KADUNA JOURNAL OF GEOGRAPHY
2026, VOL. 8, No. 1, 789-801
https://doi.org/10.47514/kjg.2026.08.01.074

Research Article

The Socio-Economic Costs of Lockdown Measures in Curtailing Epidemics in Developing Countries: A Focus on the Covid – 19 Experience in Benin Metropolis, Nigeria

Verere Sido Balogun [a]

[a] Department of Geography and Disaster Risk Management, Faculty of Environmental Sciences, University of Benin, Nigeria.

ABSTRACT

The lockdown strategy adopted by governments in various countries to curb the spread of the COVID-19 virus inadvertently resulted in socio-economic side effects, with specifics varying by the country's level of development. This study is based on the Covid - 19 lockdown experiences in a developing country, Nigeria, examining its impact on the basis of different socio-demographics. The study adopted a neighbourhood cross-sectional approach to determine how the lockdown strategy affected individuals living in high-, middle-, and low-class neighbourhoods. The results revealed that during the Covid-19 lockdown period, respondents within the youthful age group (18-35 years) and people working in the informal sector were significantly ($P \geq 0.05$) more likely to experience livelihood loss, while respondents within the middle-class neighbourhood were significantly less likely to experience livelihood loss, compared with respondents within the high-class neighbourhood. Also, variation in access to healthcare was significant on the basis of neighbourhood of residence and income ($P \leq 0.05$), with respondents who lived in the middle- and low-class neighbourhoods and earned less than 150,000 monthly less likely to access healthcare during the lockdown period. While male respondents living in the low-class were significantly ($P \leq 0.05$) more likely to experience family bonding during the lockdown, more youths (18-35 years) living in middle- and low-class neighbourhoods were significantly ($P \leq 0.05$) more likely to experience domestic violence. While more male respondents were significantly more likely to experience insecurity, respondents who lived in low-class neighbourhoods and had a monthly income cycle were less likely to experience insecurity. The study recommends preventive and preparatory perspectives, best suited for developing countries with a large informal sector, in handling future pandemics.

ARTICLE HISTORY
Submitted 10 September 2026
Accepted 30 October 2026
Published 27 November 2026

GUEST EDITOR
A. M. Ahmed

KEYWORDS
COVID-19 Lockdown; Socio-Economic Impact; Informal Sector Livelihoods; Neighbourhood Disparities; Benin Metropolis; Nigeria

1 Introduction

The COVID-19 pandemic, caused by a variant of the coronavirus in 2019 in Wuhan, China, was an unexpected occurrence for which most countries of the world were not prepared. The sudden appearance of the new coronavirus affected the entire world in an unprecedented way. Consequently, the WHO declared the virus a global pandemic on March 11, 2020 (WHO, 2020). As the rate of human-to-human transmission continued to increase in 2020 and 2021, it led to serious respiratory problems and consequent fatalities. Within 6 months in 2020, over 7 million people had contracted the virus, causing the death of about 434,796 people, with about 4,272,909 recoveries recorded around the world (World Meter, 2020). The lack of available clinical vaccines to fight the virus during the onset of the epidemic prompted a global determination to take precautionary and reactionary policies and measures, some of which had environmental and socio-economic implications. One such policy and measure adopted by most countries of the world was the 'lockdown' policy, which was either total or partial depending on the country.

The lockdown measure was adopted globally, even as the World Health Organisation (WHO, 2020) confirmed the global scale of 'lockdown' as unprecedented in the history of public health (Crossley, 2020). The infectious nature of the disease necessitated different countries to adopt 'lockdown' measures, which were first implemented by the Chinese central government in Wuhan on January 23, 2020. Between April and June 2020, more than 100 countries had announced extensive blockades to serve as a preventive measure against the spread of the virus, capable of both expected and unexpected macroeconomic shocks (WHO, 2020). However, the health and socio-economic impact of the 'lockdown' policy was experienced differently in developed and developing countries. In developing countries, especially in Africa, the implementation of the 'lockdown policy was not without its unintended mental health and socio-economic consequences (Egharevba & Iyobosa, 2020; Musoke et al., 2024; Otchia, 2026).

A 'lockdown measure' is an emergency response imposed by the government, compelling people to stay indoors during an outbreak (Ngonghala et al., 2020). As far as COVID-19 is concerned, the ultimate goal of the lockdown measures is to flatten the curve of a fast-spreading virus (WHO, 2020). The exercise required the closure of all activity-based centres, such as schools,

Corresponding Author: Balogun, V. S. verere.sido@uniben.edu Department of Geography & Disaster Risk Management, University of Benin, Nigeria.
© 2026 The Author(s)

hotels, clubs, and religious sites, which can bring a large number of people together. Also, directives such as social distancing, banning the congregation of more than 20 people, and compulsory use of face masks, particularly in public places, are usually enforced (Nigeria Centre for Disease Control - NCDC, 2020; CDC, 2020). In Nigeria, due to the continued increase and spread of the COVID-19 virus cases, the Federal Government announced a nationwide lockdown on March 30, 2020, which took immediate effect in three federal states, which were Lagos, Ogun, and Abuja (NCDC, 2020), and later, other states of the federation, including Edo State, followed suit. The lockdown was intended to reduce the rate of infection spread in the country.

However, the good intentions of the lockdown precipitated many societal challenges, which were unintended consequences for a developing country like Nigeria. The socio-economic side effects of the lockdown created so much agitation, prompting the easing of the lockdown in Nigeria. This, however, led to the rising cases of the virus across the states. Studies by Lau et al. (2020) have verified that a lockdown is an efficient approach in reducing the rate of infectious spread of the virus. However, the implementation of 'lockdown' measures in developed countries such as France, the United States, Australia, Britain, etc., has been shown to lead to economic downturns, food shortages, and mental health issues (Nicola et al., 2020). Strict lockdown measures in China have particularly been associated with severe human rights abuses, in addition to economic downturns and food shortages (Figueiredo et al., 2020). In this regard, there is still a need to consider the implications of a lockdown measure, especially in the context of a developing nation such as Nigeria. It is against this backdrop that this study seeks to investigate the socio-economic impacts of the COVID-19 'lockdown' measure among the residents of a typical urban centre in Nigeria.

