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A NON-PARAMETRIC ANALYSIS OF THE EFFECT OF COVID-19 PANDEMIC ON NIGERIANS' WELL-BEING BASED ON GEOPOLITICAL ZONES

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Abstract

The COVID-19 pandemic has crippled the economic activities of so many nations across the globe since its outbreak in 2019. This study is focused on the consequential effect of the COVID-19 pandemic in terms of standard of living, and perception of economic and security situation of Nigerians. A non-parametric approach was adopted on a primary data obtained through the administration of questionnaires online by NoiPolls during the COVID-19 period. The result obtained from this study depicts that there is a significant relationship between the security situation and perception of the country's economic situation. Kruskal-Wallis test was used to check if there is a significant difference in economic perception, security situation and standard of living where it was observed that there exists a significant difference based on the geopolitical zone. We, therefore, recommend that efforts should be made by the government towards improving the economic state of affairs especially in the southern part of the country as this will in the long run lead to sustainable cities and communities across the geopolitical zones which is one of the goals of SDGs. Moreover, efforts should also be made by the government towards improving the security situation in the north and southeast as improvement in the country's economic situation has a direct influence on the security position of the country.

1. Introduction

The worst socioeconomic challenges of alarming proportions have been experienced by Africa and the entire world over the past 24 months. In particular, on December 30, 2019, the Chinese Wuhan local health authority issued an epidemiological alert regarding the emergence of a new corona-virus strand known as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that caused the corona-virus disease 2019 (COVID-19) [1]. The COVID-19 pandemic has affected economies, individuals, and societies of the world in every respect. The upsurge in the number of cases and deaths, lockdowns, restrictions on public social life, and an economic downturn of all sorts, are likely to affect the personal well-being and mental health of all individuals negatively [2].

The COVID-19 has a multifaceted impact on the lives and livelihood of the people. The first known case of the virus in Nigeria was documented on the 27th of February 2020 and since then the number of confirmed cases had been on the increase [3]. The epidemiological pattern of the COVID-19 virus suggested an incubation period of five to fourteen days [4, 5], with a recent report suggesting a twenty-four days incubation period [6]. An infected Italian citizen brought the corona-virus to Nigeria and he came in contact with a Nigerian citizen who was then infected with the virus. The virus then spread to other citizens/non-citizens of the country in Lagos and other parts of the country at large. As of 10th July 2020, the number of reported cases in Nigeria soared to 31,323 confirmed cases of COVID-19 and 709 related deaths [7]. Egypt reported the first COVID-19 case in Africa on February 14, 2020, and Nigeria on February 27, 2020. Algeria, Cameroon, Morocco, Senegal, South Africa, Togo, and Tunisia all reported positive cases at the beginning of March 2020. From that point on, the virus spread to every corner of Africa and the rest of the world [8]. With a few notable exceptions, the majority of governments throughout the world initially played down the pandemic until it began to spread on a sustained local level. Governments first reacted by imposing mask regulations, closing international borders, tightening social segregation laws, and then physically restricting socioeconomic activities (lockdowns and shutdowns) to stop people from moving around, except those who were providing essential services, like medical and security personnel. The standard became testing, tracking, therapeutic management of infected individuals, as well as quarantines and isolation of positive cases [9]. Governments' economic responses to the pandemic in South East Asia, Africa, and the Middle East were varied and varied from fiscal to monetary and exchange rate/balance of payments adjustments. Following the approval of some vaccines for emergency use in developed countries, vaccination is gradually progressing in Africa after what was dubbed 'vaccine nationalism' in parts of Europe [9, 10]. Global response package of US$230 billion was mobilized to aid the global response to the corona-virus pandemic. US$75 billion was to be directed to the world's poorest countries in 2020. African Development Bank (AfDB) created the US$10 billion COVID-19 Rapid Response Facility (CRF) [9].

Without doubt, prolonged lockdown, school closures among others will worsen standard of living, personal economic situation, learning poverty and inequality as well as raise dropout rates, which were already at crisis levels prior to the COVID-19 pandemic. Unfortunately, the COVID-19 pandemic poses an even greater risk to the security situation and well-being of Nigerians because more are likely to drop out of school and also more susceptible to violence [11]. Hence, this leads to the aim of this study.

