UNEMPLOYMENT AND MORTALITY RATES IN NIGERIA: A COINTEGRATION APPROACH

ADOFU, Ilemona (Ph.D) and SALAMI Abdulganiyu
Department of Economics, Federal University Lafia
Email: ilemonaadofu@yahoo.com

Abstract

This study investigated the effect of unemployment rates on mortality rates in Nigeria, using time series data. The methods of data analysis are Johansen Cointegration Test and Fully-Modified Least Square Regression (embedded with distributed lag of unemployment). The result shows that the second lag of unemployment rates have significant and positive effect on mortality rates. A one percent increase in unemployment leads to 0.16% increase in total mortality rates, 0.17% increase in adult male mortality rates and 0.15% increase in adult female mortality rates. In addition, GDP per capita was found to have significant and negative effect on mortality rates. A one percent increase in GDP per capita leads to 0.11% decrease in total mortality rates. 0.12% decrease in adult male mortality rates and 0.09% decrease in adult female mortality rates. It can therefore be concluded that Nigerian economic fluctuation, represented by the unemployment rate and GDP per capita, is a determinant of the mortality rates in the country. It is recommended that policy makers put in place policies that will not only decrease the rate of unemployment but also increase GDPper capita in Nigeria.

Key words: Unemployment rate, Mortality rate, GDP per capita, economic fluctuation and time series

JEL: C32; E24

1.0 INTRODUCTION

Numerous studies have shown that increasing rates of unemployment are associated with higher mortality rates (Brenner 1976; Burgard, Brand & House 2007; Sullivan, Wachter & Strully 2009). Increase in mortality rate among the unemployed may be triggered by reduced income, disrupted social ties, feelings of hopelessness or worthlessness, and difficulties in meeting financial obligations, leading to depression, substance abuse, or other harmful conditions and behaviors

(Martikainen, Maki & Jantti, 2007; Bartley, Ferrie & Glossary 2001). Unemployed people not only lose materially, they lose access to social networks, self-esteem, self-confidence, a scheduled life structure, a sense of identity and possibly a purpose for their lives (Winkelmann &Winkelmann 1998). Neumayer (2004) opined that the stress, anxiety and psychological hardship connected to loss of job or fear of loss of job are also detrimental to health because the affected individuals may resort to medication, alcohol and other drugs to alleviate their stress and hardship. Given this line of argument, empirical evidence from Gerdtham and Johannesson (2002) shows that people who are unemployed suffer from deteriorating mental and physical health and wellbeing, which make unemployment a cause of ill-health and a significant predictor of mortality in many instances.

Contrariwise, some studies that were conducted in US and Europe revealed procyclical association of unemployment rates and mortality rates, depending on the state of the economy. They found that higher unemployment rates are associated with lower mortality (Ruhm 2000; Ionides, Wang & Granados 2013). They established that after long-term trends, higher unemployment, that is typical of economic recessions, leads to lower mortality, while lower unemployment, that is typical of economic expansions, leads to higher mortality, so that mortality fluctuates with the business cycle procyclically. This trend of fluctuations was also found for cardiovascular and infectious disease mortality, traffic deaths and industrial injuries (Kossoris 1939; Miller, Douglas, Marianne, Page, Stevens & Filipski 2009). The major exception is suicide mortality, which rises during recessions and falls during expansions, oscillating counter cyclically (Ruhm 2000; Luo, Florence, Quispe-Agnoli, Ouyang & Crosby, 2011). Explanation being that recession is associated with lower road-traffic injuries, alcohol related deaths, hospital admissions and decrease in exposure to hazardous working conditions(Gerdtham & Ruhm, 2002; Ruhm, 2008; Suhrcke & Stuckler, 2012), while economic expansion is associated with atmospheric pollution and long working hours necessitating use of tobacco, alcohol, medication and drugs, consumption of calorie-rich food and forgoing of regular medical check-up, and increase in work-related accidents and health injuries (Neumayer, 2004; Grenados, House, Ionides, Bugard & Schoeni, 2014; Rhum 2003).