Previous studies have shown that the COVID–19 pandemic, which necessitated a global lockdown, had a serious impact on the global economy, social life, activities and interactions, jobs, education, transportation, and general well-being. The pandemic resulted in a globalisation process that forced countries to close their borders, resulting in restrictions on goods and services between countries, capital flows, and the closure of businesses and manufacturing industries (Naseer et al., 2023). The Study by Bonaccorsi et al. (2020) indicates that the restrictions on mobility resulted in severe consequences, such as increased poverty and job losses. The lockdown affected the poor in the population, especially in the absence of interventions. The socio-economic effects of the COVID-19 pandemic in developed countries have been studied previously (Nicola et al., 2020; Figueiredo et al., 2020). The study by Nicola et al. (2020) reports that the restrictions in movement during the COVID-19 era affected several economic sectors, which include agriculture, petroleum and oil, manufacturing, education, healthcare, finance, hospitality, tourism, aviation, real estate, sports, entertainment, hoteling and food. The study further reported that social impacts were mostly addiction to video gaming and domestic violence. Nyabeze and Chikoko (2021) report that countries that comprise a large informal sector were particularly affected by lockdown measures. This was because most informal sectors were based on low capital and daily returns, from which payments and purchases were made. The study by Mulugeta et al. (2021) has shown how the COVID-19 'lockdown' had affected government, private, and self-employed workers. Workers were affected by the stress and boredom of working from home and the feeling of being less productive without access to work tools. The findings by Bonaccorsi et al. (2020) also reveal that areas with higher fiscal capacity, as a social indicator, were more affected by mobility deprivation than areas with lower fiscal capacity; poorer people were more affected by the consequences of the 'lockdown' measures. Despite the number of studies focused on the negative effects of the lockdown measures, a study (Kharroubi & Saleh, 2020) portraying its benefits depicts 'lockdown' measures as being very effective in containing the COVID – 19 pandemic. Other studies also report that the restricted movements, which resulted in reduced economic activities, led to lower carbon emissions and better air quality (Le Quéré et al., 2020; Ronaghi & Scorsone, 2023).

The conceptual basis for the study is the 'intersectionality concept', which is a framework first used by Kimberlé Crenshaw in explaining discrimination against individuals as an outcome of the interplay of socio-demographic factors, such as gender, age, race, social status, etc. (Crenshaw, 1989). Within the context of this study, the intersectionality concept is applicable in explaining how the intersectionality of socio-demographic factors influences the level of impacts experienced by people during the lockdown period. It is expected that the impact of the lockdown policy will affect people differently, based on their socio-economic background. This approach is thus crucial in understanding how the impacts of the lockdown measures differ among different groups, and how to proffer needed interventions during the lockdown period by considering the complexities of the impacts it has on various categories of individuals within a given society.

This use of lockdown measures by most countries during the Covid – 19 epidemic is regarded as an inevitable choice, but with unintended consequences. To understand the varying nature of such unintended

consequences, the study adopts the intersectionality model to explain how these consequences or impacts differ on the basis of the intersectionality of selected socio-demographic variables. The study is designed to expound on the nature of socio-economic consequences of 'lockdown' measures, with a focus on determining policy modifications for better outcomes in managing epidemics in the future. This study aligns with the United Nations Sustainable Development Goals: SDG 3 (Good Health and Well-being) and SDG 16 (Peace, Justice and Strong Institutions). A previous study explains that the factors that determine the approach for possible containment of a virus include network or spread of geographic population, human mobility, and information dissemination in curtailing spread (Lima et al., 2015).

Other studies (Kharroubi & Saleh, 2020; Le Quéré et al., 2020; Ronaghi & Scorsone, 2023) have shown that lockdowns were effective measures in tackling epidemics, especially in developed countries, also given that less travel reduced CO_2 emissions. A review of the literature indicates that past studies have focused on the social side effects of lockdown policies (Bonaccorsi et al., 2020; Mulugeta et al., 2021; Naseer et al., 2023). However, not much consideration has been given to the societal side effects of such lockdowns, using the intersectionality of socio-demographic attributes such as gender, age, neighbourhood of residence, occupation, and income (level and periodicity). In this regard, this study attempts to examine the various forms of socio-economic and societal challenges that could possibly outweigh the expected benefits of a lockdown policy. The study also proffers alternative measures for managing epidemics or executing lockdown measures in developing countries, such that the living standard of people is not extremely affected.

2 Materials and Methods

2.1 Study Area

Benin City is the capital and largest urban settlement in Edo State, Nigeria (Figure 1). According to Macrotrends (2022), the population of the Benin Metropolitan City is estimated at 1,841,000. The indigenous people of Benin City are the Edo (Benin) people, who speak the Edo (Bini) language. Residents of the city have one of the continent's richest cultures and are known for bead-making, bronze-casting, sculpting, and wood-carving. The occupational diversity of residents in Benin City includes artisanry, trading, agriculture, transport, estate/property management, and public service in government, private, and multinational agencies. This diversity suggests that the city is inhabited by residents across high, medium, and low social classes. Social networking is high within the city, supported by a well-connected road network and an effective communication system via mobile phone networks, newspaper distribution, and electronic mass media (television and radio). Many skilled and unskilled workers are employed by local, state, and federal agencies across Benin City. Industry and private entrepreneurs also employ a significant percentage of the city's total workforce. Many residents are self-employed and engage in various forms of artisanry, such as carpentry and furniture-making, shoemaking, phone and watch repairing, driving, car mechanics, welding and panel-beating, bronze-casting, carving, tailoring, catering, etc. (Ekhaese, 2024)

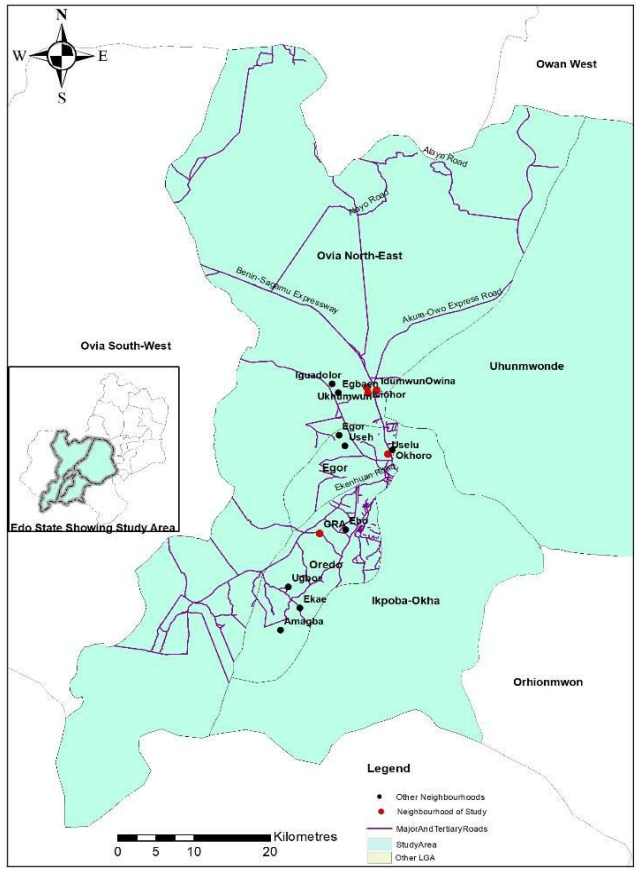

Figure 1: Edo State, with Benin City

2.2 Research Design

The study was conducted on a neighbourhood basis, using a random sampling technique. The selected Local Government Areas (LGAs) within which the study was carried out included the urbanised sections of Oredo, Ovia North-East and Egor LGAs, from which three neighbourhoods (GRA, Isihor and Uselu) were purposively selected from each of the LGAs, representing three major social strata, which are the high-class (elite), middle-class and low-class neighbourhoods, respectively. Within each neighbourhood, the streets off arterial routes were identified, and respondents, who were adult members of households, were randomly selected from the housing units within each street, as part of the sampling

pool.

