirmed BC cases in Southwest Nigeria over 6 months. Data showed that about 62% were absent at the workplace for 7 days, indicating that 31.8% suffered productivity loss at the workplace on average. Additionally, 16% of women in the group were absent at the workplace for an average of 10 days, showing a 45.5% productivity loss at the workplace. Lastly, 22% of the women were absent at the workplace for more than 2 weeks on average. An increasing incidence of BC among women causes a 26.2% decrease in productivity level at the workplace. The results from simple linear regression corroborate the findings from the descriptive statistics that BC has a significant but inverse effect on women's income and productivity. It showed that an increase in the number of confirmed cases of BC will decrease economic impact and productivity by 13.5% and 19.5%, respectively.

Onarheim, Iversen and Bloom (2016) corroborates the study by Mbonigaba and Akinola (2021). They observed that globally, the status of women's health falls short of its potential. They further opined that the deleterious ethical and human rights implications of this deficit, the negative economic impact may also be consequential, but these mechanisms are poorly understood. Building on the literature that highlights health as a driver of economic growth and poverty alleviation, the study systematically investigated the broader economic benefits of investing in women's health using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. The study systematically reviewed health, gender, and economic literature to identify studies that investigated the impact of women's health on micro and macroeconomic outcomes. Results of the existing literature indicates that healthier women and their children contribute to more productive, better and educated societies. Additionally, the study further confirmed that women's health is tied to long-term productivity, the development and economic performance of nations depends, in part, upon how each country protects and promotes the health of women.

Angba and Angba (2015) analyzed the influence of health status of women farmers on their level of cassava production in Ikom LGA, Cross River State, Nigeria. The study utilized a multi-stage random sampling technique to select 200 women farmers who were interviewed. The data generated were analyzed using descriptive and inferential statistics. Results from the regression analysis showed that household size, educational level and income are significantly related to the health status of the rural women while age

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and marital status are not significantly related. As health status of the women improved, productivity was therefore expected to increase.

Morgan, Emu, Amadi, Ekon and Njama (2021) investigated the mediating effect of job satisfaction on health and safety policy management and employee productivity in manufacturing firms in Nigeria. For the study, a quantitative analytical method was adopted, including a descriptive survey. Data was obtained by distributing questionnaire among 950 sampled respondents in selected manufacturing firms in Nigeria. Descriptive statistics and multiple regression were used. The mediating effect of job satisfaction on health and safety policy management and employee productivity relationship was confirmed using the Sobel test with the aid of Med Graph. The results showed that hazard prevention and control policy have a significant positive effect on employee productivity. Risk assessment policy have a significant positive effect on employee productivity. Also, job satisfaction has a significant positive mediating effect on health, safety policy management and employee productivity relationship.

Adeshina, Adewale, Elvis and Emife (2019) examined the impact of health status on labour productivity and economic growth in Nigeria using time series data from 1981 to 2017. The results showed that both health status and labour productivity have positively impacted economic growth during the period. Lijian, Chien-Ping, Xun, Chenggang and Zhongyi (2015) examined the impact of health on the earnings of migrant workers engaging in physically-intensive work requiring good health. The findings indicate that poor health status not only weakens the incentive of rural labourers to participate in the migrant labour force but also significantly reduces their earnings. A migrant worker in poor health only earns 67% of what a healthy worker makes. Among all the human capital characteristics and family economic factors, health status is the most influential on earnings for less educated workers. Labour productivity has a greater impact on earnings than the annual number of days that a person works.

Noronha, Figueiredo and Castro (2010) assessed the relationship between health and economic growth among the Brazilian states between 1991 and 2000. Several health measures were selected such as infant mortality rate, hospital mortality rate in the public healthcare system due to perinatal complications, and proportion of deaths from selected causes (vascular diseases, diabetes, cancer, AIDS and other communicable diseases, homicides and ill-defined causes). Findings showed that in Brazil, health correlates positively with economic growth. Also, decreases in infant mortality rates are closely associated with higher rates of economic growth and a significant negative relationship for health indicators that are related to poverty, less access to health care services and deaths from avoidable causes, such as communicable diseases and hospital mortality rates due to perinatal complications. Conversely, the study found a positive and significant correlation between the proportion of deaths from diabetes and cancer, on the one hand, and economic growth, on the other.

### 3.0 METHODOLOGY

The study examined the effect of health status on productivity using multinomial logistic regression. The model is based on Endogenous Growth theory propounded by Paul Romer in 1980 and empirical work by Angba and Angba (2015). In this study however, the model is expressed as Labour Productivity (proxied by Worker Productivity Per Hour) is a function of Health status (HS), Marital status (MS), Consistency at Work (CAW), facilities and Working environment (Wen). The multinomial logistic regression model is written as:

$$\text{Log} (P (\text{WPHour}_i = j)/P (\text{WPHour}_i = 1)) = \lambda_0 + \lambda_1 \text{HS}_i + \lambda_2 \text{MS}_i + \lambda_3 \text{CAW}_i + \lambda_4 \text{facilities}_i + \lambda_5 \text{Wen}_i$$

where;

$\text{Log} (P (\text{WPHour}_i = j)/P (\text{WPHour}_i = 1))$  is the log-odds of being in productive category  $j$  relative to the baseline category

$\lambda_0$  is the intercept term for category  $j$

$\lambda_i$  is the coefficients to be estimated for category  $j$ .