Empirical evidence however revealed that procyclical nexus between unemployment and mortality is paramount only in high income countries where citizens' average level of wealth may serve as a cushion against any income shocks, and as social safety nets that provide formal insurance mechanisms. In poor

countries, with large shares of the population living in or close to abject poverty, any aggregate income shock is likely to push many people below subsistence levels (Suhrcke & Stuckler, 2012). Evidence shows that in Africa and low-income Asia, infant mortality rises, while school enrolment and nutrition fall during recessions. In middle-income countries of Latin America, health outcomes are generally pro-cyclical, while education outcomes are counter-cyclical (Ferreira & Schady,2009). Theoretically, Okun's model of unemployment states that unemployment is negatively correlated with economic growth. He found that a percentage decrease in unemployment rate leads to 3 percent increase in economic growth (Okun's, 1962). His theory lays credence to the findings of current studies about counter-cyclical nature of unemployment in relationship with mortality rate. During the period of economic boom, that is associated with lower unemployment rates, mortality rates is expected to be low. Many procyclical studies like Rhum (2000, 2003, 2006 & 2008) found opposite of this theory.

A survey of literature shows that most of the studies on unemployment and mortality nexus are based on high income economies, very few are available for low income countries. Specifically, none was found for Nigeria. This study is therefore aimed at investigating nature of association between mortality rate and unemployment in Nigeria, taken into cognizance the methodological approaches used by previous authors. Apart from the present introductory part of the work, the second section contains the review of related literature on the subject matter, the third contains research methodology, and the fourth contains presentation of results while the last section contains conclusion and recommendations of the study.

2.0 LITERATURE REVIEW

Numerous empirical studies have found statistical but inconsistent results about the relationship between unemployment rates and mortality. The studies can be divided in to two categories; the first group used time series data, while the second category used longitudinal panel data. Across the two groups, there are divergent opinions as to how unemployment and mortality rates are associated.

The first group is spearheaded by Brenner, whose empirical studies for United States (1973, 1976, 2005), Sweden (1975), England and Wales (1979); European Union and United states (2000) have repeatedly shown that population health outcomes (infant mortality rates, admissions to mental health hospitals, suicides, homicides and cardiovascular disease) decrease during economic expansions and increased

during downturns. Particularly in Brenner (2005), he investigated the effects of real GDP per capita, unemployment rate, and the employment to population ratio on age-adjusted mortality rates over the period of 1901 to 2000, in the United States. Using Engle-Granger Cointegration method and Shiller lag estimation approach, he found that the net effect of increased unemployment leads to a substantial increase in mortality, while increases in GDP per capita leads to a significant decrease in mortality rates during. He emphasised that the use of preference criterion, the occurrence of the independent variable prior to that of dependent variable, is necessary to get a stable and reliable long term effect of unemployment on mortality. In his study, he used lag of 11 years for the independent variables. He found that within short time, the results show counter apriori-expectations for both unemployment and real GDP per capital, but becomes stable over medium-to-long-time phenomenon.

In contrast to the findings of Brenner, Grenados (2005), in an investigation of the relationship between annual national fluctuations in a number of macroeconomic indicators and mortality of US economy between 1900 and 1996, found that higher mortality rates are associated with higher unemployment only during recessions, and that as the economy expands, the situation reversed as the economy improves. He used Stuart Mill's Concomitant Variation approach and Hodrick–Prescott filter to transform the variables, before regressing the percentage change in mortality on GDPgrowth and the rate of change of unemployment. Also in Tapia Granados (2012) for England and Wales economies; Granados and Ionides (2008) for Sweden economy, negative relationships were found between economic expansions and mortality rates.