2.3 Ethical Consideration

Ethical precautions were taken to ensure non-disclosure of the personal identities of the respondents. The primary data used in this study were derived from copies of a structured questionnaire, which was used to elicit information on the side effects of "lockdowns" during pandemics in developing countries. Perceptions of the socio-economic challenges of the COVID-19 lockdown measures were derived from the responses of the respondents.

2.4 Sample size

The total sample size of 278 persons was derived from the estimated population of Benin Metropolitan City, which is estimated at 1,841,000 (Macrotrends, 2022), and calculated using the Yamane statistical formula represented as;

$$n = \frac{N}{1+N\,(e)^2} = \frac{1{,}841{,}000}{1+1{,}841{,}000\,(0.06)^2} = 278$$

Where;
n = minimum required sample size
N = population size = 1,841,000
e = the degree of accuracy expressed as a proportion = 0.06

Adam (2020).

Due to the non-availability of population estimates for each of the neighbourhoods sampled, the questionnaire copies (278) were administered almost evenly across the sampled neighbourhoods, representing high-, middle-, and low-class neighbourhoods (Table 1). This was based on an assumed similar population density level across the sampled neighbourhoods, because population figures could not be ascertained for each of the neighbourhoods studied. The validity of the questionnaire was ascertained by experts in the research subject. A cross-sectional approach was used to determine how individuals, cross-sectionalized among different socio-demographic indicators, were affected by the lockdown measures implemented.

2.5 Data Analysis

Inferential statistics (logistic regression) were used to determine how respondents with different socio-demographic backgrounds were affected by the lockdown measures. Logistic regression showed the effect of multiple independent variables (gender, age, neighbourhood of residence, occupation, income level, and periodicity) on one binary dependent variable (socio-economic impacts – livelihood loss, healthcare access, and experience of family bonding, domestic violence, and insecurity). The survey was carried out in the aftermath of the Covid – 19 lockdown in 2022. These binary dependent variables were reported by the respondents either in affirmative (i.e., yes) or negative (i.e., no) retrospectively. A qualitative approach involved the use of Key Informant Interviews (KII) in deriving preventive and preparatory perspectives best suited to handling future epidemic outbreaks in developing countries in Africa.

Table 1: Sample Size Distribution across the Study Neighbourhoods

Sampled Neighbourhoods	Sample Size	Percent
GRA (High class)	94	33.8
Isihor (Middle class)	91	32.7
Uselu (Low class)	93	33.5
Total	**278**	**100.0**

3 Results

In this section, the socio-demographic characteristics of the respondents of the survey were analysed descriptively, while the socio-economic impacts of the COVID-19 lockdown measures were analysed inferentially by using the logistic regression test to determine how groups of the independent variables (gender, age, neighbourhood of residence, occupation and income level and periodicity) are affected based on livelihood, healthcare, family life and neighbourhood security (binary dependent variables). The logistic regression results in Tables 3 - 7 show the effect of socio-demographic variables (independent variables - gender, age, neighbourhood of residence, occupation, income level, and income cycle) on various forms of perceived impacts (dependent variables). The first-row p-values indicate whether there is an association between the independent variable and the dependent variable, while the other rows compare the individual categories of the independent variables with the reference category. Exp(B) column represents the odds ratio compared to the reference category. The odds ratio predicts the odds or likelihood of an event occurring for two or more groups in relation to the reference category at the bottom. The B column contains the coefficients for the model. A positive or negative B value indicates if an event is more or less likely to occur within a group (respectively) compared with the reference category.

3.1 The Socio-demographic Background of Respondents Impacted by the Covid - 19 Lockdown

The socio-demographic profiles of the respondents describe the different socio-economic backgrounds of the respondents, which influence how they are impacted by the lockdown. From the different study areas in society. The distribution of the respondents by gender in Table 2 shows that while males make up 54.7% of the sample, the

female respondents represent 45.3%. This implies that both males and females were involved in the study, eliminating any iota of gender bias in the outcome of the findings. The age distribution of respondents indicated that all age groups were involved in the research, with 40.6% of the respondents between the age range of 18-35years, 47.8% of the respondents between the age range of 36-65 years, and 11.5% of the respondents above 66 years. The study also cut across three classes of society, stratified into residents living in a high-class neighbourhood (G.R.A, 33.8%), a middle-class neighbourhood (Isihor, 32.7%), and a low-class neighbourhood (Uselu, 33.5%).

The occupation distribution of the respondents in Table 2 comprises civil servants (11.5%), workers in private firms or businesses (19.8%), traders (16.5%), artisans (3.2%), transportation workers (7.2%), farmers (3.6%), clerics (2.9%), and students (19.8%). Unemployed and retired respondents accounted for 4.3% and 10.8% of respondents, respectively. This implies that the survey represented an extensive range of the workforce in the study area. In terms of income, the findings indicate that 20.1% of the respondents were earning below the minimum monthly wage of ₦30,000 monthly, while the majority (55.0%) of the respondents reported monthly income between ₦30,000 - ₦150,000 monthly. Respondents who earned above ₦150,000 monthly represented 24.8% of the sample. The majority of the respondents (62.6%) received their income on a monthly basis, while 37.4% of respondents depended on a daily income cycle.