This study offers a new suggestion by mapping the determinants of the self-reported level of satisfaction/dissatisfaction in terms of standard of living, economic situation (perceived), and security situation in Nigeria during the COVID-19 pandemic from January 2020 and April 2021. Using data from a web survey by NoiPolls, this research aims at studying the relationship between standard of living, economic situation, and security situation of Nigerians during the COVID-19 pandemic using a non-parametric analysis approach based on geopolitical zone.

Nigeria has been divided into geopolitical zones as a result of the late General Sani Abacha's military rule. Based on ethnicity and shared political history, the states in each of the zones were divided and organized into different groups. The most populous country in the African continent is Nigeria. Approximately 400 ethnic groups and 450 languages can be found throughout the nation. Due to this diversity, the government had to combine like-minded groups or states in order to allocate resources in a fair and efficient manner. The geopolitical zones which follow Nigeria's economic, political, and educational resources are distributed throughout the zones under this grouping system. The six geopolitical zones in the country are North Central (also called the middle belt), North West, North East, South East, South South, and South West.

The study of standard of living and personal economic situation based on the perception of the general populace will enable us to know how well Nigerians lived in terms of their living standard considering the economic situation during the early stage of the pandemic. This study also examined the geopolitical zones to enable us to know if a particular geopolitical zone

was at the receiving end during the pandemic. In addition to the above, the personal, economic, and security view of Nigerians during the pandemic will be examined simultaneously based on geopolitical zone. A nonparametric approach was adopted due to the nature of the data used for the study; the data used for the study are ordinal and nominal which violate the assumptions of parametric analysis.

This will enable us to know if the economic situation during the pandemic has any significant impact on the security situation in the country. The result obtained from this research will be of immense importance to policymakers and the government in general because it will enable them to know areas that require urgent attention towards achieving a sustainable city and community which is one of the goals of SDGs.

The study [12] used a non-parametric approach involving Spearman rank correlation and Mann-Whitney U to analyze primary data acquired from NoiPolls' online administration of questionnaires. The result obtained from this study depicts that there is a significant relationship between the security situation and the perception of the country's economic situation.

A study by [13] identified and analyzed the main threats to the system of sustainable development and planning in terms of ensuring the economic security of the state during the pandemic. It aims to establish the level structure of measures to counter the negative impact of these threats on a particular region.

Kryshtanovych et al. [14] analyzed the negative impact of pandemic on the economic growth of the world and the choice of strategy for the functioning of the apparatus of public administration. The value of the study includes the use of IDEF0 methodology for the formation and implementation of economic growth strategies.

International trade is crucial for boosting a nation's economy, so [15] investigated how COVID-19 was related to and connected to economic distance, population, trade percentage of GDP, exchange rate, and political changes, which all affect trade flows. This conceptual paper explores the

effects of pandemics on common trading parameters like GDP, distance, policy stability, and population to illustrate how COVID-19 may affect global trade. They simulated the resulting shock as a multidimensional variable reflected in capital underutilization, manufacturing output decline, international trade costs inflation, production costs inflation, decrease in demand for certain services, and shift from daily needs towards activities that exclude the proximity between people, such as productivity towards virtual market products. The sudden decline in GDP, bilateral trade, and FDI is made worse by the ongoing long-term effects of pandemics. The study contends that COVID-19 will have a variety of effects on various industries and economies because it is a technological, financial, and policy shock that has a significant impact on global trade and economic development. Important studies have been conducted recently in the scope of studying the effect of COVID-19 pandemic in different continents. This can be seen in the research works of [16-19].

2. Materials and Methods

2.1. Data source

The data used for this study is primary data obtained through the administration of questionnaires online by NoiPolls.

The methodology used for this paper is given below:

2.2. Spearman rank correlation

The Spearman rank correlation coefficient which is a non-parametric statistic involves the ranking of the bivariate data set, and in cases where there are ties, the average of the rank is taken. Spearman rank correlation coefficient takes values from –1 to +1. The Spearman rank correlation coefficient enables us to assess the degree of relationship between two variables.

The Spearman rank correlation coefficient denoted by r is defined as:

$$r = 1 - \frac{6\sum d^2}{n(n^2 - 1)}, \tag{1}$$

where d is the difference between the pair of ranks and n is the sample size.

2.3. Kruskal-Wallis test

The Kruskal-Wallis test is a non-parametric test that can be used to determine whether three or more independent samples are significantly different or not.