The second strands of studies are those that used longitudinal data to examine the relationship between mortality rate and unemployment. The researchers in this category are divided into pro-cyclical business cycles researchers, who found that lower unemployment rates are associated with higher mortality rates increases during economic expansions, and higher mortality rates associated with lower unemployment during economic recessions. Ruhm (2000) is one the famous studies in this category. Using United States state-level longitudinal data from 1979 to 1991, he used fixed effect method to investigate the relationship between unemployment and mortality rates. He found that an increase in the unemployment rate is associated with a decrease in the overall mortality rate. He also found that an increase in unemployment leads to a decrease in deaths from all preventable causes of death, with the exception of Suicide and homicide, that are countercyclical in nature. Using

fixed effect method to investigate the relationship between mortality rates and per capita disposable income of 23 member nations of the Organization for Economic Co-operation and Development (OECD) over the 1960-1997, Gerdtham & Ruhm (2002) also found that total mortality and deaths from several common causes increase when labor markets strengthen. They found that decrease in the national unemployment rate is associated with a rise in total mortality and increases in deaths from cardiovascular disease, influenza/pneumonia, liver disease, motor vehicle fatalities and other accidents. Similarly, an application of fixed effect on German state level data by Neumayer (2004) equally showed a procyclical relationship between unemployment and mortality due to cardiovascular disease, pneumonia and influenza, motor vehicle accidents and suicides. Other studies like Ariizumi and Schirle (2010), Granados, House, Gerdtham and Johannesson, 2005; Ruhm, 2008; Granados and Roux 2008 found similar trend between unemployment rates and mortality rates in their respective studies.

Aside from longitudinal studies that found procyclical relationship between unemployment rates and mortality rates, studies like Sullivan and Von Wachter (2009); Crost and Friedson (2015) found countercyclical nexus between the two variables. In Sullivan and Wachter (2009**),** where fixed effect method was also applied on administrative records of Pennsylvania workers of 1970s, 1980s and death records of 1960s. They found out that job loss by high tenured male workers lead to increase in their mortality rate by fifty to hundred percent in the first year after job loss. The trend continues, as mortality rates of displaced workers remained ten to fifteen percent higher after 25 years. Similarly, Crost and Friedson (2015) used fixed effect method to investigate the effect of education specific unemployment rates on mortality to get better likelihood of being directly impacted by a recession. They found that among the working-age population, higher education-group specific unemployment rates are positively associated with mortality rates. Their findings suggest that the unemployment rate of an educated group in a given state is positively related to mortality in that group. They explained further that part of the education specific mortality effect is driven by the loss of health insurance coverage that comes with unemployment. Other studies like Economou, Nikolaou, and Theodossiou, 2008; Elliason and Storrie 2009; Stevens, Miller, Page and Filipski (2013); & Hoynes, Hillary, Miller, and Schaller (2012) also found counter-cyclical relationship between unemployment and mortality rates even with longitudinal date panels.

In other to isolate the effect of the level of economic development from unemployment-mortality nexus, some studies have investigated the difference in

response of health outcomes to economic fluctuations in high income and low income countries. Using fixed effect method, Ferreira and Schady (2009) found that in richer countries (like United States) child health and education outcomes are counter-cyclical: they improve during recessions. But in poorer countries like Africa and low-income Asia, the outcomes are pro-cyclical: infant mortality rises, and school enrolment and nutrition fall during recessions. In the middle-income countries of Latin America, health outcomes are generally pro-cyclical, and education outcomes counter-cyclical. Similarly, using fixed effects method to investigate the relationship between mortality rate and some selected macroeconomic variables of Organisation for Economic Co-operation and Development countries, Morin (2009) found that long-run economic growth (captured by GDP per capita) decreases mortality, while short-run growth is detrimental to health in rich countries. Government programs to artificially boost economic growth leading to bubbles may negatively affect the population's health. But in poorer countries, particularly the ones with GDP per capita levels below $10,000, both long-run and short-run growth lower mortality rates, so any move that boosts economic output will improve the health of the country's people.