Table 2: The Socio-demographic Characteristics of the Respondents

Socio-Demographic Characteristics of Respondents	Categories	Frequency	Percent
Gender	Male	152	54.7
	Female	126	45.3
	Total	**278**	**100.0**
Age	18 – 35 years	113	40.6
	36 – 65 years	133	47.8
	66 years and above	32	11.5
	Total	**278**	**100.0**
Neighbourhood of Residence	GRA (High class)	94	33.8
	Isihor (Middle class)	91	32.7
	Uselu (Low class)	93	33.5
	Total	**278**	**100.0**
Occupation	Civil service	32	11.5
	Private firm/business operation	55	19.8
	Small and medium scale (SMS) Trading	46	16.5
	Artisanry	9	3.2
	Transportation	20	7.2
	Farming	10	3.6
	Fishing	1	0.4
	Cleric	8	2.9
	Studentship	55	19.8
	Unemployed	12	4.3
	Retired	30	10.8
	Total	**278**	**100.0**
Income Amount	below N30,000	56	20.1
	N30000 – N150,000	153	55.0
	Above N150,000	69	24.8
	Total	**278**	**100.0**
Income Cycle	Monthly cycle	174	62.6
	Daily cycle	104	37.4
	Total	**278**	**100.0**

3.2 The Effect of Socio-demographic Variables on Livelihood Loss During the Lockdown Period

The analysis in Table 3 shows the effect of gender, age, neighbourhood of residence, occupation, income level and income cycle on the likelihood shows the effect of gender, age, neighbourhood of residence, occupation, income level and income cycle on the likelihood of loss of livelihood during the lockdown period. The overall model was statistically significant when compared to the null model (x^2 (18) = 74.11, P ≤ 0.05) and explained 32% of the variation in livelihood losses. (Nagelkerke's R^2) and correctly predicted 75.5% of the cases.

Table 3: Socio-demographic Variables influencing Livelihood loss during the COVID-19 lockdown

Socio-Demographic Variables	B	Wald	Sig.	Exp(B)
Gender				
Male	0.50	2.55	0.11	1.64
Female				
Age		5.22	0.07	
*Age (18 – 35 years)	1.89	5.09	0.02	6.600
Age (36 – 65 years)	1.35	3.20	0.07	3.846
Age (66 years and above)				
Neighbourhood		5.18	0.08	
(Uselu: Low-class neighbourhood)	-0.10	0.07	0.79	.903
*(Isihor: Middle-class neighbourhood)	-0.78	4.17	0.04	.461
(GRA, Benin: High-class neighbourhood)				
Occupation		16.13	0.10	
Occupation (Civil service)	-0.66	0.59	0.44	.518
Occupation (private firm employment)	-0.001	0.00	1.00	.999
*Occupation (Trading)	1.59	3.79	0.05	4.905
Occupation (Artisanry)	1.09	0.91	0.34	2.977
Occupation (Transport/ Courier service)	21.05	0.00	1.00	0.00
Occupation (Farming)	1.91	1.92	0.17	6.733
Occupation (Fishing)	20.74	0.00	1.00	0.00
Occupation (Clergy)	1.16	1.04	0.31	3.199
Occupation (schooling)	0.045	0.002	0.96	1.046
Occupation (unemployed)	0.70	0.41	0.52	2.009
Occupation (retired)				
Income amount	0.30	1.23	0.54	
Income (Below ₦30,000)	0.40	0.25	0.62	1.344
Income (₦30,000 – ₦150,000)	0.39	1.22	0.27	1.492
Income (Above ₦150,000)				
Income Cycle				
Income cycle (Monthly)	1.35	0.92	0.34	1.473
INCOME CYCLE (DAILY)				

*P ≤ 0.05 (two-tailed)

The variation in livelihood losses among all the socio-demographic categories of respondents was not significant (P ≥ 0.05), however, the odds ratio (Exp. B) reveals that the odds of livelihood loss were significantly 6.6 times (Exp. B = 6.6) higher for the respondents within the youthful age group (18 – 35 years), compared with respondents within the elderly age group (66 years and above). Location did not have a significant effect (P ≥ 0.05) on the variations of the lockdown impact among the respondents; however, the odds of livelihood loss for respondents living within the middle-class neighbourhood were significantly lower (as shown by the negative B value) than those living within the high-class neighbourhood (Exp. B = 0.46). This aligns with the findings by Bonaccorsi et al. (2020), which report that areas with higher fiscal capacity as a social indicator were more affected by mobility deprivation than areas with lower fiscal capacity. Low-class and middle-class neighbourhoods are characterised by high fiscal capacity due to the spread of many small-scale businesses, jobs and industry outlets, and less dependence on financial streamflow from a central administration or government. Occupants of low-class and middle-class neighbourhoods in developing countries are more fiscally independent of financial support from the government, compared to the occupants of high-class neighbourhoods, whose jobs and sources of livelihood are linked with the policies of the central government. In middle- and low-class neighbourhoods, there are many small businesses and small-scale industries that serve as an economic hub for financial survival at a micro level, despite the threat of economic depression at the national or regional level.

In terms of occupation, the odds of livelihood loss

among market and street traders were significantly 4.9 times higher than retirees (Exp. B = 4.9). According to Nyabeze and Chikoko (2021), the informal sector is particularly affected by lockdown measures because most informal sectors are based on low capital and daily returns, from which payments and household purchases are made. Market women and street traders belong to the informal market sector, which is why they are significantly more likely to lose their source of income compared with other occupational groups. The high chances of younger adults losing their sources of livelihood during lockdown are similarly reported by Li et al. (2023). The findings reveal that the younger age group (18-35 years) had higher odds of livelihood loss because members of such an age group are newer entrants into the workforce, and as such are at more risk of livelihood losses due to lack of experience, accumulated savings, and well-established investment ventures.

3.3 The Effect of Socio-demographic Variables on Access to Healthcare During the Lockdown Period

The results in Table 4 show the effect of gender, age, neighbourhood of residence, occupation, income level and income cycle on healthcare deprivation during the lockdown period. The overall model was statistically significant when compared to the null model (x^2 (18) = 47.79, P ≤ 0.05) and explained 21% of the variation in access to healthcare (Nagelkerke's R^2) and correctly predicted 69.1% of the cases.

Table 4: Socio-demographic Variables influencing Access to Healthcare during the Covid - 19 Lockdown

Socio-demographic Variables	B	Wald	Sig.	Exp(B)
Gender				
Male	-0.18	0.39	0.53	0.84
Female				
Age		2.94	0.23	
Youthful (18 – 35 years)	0.26	0.53	0.47	1.30
Middle age (36 – 65 years)	1.40	2.93	0.09	4.05
Elderly (60 and above)				
***Neighbourhood**		9.30	0.01	
*(Uselu: Low-class neighbourhood)	-1.01	8.27	0.004	0.36
*(Isihor: Middle-class neighbourhood)	-0.82	5.86	0.02	0.44
(GRA, Benin: High-class neighbourhood)				
Occupation		15.91	0.10	
Occupation (Civil service)	0.41	0.22	0.64	1.50
Occupation (private firm employment)	1.04	1.55	0.21	2.82
Occupation (Trading)	0.56	0.47	0.49	1.76
Occupation (Artisanry)	0.27	0.06	0.80	1.31
Occupation (Transport/ Courier service)	1.04	1.21	0.27	2.84
Occupation (Farming)	0.69	0.34	0.56	2.00
Occupation (Fishing)	23.72	0.00	1.00	0.00
Occupation (Clergy)	-0.14	0.02	0.90	0.87
*Occupation (schooling)	2.30	6.10	0.01	9.92
*Occupation (unemployed)	2.70	5.97	0.01	14.88
Occupation (retired)				
***Income amount**		12.09	0.002	
*Income (Below ₦30,000)	-1.99	11.54	0.001	0.14
*Income (₦30,000 – ₦150,000)	-0.88	6.16	0.01	0.41
Income (₦150,000 and above)				
Income Cycle				
Income cycle (Monthly)	0.14	0.14	0.71	1.15
Income cycle (Daily)				

