Engineering and Technology Journal e-ISSN: 2456-3358

Volume 09 Issue 06 June-2024, Page No.- 4303-4309

DOI: 10.47191/etj/v9i06.18, I.F. – 8.227

Covid-19 Review: A Trend Analysis of the Impact of Religious Festivities and Non-Adherence to Social Distancing in Nigeria

Ukekwe Emmanuel Chukwudi[1], Bande Ponsak Steven[2], Agbo Jonathan Chukwunweike[3]

[1,2,3] Department of Computer Science, University of Nigeria, Nsukka

ABSTRACT: The global negative impact of Covid-19 pandemic necessitates curtailing measures and policies in case of future outbreak. A trend analysis of the spread of Covid-19 showing the effect of social gatherings especially during religious festivals was done. Covid-19 monthly spread and associated weather data from Nigerian Centre for Disease Control (NCDC) for the period of March 2020 to April 2022 was used to study the spread trend during religious festivities. The trend analysis revealed a significant spread increase for four of the geopolitical zones at r = 0.023, 0.000, 0.000, 0.000 respectively during religious festivals. A consistent increase in the spread of the disease during religious festivals across the six zones and a downward trend immediately after the festivities. A *t* test value of -29.027 was significant at *p*-value of 0.000 confirming that the change in spread trend during festivals was not a chance occurrence.

KEYWORDS: Spread, Covid-19, social distancing, festivities, trend, plot

1 INTRODUCTION

Although Covid-19 threat has reduced and the safety measures relaxed to an extent, the ravaging effect during the first wave cannot be easily dismissed. The spread of the disease has been attributed to overcrowding and non adherence to social distancing (LUMC-COVID-19 Research Group et al., 2020; Seidlein et al., 2021). Those living in houses with poor facilities and overcrowded living quarters seem to be worst hit by the disease (Khansa et al., 2020). According to statistics, Nigeria is estimated to be the most populace country in Africa with approximately 206,139, 587 people in 2020 (The World Bank Group, 2022). The deplorable living conditions of many in the country suggest that areas of denser population may likely be affected most during a viral outbreak. Most Nigerians cannot afford better living and housing conditions. The National Bureau of Statistics in a press release in November 17, 2022, reports that 133 million Nigerians are living in poverty. As a matter of fact, the reported figure exceeds the World Bank's projection for Nigeria in 2022. The effect of poverty in Nigeria is seen in the percentage of rural to urban migration (Omonigho & Zacheus, 2015; Akinyode & Oluwafolakemi, 2017). The urban areas are congested and people are wont to live in overcrowded rooms so as to remain in urban areas where they have more chances of eking a livelihood. The population of more developed cities such as Enugu, Kano, Bauchi, Port Harcourt, Abuja and Lagos continue to increase due to the daily migration to such places. The level of congestion in these cities hinders social distancing.

It is also worrisome that despite the congestion in most cities, Covid-19 test centres are not evenly distributed to balance the congestion. Without test centres, early detection of the disease is practically impossible. Unfortunately, due to the overwhelming surge of the pandemic, test centres were erected in a hurry and government did not take into cognizance the social distancing requirement nor the population density challenges in citing the centres across the respective cities and states

In addition to population challenges, social life style of Nigerians is another worrisome factor that may trigger Covid-19 spread. A major social life peculiar to Nigerians is adherence to religion. Nigerians are known to be very religious people with Islam and Christianity dominating. Due to the religious nature of Nigerians, religious festivals are celebrated with style. People are usually seen in crowded groups either in churches or mosques for prayers in accordance to these annual festivals. Festivals such as Easter, Eid al-Fitr, Eid ul-Adha, Christmas and New year are observed annually and people gather to celebrate them despite global warnings of social distancing. Consequently, the major cities are the worst hit. According to Nigeria's centre for disease control (NCDC), report as at May 2022, cities such as Kano, Lagos, Abuja, Port Harcourt which are more populated than others are the worst hit in the spread of Covid-19. The first confirmed case of Corona virus in Nigeria was reported on February 27, 2020 (UNDP, 2020). Since then, the disease had continued to spread. World health organization (WHO) advocates social distancing, Ebere et al (2020) appeal for social distancing adherence, Keisha et al (2020) advocate for reduced social mixing to curtail the spread of the disease while Piwat et al (2020) emphasize on

the positive effect of social distancing and quarantine on the pandemic. Despite these cautions, people remain aloof concerning the implications of non adherence to social distancing and social gatherings.

The frenzy in the celebration of religious festivals is rooted in strong adherence to religious belief. During Christmas for example, Christians celebrate it as a day of incarnation and a major aspect of their faith (Billy, 2018). The National Liturgy Office (2006) sees it as a period of feasting, Kurt (2015) sees Christmas as the day of birth of Jesus Christ which should be celebrated. It has also been revealed that there is an upward trend in stock market during Muslim festivities showing that people are in merry mood and therefore are inclined to spend more (Harit, 2017). Whittaker et al (2009) see Eid al-Fitr as a major holiday for schools to observe and celebrate. Hence, the mindset is focused on celebrating these festivials rather than adhering to global warning on social distancing.