In spite of the convergence of Ferreira and Schady (2009), and Morin (2009) about the nature of association of unemployment and mortality in developed countries and less developed countries, Hopkins (2006) showed that counter cyclical effect of unemployment cannot be generalized to all developing countries in his investigation of effect of economic shocks on macroeconomic activities and health status of three East Asia Countries. Her descriptive statistics showed that East Asian crisis was associated with short term increases in the mortality rate in Indonesia and Thailand, but there was a little impact on health outcomes in Malaysia. The inconsistent findings about the relationship between unemployment rates and mortality rates in different studies show that nexus between the two variables vary across countries, depending on the nature of economic situations, and sometimes, due to methodological difference among researchers. The findings show that the nexus differ across. This study is therefore necessary to investigate the nature of relationship between unemployment and mortality rate in Nigeria.

3.0 RESEARCH METHODOLOGY

3.1 Nature and sources of data

This study uses time series data on male and female mortality rates, real per capita income, percentage of population of people under 15 years, percentage of population over 64 years, total population size and GDP per capita extracted from World Bank Development Indicators, while unemployment rates were sourced from National Bureau of Statistics. The data ranges from 1970 to 2016.

3.2 Model specification

Three categories of mortality rates (adult female mortality rates, adult male mortality rates and total mortality rates are used, each serving as separate dependent variables in three regressions. Unemployment rates will be the main independent variable, while GDP per capita, total population size, percentage of population under 15 years and percentage of population over 64 years were used to control for variables. To evaluate long term effect of unemployment on mortality, 1 to 2year time-lag of unemployment rates was introduced in to the model. The choice of variables for this study follows Neumayer (2004) and the use of distributed lag effect of unemployment follows Neumayer (2004), Rhum (2000) and Brenne (2005).

The implicit form of the models can be specified below:

Ltotmort = f (Unempl, LGDPC, Pop15, Pop64, Ltopup)…..... 1

Lmlmort = f (Unempl, LGDPC, Pop15, Pop64, Ltopup)…..... 2

Lflmort = f (Unempl, LGDPC, Pop15, Pop64, Ltopup)… 3

Where

Ltotmort = log transformed total mortality rates, Lmlmort = log transformed adult male mortality rates, Lfltmort = log transformed adult female mortality rates, Unempl = unemployment rates, LGDPC = log transformed GDP per capital, Popu15= percentage of population under 15 years, Popu64= percentage of population above 64 years, Ltopup= log transformed total population size of the country. The structural form of the models can be specified below:

$$Ltotmort = \beta_1 Unempl + \beta_2 GDPC + \beta_3 Popu15 + \beta_3 Popu64 + \beta_3 Topup + \mu \ldots\ldots\ldots\ldots\ldots 4$$

$$Lmlmort = \gamma_1 Unempl + \gamma_2 GDPC + \gamma_3 Popu15 + \gamma_3 Popu64 + \gamma_3 Topup + \mu \ldots\ldots\ldots\ldots\ldots\ldots 5$$

$$Lfltmort = \varphi_1 Unempl + \varphi_2 GDPC + \varphi_3 Popu15 + \varphi_3 Popu64 + \varphi_3 Topup + \mu \ldots\ldots\ldots\ldots\ldots 6$$

Apriori expectation; $\hat{a}_1 > 0$, $\hat{a}_2 < 0$

It is expected that an increase unemployment rates (Unempl) will lead to increase in total mortality (Ltotmort), adult male mortality (Lmlmort) and adult female mortality (Lflmort) rates in equations 4, 5 and 6 respectively. Also, increase in real GDP per capita income is expected to lead to decrease in mortality rates in the three equations. Equations 4, 5 and 6 would be used to estimate model 1, 2 and 3 respectively.

3.3 Unit Root Test

Augmented Dickey Fuller unit root test was carried out to establish the order of integration of variables. This augmented version of unit root test includes extra lagged terms of the dependent variable in order to eliminate autocorrelation This test is necessary to know the level of stationarity of the variables, and apply appropriate cointegration technique to check the nature of long run cointegration among the variables (Dickey and Fuller 1979; 1981). It can be specified as below:

$$\Delta y_t = \alpha_0 + \alpha_{1t} + \sum_{i=1}^{p} i \Delta y_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 7$$

Where, y is the variable in consideration, Ä is the first difference operator, α_0 is intercept or constant, α_1 is a trend term, ñ is a lag order of the autoregressive process, and ?$_t$ is the error term.