$P \leq 0.05$ (two-tailed)

Among the socio-demographic categories of respondents, variation in access to healthcare was significant on the basis of neighbourhood of residence and income (P ≤ 0.05). The odds ratio reveals that the odds for residents in the low-class and middle-class neighbourhoods accessing healthcare were 0.36 and 0.44 times (Exp. B = 0.36 and 0.44) less likely than the residents living within the high-class neighbourhood. Also, the odds of accessing healthcare during the lockdown period among respondents with lower income ranges (below ₦30,000 and between ₦30,000 and ₦150,000) were 0.14 and 0.41 times (Exp. B = 0.14 and 0.41) less likely, compared with respondents who earned above ₦150,000. Occupation did not significantly affect the variation in access to healthcare (P ≥ 0.05). The odds of accessing healthcare among students and unemployed individuals

were 9.92 and 14.88 times higher (Exp. B = 9.92 and 14.88), compared with retirees. Studies by Siedner et al. (2020); Pujolar et al. (2022); Chinedu et al. (2025) similarly report that access to health care was reduced during the COVID-19 lockdown for reasons ranging from inadequate personnel and resources, fear of exposure to COVID-19 infection, non-affordability of health services, travel restrictions due to non-functioning transportation facilities, and security personnel violence.

3.4 Impact of Lockdown Measures on Family Life (Experience of Family Bonding)

The results in Table 5 show the effect of gender, age, neighbourhood of residence, occupation, income level, and income cycle on the experience of family bonding during the lockdown period. The overall model was statistically significant when compared to the null model (x^2 (18) = 42.39, P ≤ 0.05) and explained 23% of the variations in the experience of family bonding (Nagelkerke's R^2) and correctly predicted 82.7% of the cases.

Table 5: Socio-demographic Variables influencing Family Bonding during the Covid - 19 Lockdown

Socio-demographic Variables	B	Wald	Sig.	Exp(B)
Gender				
*Gender (Male)	1.11	8.17	0.004	3.04
Gender (Female)				
Age		2.28	0.32	
Youthful (18 – 35 years)	0.54	1.41	0.23	1.72
Middle age (36 – 65 years)	1.40	1.71	0.19	4.06
Elderly (60 and above)				
***Neighbourhood**		7.48	0.02	
*Uselu (Low-class neighbourhood)	1.16	7.15	0.01	3.17
Isihor (Middle-class neighbourhood)	0.67	2.43	0.12	1.96
GRA (High-class neighbourhood)				
Occupation		10.95	0.36	
Occupation (Civil service)	-1.34	1.46	0.23	0.26
Occupation (private firm employment)	-1.01	0.74	0.39	0.36
Occupation (Trading)	-0.27	0.03	0.86	0.76
Occupation (Artisanship)	-1.93	2.54	0.11	0.15
Occupation (Transport/ Courier service)	-1.28	0.77	0.38	0.28
Occupation (Farming)	18.74	0.00	1.00	0.00
*Occupation (Fishing)	-2.74	4.27	0.04	0.07
Occupation (Clergy)	-1.43	1.52	0.22	0.24
Occupation (schooling)	0.42	0.07	0.79	1.52
Occupation (unemployed)	-2.29	2.68	0.10	0.10
Occupation (Retired)				
Income amount		3.78	0.15	
Income (Below ₦30,000)	0.52	1.03	0.31	1.69
Income (₦30,000 – ₦150,000)	1.32	3.65	0.06	3.75
Income (₦150,000 and above)				
Income Cycle				
Income cycle (Monthly)	-0.14	0.09	0.76	0.87
Income cycle (Daily)				

$P \leq 0.05$ (two-tailed)

The results in Table 5 also revealed that the experience of family bonding varied significantly (p ≤ 0.05) between males and females, with males 3.04 times more likely to experience more family bonding compared with female family members (Exp. B = 3.04). Also, the experience of family bonding varied significantly among the neighbourhoods of the study, with the families in the low-class neighbourhood 3.17 times more likely to experience

increased family bonding compared with the high-class neighbourhood (Exp. B = 3.17). Among the various occupational groups, fishers were significantly less likely to experience greater family bonding during the lockdown, compared with the retired group. According to Biroli et al. (2021) and Gayatri and Puspitasari (2022), many families regarded the lockdown as an opportunity to foster companionship and build stronger bonds among family members while sharing resources and limited space. However, this sometimes led to conflicts among family members owing to the stress and anxiety of the constant display of negative behaviours by family members within a constraining space. The study by Salama et al. (2025) supports the finding that men experienced greater familial cohesion or satisfaction compared to women.

3.5 Impact of Lockdown Measures on Family Life (Experience of Domestic Violence)

The results in Table 6 show the effect of gender, age, neighbourhood of residence, occupation, income level and income cycle on the variations in the experience of increased domestic violence during the lockdown period. The overall model was statistically significant when compared to the null model (x^2 (18) = 58.75, P ≤ 0.05) and explained 28% of the variation in the experience of domestic violence within the family unit (Nagelkerke's R^2) and correctly predicted 77.7% of the cases.