The null and alternative hypotheses are stated as follows:

H_0: There is no significant difference.

H_1: There is a significant difference.

The two conditions for using Kruskal-Wallis test are such that each sample must be randomly selected and the size of each sample must be at least 5. If these conditions are met, then the sampling distribution for the Kruskal-Wallis test is approximated by a Chi-square distribution with $K - 1$ degrees of freedom, where K is the number of samples.

Given three or more independent samples, the Kruskal-Wallis test statistic is given as:

$$H = \frac{12}{N(N+1)}\left(\frac{R_i^2}{n_1} + \frac{R_2^2}{2} + \frac{R_3^2}{3} + \cdots \frac{R_K^2}{n_K}\right) - 3(N+1), \tag{2}$$

where:

K represents the number of samples,

n_i is the size of the ith sample,

N is the sum of the sample size, and

R_i is the sum of the ranks of the ith sample.

3. Data Analysis and Interpretation

3.1. Correlation coefficient

Table 1 gives the correlation coefficients of the standard of living, economic situation, and security situation which are our variables of interest.

Table 1. Spearman correlation coefficient

			Economic situation
Spearman's rho	Standard of living	Correlation coefficient	.490
		Sig. (2-tailed)	.000
		N	1079
	Security situation	Correlation coefficient	.261
		Sig. (2-tailed)	.000
		N	1079

From Table 1, it is seen that standard of living has a significant relationship with economic situation at 0.05 level of significance with a correlation coefficient of 0.490. Though this value is fairly weak, it depicts that the economic situation has an impact on the standard of living of Nigerians. The relationship between security situation and economic situation was also observed to be significant at 0.05 level of significance with a correlation coefficient of 0.261. This is also a weak positive relationship but it does not over-rule the fact that the economic situation of Nigeria has an influence on her security situation.

A comparative study of these results based on geopolitical zone was further examined. The results obtained are presented in Table 2. From Table 2, it can be observed that North Central has a significant relationship between standard of living and economic situation at 0.05 level of significance with a correlation coefficient of 0.556 and also a significant relationship between security situation of the country and economic situation with a correlation coefficient of 0.419. North East shows a significant relationship with a correlation coefficient of 0.380 between standard of living and economic situation. Same significant correlation is also seen

between security situation and economic situation with a coefficient of 0.252. A significant relationship is also observed under North West between standard of living and economic situation having a coefficient of 0.529. In the same vein, a significant relationship can be observed between security situation and economic situation. South South, South East and South West also show a significant correlation between standard of living and economic situation, security situation and economic situation with their corresponding correlation coefficients shown in Table 2.

Table 2. Spearman correlation coefficient

Geopolitical zone				Economic situation
North Central	Spearman's rho	Standard of living	Correlation coefficient	.556
			Sig. (2-tailed)	.000
			N	165
		Security situation	Correlation coefficient	.419
			Sig. (2-tailed)	.000
			N	165
North East	Spearman's rho	Standard of living	Correlation coefficient	.380
			Sig. (2-tailed)	.000
			N	149
		Security situation	Correlation coefficient	.252
			Sig. (2-tailed)	.002
			N	149
North West	Spearman's rho	Standard of living	Correlation coefficient	.529
			Sig. (2-tailed)	.000
			N	275
		Security situation	Correlation coefficient	.223
			Sig. (2-tailed)	.000
			N	275
South East	Spearman's rho	Standard of living	Correlation coefficient	.530
			Sig. (2-tailed)	.000
			N	130
		Security situation	Correlation coefficient	.337
			Sig. (2-tailed)	.000
			N	130

South South	Spearman's rho	Standard of living	Correlation coefficient	.521
			Sig. (2-tailed)	.000
			N	146
		Security situation	Correlation coefficient	.208
			Sig. (2-tailed)	.012
			N	146
South West	Spearman's rho	Standard of living	Correlation coefficient	.408
			Sig. (2-tailed)	.000
			N	214
		Security situation	Correlation coefficient	.225
			Sig. (2-tailed)	.001
			N	214

3.2. Kruskal-Wallis

Table 3 shows the average ranks obtained for each geopolitical zone under three different conditions which are security situation, standard of living and economic situation.