3.4 Cointegration Test

The Johansen Cointegration approach was used when more than two variables are involved in a model. It helps to detect the number of cointegrating equations in a model, and detect the speed of adjustment from short to long run equilibrium. For instance, the first model consists of ltotmort, Unempl, GDPC, Popu15, Popu64, and Topup. They can all be represented by the matrix Z_t = [ltotmort$_t$, Unempl$_t$, GDPC$_t$, Popu15$_t$, Popu64$_t$, and Topup$_t$]. The matrix can be mathematically represented below:

$$Z_t = A_1 Z_{t-1} + A_2 Z_{t-2} + \ldots A_k Z_{t-k} + U_t \quad \ldots\ldots 8$$

The Z_{t-1} represents the endogenous variables in their respective lag forms, A_k represents the coefficients of the variables, while U_t represents the error term. The equation can be reformulated in a vector error-correction model (VECM) as follow:

$$\Delta Z_t = r_1 \Delta Z_{t-1} + r_2 \Delta Z_{t-2} + r_{k-1} \Delta Z_{t-k-1} + \pi Z_{t-1} + U_t \quad \ldots\ldots 9$$

Where $r_i = (1 - A_1 - A_2 - \ldots - A_k)\ (i = 1, 2, \ldots, k-1)$ and $= -(1 - A1 - A2 - \ldots - A_k)$. The π matrix contains information regarding the long-run relationships. π can be decomposed into $\alpha\beta'$ where α includes the speed of adjustment to equilibrium coefficients while β is the long-run matrix of coefficients. Therefore, the $\beta' Z_{t-1}$ term is equivalent to the error-correction term $(Y_{t-1} - \beta_0 - \beta_1 X_{t-1})$ in the single-equation case, except that $\beta' Z_{t-1}$ contains up to (n-1) vectors in a multivariate framework. The Johansen Cointegration method was also applied to the remaining two models.

3.5 Fully Modified Ordinary Least Squares (FMOLS)

After the Cointegration relationship has been established among the variables in the models, Fully Modified Ordinary Least Squares (FMOLS), developed by Phillips and Hansen (1990), was used to estimate the relationship that exists in the models. It provides consistent and efficient estimates in the presence of cointegration, explicates serial correlation effects and checks for endogeneity among regressors.

4.0 PRESENTATION OFRESULTS

4.1 Descriptive statistics

The descriptive statistics of the variables used in this study are presented in table 4.1.

Table 4.1: Descriptive Statistics

	FLMORT	M LMORT	TOTMORT	UNEMPL	POPU15	POPU64	TOPOP	GDPC
Mean	415.8183	371.8540	787.6723	9.4489	44.0192	2.8120	10900	257770.5
Maximum	466.7358	409.6812	876.4170	27.4000	45.1434	2.8879	17700	383023.4
Minimum	376.6746	347.3872	727.0618	1.6000	42.5727	2.7318	5613184	172402.7
Jargue-Berra	1.6787	3.5562	2.8919	7.3627	0.3416	3.2913	3.3249	3.7342
Probability	0.4320	0.1690	0.2355	0.02519	0.8430	0.1929	0.1897	0.1546
Observations	47	47	47	47	47	47	47	47

Source: Extracted from the ADF test results using e-views version 10

As shown in the table 4.1, the minimum value of adult female mortality rate (FLMORT) is about 377 per a thousand deaths, that of adult male is about 347 per a thousand death while that of total mortality rate (TOTMORT) is about 727 per two thousand deaths. Their respective maximum values are 467, 410 and 876. The table shows that the three dependent variables are normally distributed as their skewness are approximately zero, their kurtosis approximately 3 and the probabilities of Jargue-Berra above 5% level of statistical significance. This shows that models are likely to yield robust results since the dependent variables are well behaved. The unemployment rate (UNEMPL) is also normally distributed at 10% level of statistical significance, since the probability of its Jague-Berra is less than 10% level of statistical significance. The GDP per capita and the remaining control variables are also normally distributed since the probability values of their Jague-Berra statistics are less than 5% level of statistical significance.