Table 6: Socio-Demographic Variables Influencing the Experience of Domestic Violence during the COVID–19 Lockdown

Socio-demographic Variables	B	Wald	Sig.	Exp(B)
Gender				
Gender (Male)	-0.37	1.10	0.29	0.69
Gender (Female)				
Age		3.98	0.14	
*Youthful (18 – 35 years)	2.01	3.72	0.05	7.48
Middle age (36 – 65 years)	1.55	2.50	0.11	4.73
Elderly (60 and above)				
Neighbourhood		11.21	0.004	
*Uselu (Low-class neighbourhood)	1.22	6.80	0.009	3.38
*Isihor (Middle-class neighbourhood)	1.48	11.06	0.001	4.39
GRA (High-class neighbourhood)				
***Occupation**		19.56	0.03	
Occupation (Civil service)	-0.70	1.27	0.26	0.50
Occupation (private firm employment)	-0.23	0.11	0.74	0.80
Occupation (Trading)	-0.62	0.38	0.54	0.54
Occupation (Artisanry)	1.32	2.77	0.10	3.75
Occupation (Transport/ Courier service)	0.14	0.02	0.89	1.15
Occupation (Farming)	21.49	0.00	1.00	0.00
*Occupation (Fishing)	1.95	4.45	0.04	6.99
Occupation (Clergy)	-1.00	1.82	0.18	0.37
Occupation (schooling)	-0.43	0.20	0.66	.652
Occupation (unemployed)	0.44	0.19	0.67	1.55
Occupation (Retired)				
Income amount		0.14	0.94	
Income (Below ₦30,000)	0.08	0.02	0.90	1.09
Income (₦30,000 – ₦150,000)	0.16	0.12	0.73	1.17
Income (₦150,000 and above)				
Income Cycle				
Income cycle (Monthly)	-0.50	1.35	0.25	0.61
Income cycle (Daily)				

$P \leq 0.05$ (two-tailed)

The results in Table 6 reveal that neighbourhood and occupational groups significantly influenced the experience of domestic violence during the lockdown period (p ≤ 0.05). However, within the age groups, those between 18 and 35 years were significantly and 7.48 times more likely to experience domestic violence compared to

the elderly age group during the lockdown (Exp. B = 7.48). Residents of low-class and middle-class neighbourhoods were also 3.38 and 4.39 times more likely to experience domestic violence, respectively (Exp. B = 3.38 and 4.39). Fishers were also 7.0 times more likely to experience domestic violence during the lockdown period (Exp. B = 7.0). Biroli et al. (2021) and Gayatri and Puspitasari (2022) report that despite increased family interactions during the lockdown, worsening economic conditions, job losses, disruption in work patterns, reassignment of family chores, and poor mental health increase the incidence of quarrels and domestic violence within the family. It is noted that women and children are mostly at the receiving end (Sediri et al., 2020; McCrary & Sanga, 2021). Findings by Berniell and Facchini (2021) suggest that the frequency of reports of domestic violence corresponds with the intensity of the level of lockdown compliance.

3.6 Impact of Lockdown Measures on Neighbourhood Security

The results in Table 7 show the effect of gender, age, neighbourhood of residence, occupation, income level, and income cycle on the variations in the experience of increased insecurity during the lockdown period. The overall model was statistically significant when compared to the null model (x^2 (18) = 62.62, P ≤ 0.05) and explained 28% of the variation in the experience of insecurity within residential neighbourhoods (Nagelkerke's R^2) and correctly predicted 69.4% of the cases.

Table 7: Socio-Demographic Variables Influencing the Experience of Insecurity during the COVID–19 Lockdown

Socio-demographic Variables	B	Wald	Sig.	Exp(B)
*Gender (Male)	0.65	4.54	0.03	1.92
Gender (Female)				
Age		0.89	0.64	
Youthful (18 – 35 years)	-0.36	0.89	0.35	0.70
Middle age (36 – 65 years)	20.84	0.00	0.10	0.00
Elderly (60 and above)				
***Neighbourhood**		11.59	0.003	
*Uselu (Low-class neighbourhood)	-1.18	10.62	0.001	0.31
Isihor (Middle-class neighbourhood)	-0.39	1.04	0.31	0.68
GRA (High-class neighbourhood)				
Occupation		14.83	0.14	
Occupation (Civil service)	21.11	0.00	0.99	0.00
Occupation (private firm employment)	21.82	0.00	0.99	0.00
Occupation (Trading)	22.38	0.00	0.99	0.00
Occupation (Artisanry)	21.81	0.00	0.99	0.00
Occupation (Transport/ Courier service)	23.59	0.00	0.99	0.00
Occupation (Farming)	22.90	0.00	0.99	0.00
Occupation (Fishing)	43.00	0.00	0.99	0.00
Occupation (Clergy)	20.16	0.00	0.99	0.00
Occupation (schooling)	21.32	0.00	0.99	0.00
Occupation (unemployed)	42.54	0.00	0.99	0.00
Occupation (Retired)				
Income amount		0.98	0.61	
Income (Below ₦30,000)	0.28	0.24	0.63	1.32
Income (₦30,000 – ₦150,000)	-0.16	0.18	0.67	0.86
Income (₦150,000 and above)				
Income Cycle				
Income cycle (Monthly)	-1.405	11.18	0.001	0.25
Income cycle (Daily)				

**P ≤ 0.05 (two-tailed)*

Within groups, the model shows that males were significantly 1.92 times more likely than females to experience insecurity (Exp. B = 1.92). Among neighbourhoods, the residents in the low-class neighbourhoods were significantly less likely to experience insecurity compared to high-class neighbourhoods (Exp. B = 0.31). This may be because high-class neighbourhoods are often targeted by impoverished deviants from middle- and low- class neighbourhoods. Within the 'income cycle' group, those who earned

income monthly through salary payments from their employers were significantly less likely to experience insecurity during the lockdown period (Exp. B = 0.25). This is because respondents in the informal sector, who relied on daily returns from business outings, were more vulnerable to attacks or harassment by either hooligans or security agencies. Findings by Akanmu et al. (2021) indicate that insecurity was significantly higher during the COVID-19 lockdown, driven by poverty, poor governance and planning, and idleness.

3.7 Qualitative Findings on alternative measures for managing epidemics and lockdown Policies in developing countries

The results from the qualitative data provided suggestions from healthcare professionals on strategies for a better outcome in the handling of disease outbreaks in the future. Medical professionals in a tertiary health institution were interviewed, and their responses suggested that pandemics have been recurrent over time, which were either regional or global in spread. Over time, measures adopted to cope with pandemics were adjudged to reflect the rate and scale of spatial spread of the epidemic, the populations at risk, socio-economic impact, virulence, the urgency required, and the availability of vaccines and specialised healthcare workers (Kawashima et al., 2016; Mohammadpour et al., 2021). The healthcare workers interviewed suggest the need for adopting strategies reflecting the socio-economic and demographic peculiarities of the Nigerian State. The strategies suggested include the need for the recruitment and training of health professionals in the health sector. Virologists and epidemiologists are professionals in high demand. Remuneration should be reviewed to discourage the high rate of career flight among health workers.