Table 3. Ranks

	Geopolitical zone	*N*	Mean rank
Standard of living	North Central	165	585.59
	North East	149	541.83
	North West	275	564.93
	South East	130	509.30
	South South	146	426.72
	South West	214	567.47
	Total	1079	
Economic situation	North Central	165	555.69
	North East	149	615.19
	North West	275	617.53
	South East	130	484.37
	South South	146	454.26
	South West	214	468.21
	Total	1079	

Security situation	North Central	165	539.51
	North East	149	531.49
	North West	275	557.31
	South East	130	452.38
	South South	146	610.88
	South West	214	528.94
	Total	1079	

Table 4. Test statistics

	Standard of living	Economic situation	Security situation
Chi-square	28.191	54.105	19.344
df	5	5	5
Asymp. sig.	.000	.000	.002

Table 4 gives the Kruskal-Wallis test which enables us to assess if there exists any significant difference between standard of living, security situation and economic situation based on geopolitical zone. The result shows that there is a significant difference within standard of living, economic situation and security situation at 0.05 level of significance based on geopolitical zone. A post-hoc test was further conducted to verify where the difference emanates from.

Figure 1 shows North West, North Central and North East account for the significant differences under economic situation having higher values of 617.53, 555.69 and 615.19, respectively.

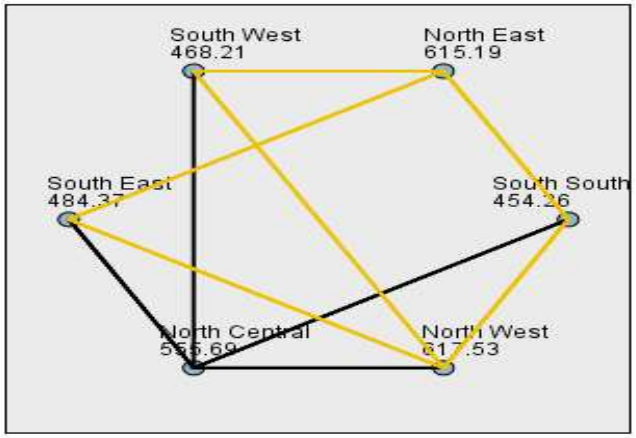

Figure 1. Pairwise comparisons of geopolitical zone.

Table 5. Pairwise comparisons of geopolitical zone

Sample 1 - Sample 2	Test statistic	Std. error	Std. test statistics	Sig.	Adj. sig.
South South - South West	-12.956	33.004	-423	.672	1.000
South South - South East	30.109	37.077	.812	.417	1.000
South South - North Central	101.431	34.935	2.903	.004	.055
South South - North East	160.934	35.804	4.495	.000	.000
South South - North West	163.276	31.484	5.186	.000	.000
South West - South East	16.153	34.190	.472	.637	1.000
South West - North Central	87.475	31.854	2.746	.006	.090
South West - North East	146.979	32.806	4.480	.000	.000
South West - North West	149.320	28.027	5.328	.000	.000
South East - North Central	71.322	36.057	1.978	.048	.719
South East - North East	130.826	36.900	3.545	.000	.006
South East - North West	133.167	32.725	4.069	.000	.001
North Central - North East	-59.503	34.747	-1.712	.087	1.000
North Central - North West	-61.845	30.277	-2.043	.041	.616
North East - North West	-2.341	31.276	-0.75	.940	1.000

Each row tests the null hypothesis that Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are

displayed. The significance level is 0.05. Table 5 also depicts that North West, North Central and North East account for the significant differences. The observed significant differences from the table are 0.004, 0.000, 0.000, 0.006, 0.000, 0.000, 0.048, 0.000, 0.000, 0.041. These *P*-values are less than 0.05 the level of significance.

Figure 2 shows that South South account for the significant differences under standard of living with a value of 426.72.