4.2 Unit Root Test

The results of unit root tests extracted from section 3 of the appendix are presented table 4.2.

Table 4.2: Stationarity Test of the Variables

Augmented Dickey-Fuller Statistics of the Variables							
Variable	At levels	First difference	Critical values			Prob. value	Order of Integration
			1%	5%	10%		
Totmort	-0.5723	-1.8985	-2.6186	-1 .9485	-1.6121	0.0557	(1)
Mlmort	-0.4308	-1.9383	-2.6186	-1 .9485	-1.6121	0.0511	(1)
Fltmort	-0.7186	-1.8609	-2.6186	-1 .9485	-1.6121	0.0604	(1)
Unempl	-1.0878	-6.6998	-2.6174	-1 .9483	-1.6122	0.0000	(1)
GDPC	0.6437	-1.6470	-2.6162	-1 .9481	-1.6123	0.0000	(1)
Popu15	0.0657	-1.6501	-2.6241	-1 .9493	-1.6117	0.0928	(1)
Popu64	-0.5952	-2.2821	-2.6241	-1 .9493	-1.6117	0.0234	(1)
Topup	-8.1575	-3.7388	-3.5847	-2 .9281	-2.6022	0.0066	(1)

Source: Extracted from the ADF test results using e-views version 10

As shown in the table 4.2, all the variables are stationary at their first differences. Unemployment rate (Unempl), GDP per capita, percentage of population above 64 years and total population size are integrated at 5% level of statistical significance, given that their probability values are less than 5% level of statistical significance. On the other hand, total mortality rate (Totmort), male mortality rate (Mlmort), female mortality rate (Flmort), and percentage of population of people of under 15 years are integrated at 10% level of statistical significance, as their probability values are less than 10%. Therefore, the null hypotheses of no stationarity are rejected. Given that all the variables are integrated of order one, Johansen cointegration technique will be used to test for existence of long run among the variables in models 1, 2 and 3.

43 Cointegration RegressionResults

Table 5.1, 5.2 and 5.3 of the appendix contains the results of Johansen Cointegration tests for equations 4, 5, and 6 respectively. The results of the cointegration tests showed that the probability values of the trace and maximum eigen values of the three models are less than 5% level of statistical significance. This led to rejection of the null hypothesis of no long-run relationship between mortality rates and unemployment in Nigeria. This implies that there is long-run relationship between

mortality rates and unemployment in Nigeria. In order to establish the extent of the relationship, the estimates of FMOLS are presented in table 4.3.

Table 4.3 Fully Modified Ordinary Least Square Results

Variable	**Model 1**	**Model 2**	**Model 3**
Unempl	-0.0006 (0.0006)	-0.0006 (0.0007)	-0.0007 (0.0005)
Unempl(-1)	0.0002 (0.0007)	0.0000 (0.0008)	0.0003 (0.0006)
Unempl(-2)	0.0016 (0.0006)**	0.0017 (0.0007)**	0.0015 (0.0005)**
LGDPC	-0.1052 (0.0119)***	-0.1210 (0.0145)***	-0.0910 (0.0101)***
Intercept	11.9367 (0.0746)***	11.4605 (0.4851)	11.0454 (0.3370)***
R^2	0.9537	0.9341	0.9721
Adjusted R^2	0.9447	0.9213	0.9666
Number of observations	44	44	44
Estimation Method	Fully-modified OLS	Fully-modified OLS	Fully-modified OLS

Notes: Standard errors in parentheses; *** significant at the 1% level; ** significant at the 5%; *significant at the 10%;

Source: Extracted from the Fully-modified OLS results using e-views version 10

The table 4.3 contains extract from the FMOLS for equations 4 (Model 1), 5 (Model 2) and 6 (Model 3). The coefficients of unemployment rates in the three models are not statistically significant, and are wrongly signed. When the variable was lagged once, it is still not statistically significant, but has expected (positive) sign in the three models. The variable becomes statistically significant (at 5%) in the second lags, implying that unemployment rates significantly influence mortality rate after two years. In the first model, it shows that one percent increase in unemployment leads to 0.16% increase in total mortality rates. In the second model, it shows that one percent increase in unemployment rates leads to 0.17% increase in adult male mortality rates. In the third model, it shows that one percent increase in unemployment leads to 0.15% increase in adult female mortality rates.