The study also suggests the need for constant monitoring. According to the respondents, "Clusters of new variants have been revealed during and even after the Covid-19 lockdown period at various locations, some of which had higher transmission rates". The Nigeria Centre for Disease Control (NCDC) provided daily data on COVID-19 infection rates during the epidemic. In collaboration with the various State Centres for Disease Control, regular and efficient testing and reporting processes are necessary to monitor a virus that is continuously evolving, so that if an outbreak occurs or a novel variant emerges, it can be swiftly reported to the National Centre. State Centres should be equipped with test kits, laboratories, and access to a reliable national database on infectious diseases. In the event of a disease outbreak, there should be a prompt response beginning with a timely alarm, activation of a pandemic preparedness plan, and an effective time management process. Health care workers should be trained to exhibit professionalism and to take immediate steps to stop the spread of a pandemic through quarantine procedures.

There is a need for the Nigerian Government and its foreign partners to prioritise a National Preparedness Plan, which should align with the global plan in the event of a Disease outbreak. "Such a plan should include the procedures for executing the three essential components (prevention, detection and response) of the plan". The Nigerian Government, through the NCDC Task Force and the Nigeria Immigration Service (NIS), should adopt a proactive approach by shutting down (completely or partially, as the circumstances demand) the national borders at the onset of a pandemic.

Health care professionals have also observed the need to build trust in the national health care system. Trust can be built when health care directives or advice are supported by publicly available evidence. Standard vaccination, which should include COVID-19 vaccines, should be easily accessible for people of all social classes. The availability, location, and schedule of vaccine administration should be publicised through mass and social media. Appropriate logistics in the form of an efficient transportation system are necessary. In rural areas, mobile clinics should be used to expand the coverage areas during vaccination. Equipment, such as coolers and fridges, is also required for preserving vaccines in the right condition for use.

Lastly, interviewees identified the need for more funding in the health sector. The emigration of health workers to developed countries, with more competitive salaries, has left a wide and unfilled gap in health institutions. There is a need to train intended and current health workers and improve their remuneration. Equipment, working tools, sterilisers, reagents, and protective kits should be available in health facilities to enhance performance. Health workers should be protected in the course of their duty by providing them with gloves and face masks to reduce the risk of infection. Quarantine units should be built at secondary and tertiary health facilities to reduce the risk of disease spread.

4 Conclusion

The adoption of the lockdown measure by the Nigerian Government in 2020 was done with the good intention of curtailing the spread of COVID-19. However, this came at a socio-economic cost, which inflicted more harm and affected most people in developing countries. On the basis of livelihood losses, the results reveal that mostly youths (18-35 years) and persons living in high-class neighbourhoods were at greater risk of livelihood loss. Persons earning lower incomes (less than N150,000) and those living in middle- and low-class neighbourhoods likely had less access to health care owing to its unaffordability. In terms of family life and relationships,

males in low-class neighbourhoods reported experiencing more family bonding and familial satisfaction compared to females. The younger age groups (18-35 years) living in low- and middle-class neighbourhoods were more likely to experience domestic violence compared to other age groups and those in the high-class neighbourhoods. Lastly, males in the high-class neighbourhood and those with a daily income cycle tended to be more vulnerable to insecurity compared to other groups. The qualitative findings of the study provide an alternative pathway to the lockdown strategy towards addressing pandemics, by adopting a preventive approach and developing a national preparedness plan in case of a recurrence of a disease outbreak. Further studies on the impact of the lockdown strategy on screen time and delinquent behaviours of children are recommended.

References

Adam, A. M. (2020). Sample size determination in survey research. Journal of Scientific Research and Reports, 26(5), 90–97. https://doi.org/10.9734/JSRR/2020/v26i530263

Akanmu, A. A., Salisu, U. O., Daramola, O. P., Ogunsesan, A. S., Fasina, S. O., Adejare, J. A., & Olatunji, O. M. (2021). The COVID-19 pandemic and insecurity: The furiousness in Nigerian communities. Urban, Planning and Transport Research, 9(1), 368–406. https://doi.org/10.1080/21650020.2021.1946420

Berniell, I., & Facchini, G. (2021). COVID-19 lockdown and domestic violence: Evidence from internet-search behavior in 11 countries. European Economic Review, 136, Article 103775. https://doi.org/10.1016/j.euroecorev.2021.103775

Biroli, P., Bosworth, S., Della Giusta, M., Di Girolamo, A., Jaworska, S., & Vollen, J. (2021). Family life in lockdown. Frontiers in Psychology, 12, Article 687570. https://doi.org/10.3389/fpsyg.2021.687570

Bonaccorsi, G., Pierri, F., Cinelli, M., Flori, A., Galeazzi, A., Porcelli, F., Schmidt, A. L., Valensise, C. M., Scala, A., Quattrociocchi, W., & Pammolli, F. (2020). Economic and social consequences of human mobility restrictions under COVID-19. Proceedings of the National Academy of Sciences, 117(27), 15530–15535. https://doi.org/10.1073/pnas.2007658117

Centre for Disease Control. (2020). COVID-19 dashboard. Africa CDC. https://africacdc.org/covid-19/

Chinedu, H. N., Asadu, N., Ogochukwu, E. C., & Agboti, C. I. (2025). COVID-19 lockdown and access to health services among people with mental health problems in Nigeria. Journal of Forensic Psychology Research and Practice, 25(4), 805–825. https://doi.org/10.1080/24732850.2024.2366947

Crenshaw, K. (1989). Demarginalizing the intersection of race and sex: A Black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. University of Chicago Legal Forum, 1989(1), 139–167. https://chicagounbound.uchicago.edu/uclf/vol1989/iss1/8

Crossley, G. (2020, January 23). Wuhan lockdown 'unprecedented', shows commitment to contain virus: WHO representative in China. Reuters. https://www.reuters.com/article/us-china-health-who/wuhan-lockdown-unprecedented-shows-commitment-to-contain-virus-who-representative-in-china-idUSKBN1ZM1G9

Egharevba, J. O., & Iyobosa, W. (2020). Effect of Coronavirus (Covid-19) pandemic on the socio-economic activities of residents in Egor Local Government Area, Edo State, Nigeria. Maiduguri Journal of Arts and Social Sciences, 20, 16–28.