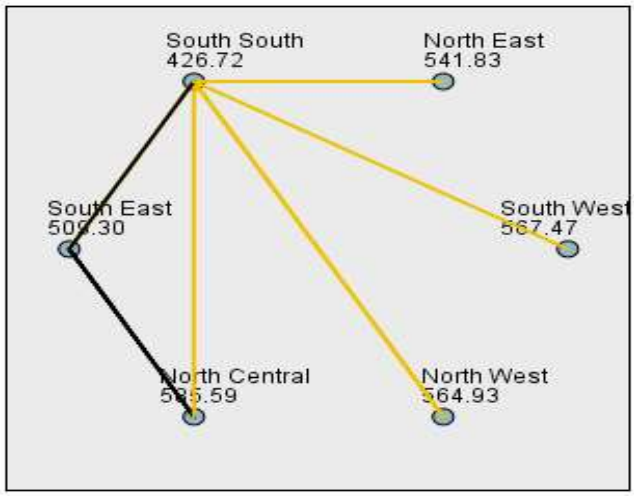

Figure 2. Pairwise comparisons of geopolitical zone.

Each row tests the null hypothesis that Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is 0.05. The significance of South South is also evident in Table 6. From all the pairwise comparisons of Table 6, South South attributes to the significant differences that exist. The observed significant differences from the table are 0.026, 0.001, 0.000, 0.000, 0.000. These *P*-values are less than 0.05 the level of significance.

Table 6. Pairwise comparisons of geopolitical zone

Sample 1 - Sample 2	Test statistic	Std. error	Std. test statistics	Sig.	Adj. sig.
South South - South East	82.581	37.124	2.224	.026	.392
South South - North East	115.103	35.850	3.211	.001	.020
South South - North West	138.205	31.524	4.384	.000	.000
South South - South West	-140.752	33.045	-4.259	.000	.000
South South - North Central	158.868	34.979	4.542	.000	.000
South East - North East	32.522	36.947	.880	.379	1.000
South East - North West	55.623	32.767	1.698	.090	1.000
South East - South West	-58.170	34.233	-1.699	.089	1.000
South East - North Central	76.287	36.103	2.113	.035	.519
North East - North West	-23.102	31.316	-.738	.461	1.000
North East - South West	-25.649	32.847	-.781	.435	1.000
North East - North Central	43.765	34.791	1.258	.208	1.000
North West - South West	-2.547	28.062	-.091	.928	1.000
North West - North Central	20.664	30.315	.682	.495	1.000
South West - North Central	18.117	31.894	.568	.570	1.000

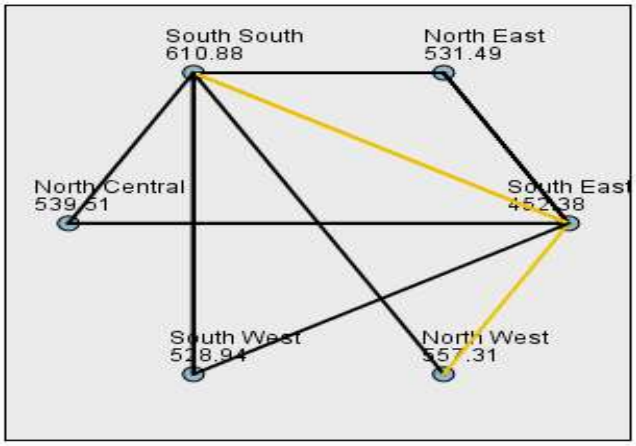

Figure 3

From Figure 3, it can be observed that South East accounts for the significant difference under security situation with a value of 452.38.

Table 7. Pairwise comparisons of geopolitical zone

Sample 1 - Sample 2	Test statistic	Std. error	Std. test statistics	Sig.	Adj. sig.
South East - South West	-76.560	34.398	-2.226	.026	.390
South East - North East	79.113	37.125	2.131	.033	.496
South East - North Central	87.129	36.276	2.402	.016	.245
South East - North West	104.930	32.924	3.187	.001	.022
South East - South South	-158.503	37.302	-4.249	.000	.000
South West - North East	2.553	33.005	.077	.938	1.000
South West - North Central	10.569	32.048	.330	.742	1.000
South West - North West	28.370	28.197	1.006	.314	1.000
South West - South South	81.943	33.204	2.468	.014	.204
North East - North Central	8.016	34.959	.229	.819	1.000
North East - North West	-25.817	31.467	-.820	.412	1.000
North East - South South	-79.390	36.022	-2.204	.028	.413
North Central - North West	-17.801	30.461	-.584	.559	1.000
North Central- South South	-71.374	35.147	-2.031	.042	.634
North West - South South	-53.573	31.676	-1.691	.091	1.000

Each row tests the null hypothesis that Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is 0.05. South East's significance can also be observed from the pairwise comparison of Table 7 where South East appears to be significant when compared to other regions. The observed significant differences from the table are 0.026, 0.033, 0.016, 0.001, 0.000, 0.014, 0.028, 0.042. These *P*-values are less than 0.05 the level of significance.