The table equally shows that GDP per capita income statistical and negatively influence mortality rates, across the three categories, at 5% level of statistical

significance. In the first model, it shows that one percent increase in GDP per capita leads to 0.11% decrease in total mortality rates. In the second model, it shows that one percent increase in GDP per capital leads to 0.12% decrease in adult male mortality rates. In the third model, it shows that one percent increase in GDP per capital leads to 0.09% decrease in adult female mortality rates.

4.4 Robustness Check

To show that the models estimated in this study are stable, consistent and free from violations of regressions assumptions, diagnostic tests of heteroskedasticity, serial correlation and normality test were conducted. Also included in the table is the cointegration coefficient that was extracted from Vecto-autoregression Model (VECM) of the models. The results is presented in table 4.4.

Table 4.4: Robustness Check for the Models

Diagnostic Tests	Model 1		Model 2		Model 3	
	Statistics	P-value	Statistics	P-value	Statistics	P-value
Autocorrelation (Breusch-Godfrey LM test)	34. 8830	0.5379	35.5441	0.5067	0.3433	0.5639
Heteroskedasticity (Breusch-Pagan-Godfrey)	534.8595	0.6252	529.9988	0.6804	532.7428	0.6496
Normality Test	0.2060	0.9021	0.2535	0.8810	0.2143	0.8984
Error correction coefficient	-0.0390	-	-0.0469	-	-0.0263	-

Source: Extracted from Diagnostic Tests andVecto-autoregression model using e-views version 10

As shown in table 4.4, the probability values of the three diagnostic tests (autocorrelation, heteroscedasticity and normality tests) for the three models are greater than 5% level of statistical significance. This implies rejection of the null hypotheses. The models are free from misspecification problem, the successive errors are not correlated with each other, and there is equal variance among the errors of the models. Also, the coefficients of the vecto-autoregression models are all less

than one and negative, confirming the stability of cointegration and VECM estimates. Even the correlation matrix in section 5.4 of the appendix shows that the correlation coefficients of the variables are low, as such, the possibility of multicollinearity problem is ruled out.

4. DISCUSSION OFRESULTS

This study is conducted to examine the effect of unemployment on the mortality rates, using Nigerian time series data from 1970 to 2016. It is meant to contribute to the ongoing debated whether job loss, or a total unemployment shortens people's lives. The long run cointegrating relationship between unemployment and mortality rates is estimated using fully-modified ordinary least square regression, presented in table 4.3. In other to get robust and stable results, population of people under 15 years, population of people of over 64 years, total population size and GDPper capita were used as control variables. This is in line with the likes of Rulm (2000), Neumer (2004), Brenne (2005) and who have previously conducted similar study. It was discovered that increase in unemployment rates leads to increase mortality rates aggregately, among male adults and female adults in Nigeria. This is similar to the findings of Brenne (2005), Viren 2005; Economou, Nikolaou, and Theodossiou, 2008; Hoynes, Hillary, Miller, and Schaller (2012); who have also found, in their respective findings that unemployment is positively associated with mortality rates. When people lose their jobs, or could not find any job to do, they find it difficult to eat regular and balance diet, they suffer from deteriorating mental and physical health and wellbeing, which leads to depression, substance abuse, or other harmful conditions and behaviors, all of which have serious health effects.