$\text{HS}_i$  = Health status

$\text{MS}_i$  = Marital status

$\text{CAW}_i$  = Consistency at work

$\text{Facilities}_i$  = Facilities

$\text{Wen}_i$  = Working Environment

### 4.0 RESULTS AND DISCUSSION

Table 4.1 contains the summary of demographic and socioeconomic characteristics of the respondents. Items include sex, marital status (MS), educational qualification (EQ), age and income. A total of 440 respondents were interviewed.

**Table 4.1**  
Demographic and socioeconomic characteristics of the respondents

Variable	Frequency	Percentage
<b>Sex</b>		
Male	223	50.68
Female	217	49.32
<b>Total</b>	<b>440</b>	<b>100</b>
<b>Age</b>		
18-25 years	50	11.36
26-34 years	124	28.18
35-44 years	165	37.50
45-60 years	84	19.09
61 years above	17	3.86
<b>Total</b>	<b>440</b>	<b>100</b>
<b>Educational Qualification</b>		
No formal Education	56	12.73
Primary Education	56	12.73
Secondary Education	108	24.55
Tertiary Education	203	46.14
Non-formal Education	17	3.86
<b>Total</b>	<b>440</b>	<b>100</b>
<b>Income</b>		
1, 000 – 20, 000	167	37.95
21, 000 – 40, 000	114	25.91
41, 000 – 60, 000	104	23.64
61, 00 – 100, 000	34	7.73
100, 000 and above	21	4.77
<b>Total</b>	<b>440</b>	<b>100</b>

Source: Field Survey, 2023

Table 4.1 shows majority of the respondents interviewed were males (50.68%) while females constitute (49.32%). The ages of the respondents are between 18-61 above. Ages 26-34 and 35-44 years combined constitute 65.68% representing the most productive categories of the respondents. In Table 4.1, 46.14% of the respondents have acquired tertiary education, 24.55% have acquired secondary education while 12.73% have not acquired any formal education. Income earned in a month by the respondents ranges from 1, 000 to 100, 000 and above. 25.91% of the respondents have earned between 21, 000 – 40, 000 naira in a month. 4.77% earned above 100, 000 naira while 37.95% have earned between 1, 000 – 20, 000. The income disparity among the respondents reflects the type and level of labour productivity they are engaged in.

Table 4.1 presents the socio-economic characteristics of the respondents including sex, age, marital status, educational qualification and income. Sex as a biological feature is an important factor when it comes to labour productivity because of the physical characteristics attributed to being a male or female. Majority of the respondents interviewed were males. Males are known to be strong, productive and providers for family. Women also play critical roles in decision making when it comes to participation in economic activities. Both men and women therefore contribute to economic activities in diverse ways that can accelerate productivity growth and economic development. Thus, the inclusion of women as men in the study represents a fair approach in the survey.

Age is an important factor in labour productivity. Responses in Table 4.1 shows at least 18 years as the minimum age indicated. Ages 26-34 and 35-44 years combined constitute 65.68% representing the most productive categories of the respondents. The workers in the category 26-44 years are adjudged to be economically active, strong, innovative, resilient and contribute significantly to economic activities. The pool of young people in this category is a critical source of labour supply that is useful in increasing labour productivity. Their contribution to accelerating economic growth is in their passionate pursuit for achieving their dreams through active participation in economic activities that fulfills their aspirations.

Education is a skill and major determinant of labour productivity. Being able to read, write and communicate effectively enhances the productive capacity of a worker. Educated individuals are smart, innovative, calculative and skillful to contribute to economic growth. Majority of the respondents have acquired tertiary education which makes them members of society with capacity to significantly contribute to economic growth while many have acquired secondary education. Secondary education equips an individual with the basic skill that is required to be a functional member of society and to be productive in any chosen economic activity. Although, 12.73% have not acquired any formal education, they are also useful for contributing to productivity growth

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through their participation in economic activities. Workers with no formal education mostly engage in menial jobs and hand work on which they rely to earn a living. In Table 4.1, income earned in a month by the respondents ranges from 1, 000 to 100, 000 and above. Income earned from a legitimate activity enhances the welfare of a worker and is useful for investment. The income disparity among the respondents reflects the type and level of labour productivity they are engaged in.

To examine the effect of health status (HS) on labour productivity, multinomial logistic regression was conducted. Therefore, the analysis is based on the logistic regression output where worker productivity per hour is the dependent variable while Health Status (HS), Marital status (MS), Consistency at Work (CAW), facilities and working environment (Wen) are the independent variables. The base outcome for the WPHour variable is outcome 2. The result is presented in Table 4.2.