4. Discussion

The emergence of the COVID-19 virus in Wuhan, China in 2019 marked a pivotal moment in global history. This novel virus quickly spread across international borders, impacting nations worldwide in multifaceted ways. Beyond the severe health consequences it brought, the COVID-19

pandemic triggered a cascade of effects on economies, living standards, and security situations in various countries, including Nigeria. The economic repercussions of the COVID-19 pandemic have been felt acutely in Nigeria, as in many other nations. The imposition of lockdowns, travel restrictions, and social distancing measures aimed at curbing the virus's spread disrupted economic activities across sectors. Businesses faced closures, supply chains were disrupted, and millions of individuals found themselves unemployed or underemployed. The resultant economic strain challenged the livelihoods and standards of living of Nigerians. This study sought to examine the intricate relationship between the pandemic's economic impacts and the overall well-being of Nigerians, particularly, in the context of geopolitical zones.

Standard of living is a multidimensional concept that encompasses various aspects of human welfare, including income, access to healthcare, education, housing, and social services [20]. The COVID-19 pandemic, with its disruptions and uncertainties, posed formidable challenges to the maintenance and improvement of living standards in Nigeria. This research employed a non-parametric approach, utilizing the Kruskal-Wallis and Spearman rank correlation tests, to explore how the pandemic affected the standard of living across different geopolitical zones. The pandemic also had implications for security situations within Nigeria. As economic hardships intensified and social inequalities became more pronounced, the potential for civil unrest and security threats increased. Understanding how the pandemic influenced security dynamics is crucial for policy makers and stakeholders.

The results of this study demonstrated statistically significant differences in the standard of living, economic conditions, and security situations among Nigeria's geopolitical zones during the COVID-19 pandemic. The Kruskal-Wallis test identified variations among the zones, while the Spearman rank correlation revealed certain relationships between these variables. A post-hoc test was conducted to identify which geopolitical zones contributed significantly to these observed differences. The findings highlighted specific regions that experienced more pronounced impacts, whether positive or

negative, on their standard of living, economic conditions, and security situations during the pandemic. Understanding the disparities among Nigeria's geopolitical zones is essential for crafting targeted policy interventions. Policymakers should consider the unique challenges and opportunities presented by each region to develop effective strategies for mitigating the negative effects of future crises and promoting sustainable development.

In conclusion, the COVID-19 pandemic is a stark reminder of the interconnectedness of health, economics, and security. This study sheds light on the complex relationship between these variables in Nigeria's diverse geopolitical landscape. Future research could delve deeper into the specific mechanisms underlying these relationships and explore additional factors that may have influenced the observed variations. Ultimately, evidence-based policymaking informed by such research will be crucial for building resilience and ensuring the well-being of Nigerians in the face of future challenges.

5. Conclusion and Recommendation

The result obtained from this study depicts that there is a significant relationship between the security situation and perception of the country's economic situation. The standard of living of Nigerians was studied alongside their perception of the economic situation and we observed that there is a significant relationship between these two. This was also examined based on geopolitical zone. The Kruskal-Wallis test was adopted to assess if there exists any iota of difference between security situation, economic perception, and standard of living based on the geopolitical zone. The test result showed that there is a significant difference in the standard of living, economic situation and security perception. A post-hoc test was further carried out to verify which of the geopolitical zones contributes to the significant differences that exist and it was observed that North West, North East, South South, South East account for the significant differences that exist in economic situation, standard of living and security situation, respectively.

From the results obtained, it can be concluded that the economic situation of Nigeria has a great impact on Nigeria's standard of living and security situation. From these observations, we make the following recommendations: (1) Efforts should be made by the government towards improving the economic state of affairs especially in the southern part of the country. (2) Effort should also be made by the government towards improving the security situation in the North and South East as improvement in the country's economic situation has a direct influence on the security position of the country. The above recommendations were made based on the findings and are aimed towards achieving one of the SDGs which are sustainable cities and communities. COVID-19 has in one way or the other affected the country's GDP. Future research areas can include the country's GDP. That is, the impact of COVID-19 on the country's GDP and standard of living.

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