The significant positive relationship between unemployment and mortality rates found in this study is at variance with procyclical studies like Rhum (2000), Neumayer (2004), Gerdtham & Ruhm (2002), Neumayer (2004), Ariizumi and Schirle (2010), Gerdtham & Johannesson, (2005). This is because Nigeria is a low income country, where a slight shock to people's income has devastating effect on their well-being, the situation is different from the high income countries, where procyclical relationship was found between unemployment and mortality rates. This study also share similarity with Ferreira and Schady (2009) and Morin (2009), who found higher mortality rate was associated with bad economic signals in developing nations, opposite of which is the case in developed nations.

Similar to the findings of Martikainen, Makela, Koskinen and Valkonen (2001); Singh and Siahpush (2002), Morin (2009), it was found that GDP per capita income is strongly negatively related to mortality rates, across all categories. This is justifiable because when income per individual in a country increases, it is likely to increase access to health improving activities and goods. They get increasing access to social media, higher ability to get regular and balance diet. While checking for the robustness of the models in the study, it was found that the three models are free from statistical problems of misspecification error, serial correlation and heteroskedasticity. Therefore, its findings are reliable and can be useful for fellow researchers, policy makers and other stakeholders of public health.

5. SUMMARY AND RECOMMENDATION

This study found that unemployment rates, across all categories, are statistically significant in influencing mortality rates. Just like many other previous researchers, this study found that increase in mortality rates leads to increase in mortality rates in Nigeria. It is therefore necessary for policy makers to put in place policies that will decrease the skyrocketing unemployment rate in the country. As seen in many studies reviewed in this study, unemployment also increase death from many diseases like cardiovascular disease, influenza/pneumonia and liver disease. It goes to imply that decrease in unemployment rate can also improve the health status of many people in the country.

Also, this study found that increase in GDP per capital is statistically significant in reducing mortality rates, across all categories. This implies that government need to put in place necessary infrastructural facilities, business-friendly macroeconomic policies and security for lives and property to increase output per head in the country. This will increase employment opportunities, reduce mortality rates and fast ward the country towards rapid economic growth and development.

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APPENDIX

Table 5.1: Cointegrating Relationship for Model 1

Date: 05/02/18 Time: 11:36
Sample (adjusted): 1972 2016
Included observations: 45 after adjustments
Trend assumption: Linear deterministic trend
Series: LTOTMORT UNEMPL LGDPC LTOPOP POPU15 POPU65
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.755635	164.6640	95.75366	0.0000
At most 1 *	0.486250	101.2548	69.81889	0.0000
At most 2 *	0.471021	71.28399	47.85613	0.0001
At most 3 *	0.362468	42.62772	29.79707	0.0010
At most 4 *	0.254323	22.37096	15.49471	0.0039
At most 5 *	0.184268	9.165124	3.841466	0.0025

Trace test indicates 6 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 5.2: Cointegrating Relationship for Model 2

Date: 05/02/18 Time: 12:25
Sample (adjusted): 1972 2016
Included observations: 45 after adjustments
Trend assumption: Linear deterministic trend
Series: LMLMORT UNEMPL LGDPC LTOPOP POPU15 POPU65
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.763209	163.7339	95.75366	0.0000
At most 1 *	0.490686	98.90795	69.81889	0.0001
At most 2 *	0.458209	68.54684	47.85613	0.0002
At most 3 *	0.351309	40.96749	29.79707	0.0017
At most 4 *	0.234823	21.49158	15.49471	0.0055
At most 5 *	0.189369	9.447399	3.841466	0.0021

Trace test indicates 6 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 5.3: Cointegrating Relationship for Model 3

Date: 05/02/18 Time: 12:32
Sample (adjusted): 1972 2016
Included observations: 45 after adjustments
Trend assumption: Linear deterministic trend
Series: LFLMORT UNEMPL LGDPC LTOPOP POPU15 POPU65
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.724433	161.3109	95.75366	0.0000
At most 1 *	0.494651	103.3092	69.81889	0.0000
At most 2 *	0.477658	72.59641	47.85613	0.0001
At most 3 *	0.369913	43.37198	29.79707	0.0008
At most 4 *	0.266059	22.58659	15.49471	0.0036
At most 5 *	0.175186	8.666894	3.841466	0.0032

Trace test indicates 6 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values