**Table 4.2**

**Multinomial logistic regression output for the effect of health status on labour productivity**

Dependent Variable: WPHour	Outcome 1 (1-6 hours)	Outcome 2 (base outcome)	Outcome 3 (13-18 hours)
HS (Health Status)	0.310 (0.035) **	base outcome	0.306 (0.520)
MS (Marital Status)	0.207 (0.028) **	base outcome	-0.04 (0.905)
CAW (Consistency at Work)	0.319 (0.082) *	base outcome	-0.928 (0.233)
Facilities	0.264 (0.077) *	base outcome	0.929 (0.034) *
Wen (Working Environment)	-0.262 (0.119)	base outcome	-0.640 (0.229)
Constant	-1.523 (0.002) ***	base outcome	-2.893 (0.086) *

Notes: p-values in parentheses; \*\*\*, \*\* and \* denote 1%, 5% and 10% level of significance respectively.

Source: Authors' computation in Stata 15

Table 4.2 contains the results of multinomial logistic regression of the effect of health status on labour productivity. Probability values are written in parentheses while WPHour is the dependent variable. The base category is the "outcome 2". For "outcome 1" the result shows health status has a positive coefficient (0.310) and is statistically significant at 5% level of significance. This means each increase in health status positively affects the log odds by 31% of worker productivity per hour of those in outcome 1, that is individual who work between 1-6 hours. For outcome 3, the coefficient is 0.306 and not statistically significant. This suggests that health status does not have a significant effect on worker's productivity for individuals in Outcome 3. This therefore implies that each improvement in health status does not increase the log odds of worker's productivity in category 3 (13-18 hours). Marital status (MS) has a positive coefficient (0.207) that is statistically significant at 0.05 probability level. This means being in a positive or healthy marriage increases worker's productivity for those in outcome 1. Therefore, it could be implied that being married or being in a stable relationship positively affects the productivity of those who work between 1-6 hours by 20.7% for Outcome 1. For outcome 3, the result is not statistically significant.

CAW has a positive and significant coefficient (0.319) at 10% probability level in Table 4.2. This means increase in consistency at work (CAW) positively affects the log odds of worker productivity per hour for Outcome 1 by 31.9%. For outcome 3, the coefficient is -0.928 but not statistically significant. This suggests that consistency at work does not have a significant effect on productivity for Outcome 3. "Facilities" have a positive coefficient (0.26) that is significant at 10% level for "outcome 1". This means that increase in the availability of facilities increases the log odds of worker productivity per hour for those in category 1 by 26%. Similarly, for Outcome 3, facilities have a positive coefficient (0.929) that is significant at 0.05 level of probability. This means increase in availability of functional facilities increases the log odds of worker productivity per hour for those in the category 3 by 92.9%. This suggests that availability of functional and better facilities significantly enhance productivity for Outcome 3. Conversely, the coefficients of working environment (Wen) for both outcome 1 and 3 are -0.262 and -0.64 but are all statistically insignificant. This suggests that working environment does not have a significant effect on productivity for Outcomes 1 and 3.

Based on the findings in Table 4.2, health status has a positive effect on labour productivity. This means that individuals with better health status are likely to be more productive. Healthy individuals find it easy to work optimally thus increasing how much work is done per hour. However, when people are sick, they do not go to work so hours they would have worked is lost. This result is consistent with the empirical study carried out by Siddique, Mohey-ud-din and Kiani (2020). They found that improved health status is associated with increased productivity. Saif, Muhammad and Mahmood (2019) found that 1% improvement in health status would result in around 13.39% rise in worker productivity. Also, Adeshina, Adewale, Elvis and Emife (2019) found that health status has positively impacted labour productivity.

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Based on the result in Table 4.2, marital status (MS), consistency at work (CAW) and facilities have positive effect on productivity. Therefore, it could be implied that being married or being in a stable relationship positively affects productivity. Generally, the benefits of a healthy marital relationship are enormous such as emotional support, improved mental health, increased happiness, longer lifespan and financial benefits among others. These benefits are essential for encouraging individual productivity in any meaningful economic engagement. Also, consistency at work (CAW) is an important factor for achieving work place goals. It offers several benefits such as improved productivity where consistent routines and processes increase efficiency. Consistency at work enhances reliability, better decision making, reduced errors, team cohesion that are all useful for increasing productivity. Facilities are similarly important in enhancing productivity and therefore access to functional facilities generally increases the probability of being in higher productive categories. Voordt and Jensen (2023) found positive impacts of appropriate building characteristics on health, satisfaction and productivity.

### 5.0 CONCLUSION

The study examined the effect of health status on labour productivity in Adamawa state. Following the analyses conducted and the results obtained, there is strong evidence to conclude that health status has a significant effect on labour productivity in Adamawa state. Healthy workers are likely to be more productive, however when people are severely sick, they do not go to work so hours they would have worked is lost. Other variables used in the model such as marital status, consistency at work and facilities have shown positive relationship with labour productivity and therefore can be regarded as significant determinant of productivity. These findings have implication for policy at both government and private sector levels. Based on the findings, the study therefore recommends that Adamawa state should prioritize the health of their citizens by widening access to health care services through a robust health insurance scheme and provision of healthcare facilities. Also, government should make functional facilities available by investing in critical infrastructure that would encourage worker productivity in Adamawa state.

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