Ekhaese, E. N. (2024). Go-ahead element of domestic architecture: Socioeconomic and cultural characteristics of the residents in Benin. Journal of Civil Engineering and Architecture, 18, 296–310. https://doi.org/10.17265/1934-7359/2024.06.005

Figueiredo, A. M., Codina, A. D., Figueiredo, D., Sáez, M., & León, A. C. (2020). Impact of lockdown on COVID-19 incidence and mortality in China: An interrupted time series study. Bulletin of the World Health Organization. https://doi.org/10.2471/blt.20.256701

Gayatri, M., & Puspitasari, M. D. (2022). The impact of COVID-19 pandemic on family well-being: A literature review. The Family Journal, 31(3), 441–448. https://doi.org/10.1177/10664807221131006

Kawashima, K., Matsumoto, T., & Akashi, H. (2016). Disease outbreaks: Critical biological factors and control strategies. In Y. Yamagata & H. Maruyama (Eds.), Urban resilience: A transformative approach (pp. 173–204). Springer. https://doi.org/10.1007/978-3-319-39812-9_10

Kharroubi, S., & Saleh, F. (2020). Are lockdown measures effective against COVID-19? Frontiers in Public Health, 8, Article 549692. https://doi.org/10.3389/fpubh.2020.549692

Lau, H., Khosrawipour, V., Kocbach, P., Mikolajczyk, A., Schubert, J., Bania, J., & Khosrawipour, T. (2020). The positive impact of the lockdown in Wuhan on containing the COVID-19 outbreak in China. Journal of Travel Medicine, 27(3), Article taaa037. https://doi.org/10.1093/jtm/taaa037

Le Quéré, C., Jackson, R. B., Jones, M. W., Smith, A. J., Abernethy, S., Andrew, R. M., De-Gol, A. J., Willis, D. R., Shan, Y., Canadell, J. G., Friedlingstein, P., Creutzig, F., & Peters, G. P. (2020). Temporary reduction in daily global CO2 emissions during the COVID-19 forced confinement. Nature Climate Change, 10(7), 647–653. https://doi.org/10.1038/s41558-020-0797-x

Li, L., Serido, J., Vosylis, R., Sorgente, A., Lep, Ž., Zhang, Y., Fonseca, G., Crespo, C., Relvas, A. P., Zupančič, M., & Lanz, M. (2023). Employment disruption and wellbeing among young adults: A cross-national study of perceived impact of the COVID-19 lockdown. Journal of Happiness Studies, 24(3), 991–1014. https://doi.org/10.1007/s10902-023-00629-3

Lima, A., De Domenico, M., Pejovic, V., & Musolesi, M. (2015). Disease containment strategies based on mobility and information dissemination. Scientific Reports, 5, Article 10650. https://doi.org/10.1038/srep10650

Macrotrends. (2022). Benin City, Nigeria metro area population 1950–2022. https://www.macrotrends.net/cities/21981/benin-city/population

McCrary, J., & Sanga, S. (2021). The impact of the coronavirus lockdown on domestic violence. American Law and Economics Review, 23(1), 137–163. https://doi.org/10.1093/aler/ahab003

Mohammadpour, M., Zarifinezhad, E., Ghanbarzadegan, A., Naderimanesh, K., Shaarbafchizadeh, N., & Bastani, P. (2021). Main factors affecting the readiness and responsiveness of healthcare systems during epidemic crises: A scoping review on cases of SARS, MERS, and COVID-19. Iranian Journal of Medical Sciences, 46(2), 81–92. https://doi.org/10.30476/ijms.2020.87608.1801

Musoke, D., Nalinya, S., Lubega, G. B., Deane, K., Ekirapa-Kiracho, E., & McCoy, D. (2024). The impact of the COVID-19 lockdown on social and economic welfare in Uganda. Archives of Public Health, 82, Article 117. https://doi.org/10.1186/s13690-024-01337-x

Mulugeta, T., Tadesse, E., Shegute, T., & Desta, T. T. (2021). COVID-19: Socio-economic impacts and challenges in the working group. Heliyon, 7(6), Article e07307. https://doi.org/10.1016/j.heliyon.2021.e07307

Naseer, S., Khalid, S., Parveen, S., Abbass, K., Song, H., & Achim, M. V. (2023). COVID-19 outbreak: Impact on global economy. Frontiers in Public Health, 10, Article 1009393. https://doi.org/10.3389/fpubh.2022.1009393

Ngonghala, C. N., Iboi, E. A., & Gumel, A. B. (2020). Could masks curtail the post-lockdown resurgence of COVID-19 in the US? Mathematical Biosciences, 329, Article 108452. https://doi.org/10.1016/j.mbs.2020.108452

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. International Journal of Surgery, 78, 185–193. https://doi.org/10.1016/j.ijsu.2020.04.018

Nigeria Centre for Disease Control (NCDC). (2020). COVID-19 situation report – 82 (Vol. 205). https://ncdc.gov.ng/themes/common/files/sitreps/87e68bc490200d45226442bdbd0d228d.pdf

Nyabeze, K., & Chikoko, W. (2021). Socio-economic impact of COVID-19 lockdown measures on the informal sector livelihoods in Zimbabwe. African Journal of Social Work, 11(4), 226–234. https://www.ajol.info/index.php/ajsw/article/view/215263

Otchia, C. S. (2026). The unintended consequence of COVID-19 containment measures in Africa: A double machine learning perspective. Scientific African, 31, Article e03273. https://doi.org/10.1016/j.sciaf.2026.e03273

Pujolar, G., Oliver-Anglès, A., Vargas, I., & Vázquez, M. L. (2022). Changes in access to health services during the COVID-19 pandemic: A scoping review. International Journal of Environmental Research and Public Health, 19(3), Article 1749. https://doi.org/10.3390/ijerph19031749

Ronaghi, M., & Scorsone, E. (2023). The impact of COVID-19 outbreak on CO2 emissions in the ten countries with the highest carbon dioxide emissions. Journal of Environmental and Public Health, 2023, Article 4605206. https://doi.org/10.1155/2023/4605206

Salama, R. A. A., Abd El-Kader, R. G., Tadross, T. M., & Elsalous, S. H. (2025). Assessment of the effect of the COVID-19 pandemic on levels of satisfaction in marital relationships during and post-lockdown. International Journal of Africa Nursing Sciences, 22, Article 100831. https://doi.org/10.1016/j.ijans.2025.100831

Sediri, S., Zgueb, Y., Ouanes, S., Ouali, U., Bourgou, S., Jomli, R., & Nacef, F. (2020). Women's mental health: Acute impact of COVID-19 pandemic on domestic violence. Archives of Women's Mental Health, 23(6), 749–756. https://doi.org/10.1007/s00737-020-01082-4

Siedner, M. J., Kraemer, J. D., Meyer, M. J., Harling, G., Mngomezulu, T., Gabela, P., Dlamini, S., Gareta, D., Majozi, N., Ngwenya, N., Seeley, J., Wong, E., Iwuji, C., Shahmanesh, M., Hanekom, W., & Herbst, K. (2020). Access to primary healthcare during lockdown measures for COVID-19 in rural South Africa: An interrupted time-series analysis. BMJ Open, 10(10), Article e043763. https://doi.org/10.1136/bmjopen-2020-043763

World Health Organization. (2020). COVID-19 strategy update (April 2020). https://www.who.int/publications/i/item/covid-19-strategy-update---14-april-2020

Worldometer. (2020). COVID-19 coronavirus pandemic. https://www.worldometers.info/coronavirus/