Despite the fact that religious festivities have so much relevance and significance in the life of Nigerians, the implication may be far worse considering the rate at which the pandemic rapidly spread without control. The National Health Commission of China reported that the disease was spreading at an average rate of more than 3,000 newly confirmed cases per day (Ben, 2020). World Health Organization (2020) scientific brief enunciates that the pandemic is fast spreading due to its mode of transmission and that the only thing that can break the transmission chain is by social distancing. The fact that the disease is airborne makes the transmission faster (Renyi, 2020). When people are in confined spaces and a distance of less than 1 meter between each other, coughs and sneezes are a sure way of transmitting the disease. Hence, social distancing should be encouraged.

Most of the previous researches on social distancing mainly focus on curtailing measures (Seidlein et al., 2021; Ebere, et al., 2020; Kayode et al., 2021; Joel et al, 2009), however there is need to use a typical instance of social gathering to establish the direct effect of non adherence to social distancing on Covid-19 spread. In this paper therefore, we shall use a typical instance of social gatherings during religious festivities to examine the direct effect of social distancing on Covid-19 spread.

The purpose of this research therefore is to propose an advisory approach that curtails Covid-19 spread in Nigeria based on previous experience. The research objective is therefore to investigate the effect of non adherence to social distancing during religious festivities in Nigeria.

2. METHODS

2.1 Data Collection

Covid-19 monthly data as well as test centre distribution across the country were extracted from Nigerian Centre for Disease Control ([1]NCDC) for the period between March 2020 to September 2022. Population data is based on the 2019 population projection by National Bureau of Statistics ([2]NBS). Extracted data were summarised under the six geopolitical zones of Nigeria as shown in Table 1.

Table 1: Nigerian Geopolitical Zones and State representation

S/no	Zone	State
1	South West	**Lagos**, Oyo, Ekiti, Osun, Ondo, Ogun
2	South East	**Enugu**, , Imo, Ebonyi, Abia and Anambra
3	South South	**Rivers**, Bayelsa, Akwa Ibom, Edo, Cross River and Delta
4	North Central	**Abuja,** Niger, Kogi, Benue, Plateau, Nasarawa and Kwara
5	North East	**Bauchi,** Borno, Taraba, Adamawa, Gombe and Yobe
6	North West	**Kano,** Zamfara, Sokoto, Kaduna, Kebbi, Katsina, Kano and Jigawa

2.2. Method of Data Analysis

During religious festivities, caution is thrown aside as people gather to celebrate their faith and belief despite the congestion. Popular religious festivals in Nigeria considered in the work are shown in Table 2

Table 2: Popular Religious Festivals in Nigeria

S/No	Festival	Occasion
1	Easter	Death and resurrection of Jesus Christ
2	Eid al-Fitr	Commemorates the end of the holy month of Ramadan
3	Eid ul-Adha	Remembers the prophet Ibrahim's willingness to sacrifice his son when God ordered him to
4	Christmas	Birth of Jesus Christ
5	New Year	New beginning

Religious festivals are annual events and their impact are cumulative. and constitute a finite set Hence, we shall denote religious festivals as a set given as:

[1] https://ncdc.gov.ng/diseases/sitreps/?cat=14&name=An%20update%20of%20COVID

[2] https://covidtestingcentres.ncdc.gov.ng/all_centers

$$R_f = \{f_1, f_2, f_3, \ldots . f_n\} \quad (1)$$

To ascertain the effect of religious festivals on Covid-19 spread, we shall be making use of descriptive statistics and graph trend. Graphs are known to present complex data concisely and precisely. They are also known to transform raw data into information when appropriately applied. Hence, the purpose of a graph is to present data that are too numerous or complicated to be described adequately in the text and in less space. Graphs simply condense very large amount of data and present it in an easier and readable format to the audience. In addition, graphs are well suited for identifying patterns in data and they present results in formats that clearly and effectively communicate important points. (Alacac et al, 2011; Bowen & Roth, 2005; Monteiro & Ainley, 2004). In this study, a line graph shall be used to illustrate the rise and fall of Covid-19 spread during the religious festivities. To test whether the sudden change in spread is significant or not, a one sample t-test shall be deployed.

The one sample t test is a statistical test that compares the mean of a sample data to a known value. In other words, the one sample t test ascertains whether a given population differs from a fixed value. In our case, we shall use the one sample t test to determine if the mean of recorded spread during religious festivals differ from a known mean when there is no religious festival

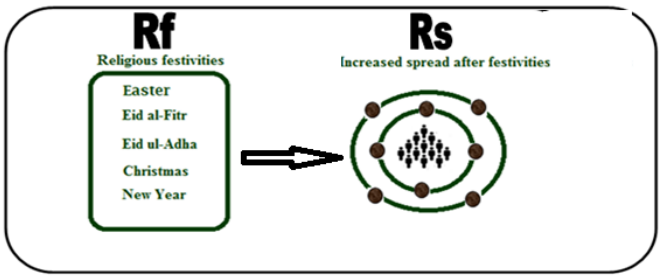

Figure 1: Relationship between Covid-19 spread, religious festivals and population density

3. DATA ANALYSIS

The analysis will be aimed at establishing a relationship between religious festivals on and rate of spread.

3.1 Establishing a relationship between religious festivals (R_f) and rate of spread (R_s)

A sample of six states (Lagos, Port Harcourt, Abuja, Enugu, Kano and Bauchi) were selected from each of the six geopolitical zones in the country.

The number of newly confirmed cases for each month from March 2020 to September 2022 were extracted. A total of 31 observations were recorded for each zone giving rise to 186 observations for the 6 zones as shown in Table 3.

Table 3: Covid-19 data on the six geopolitical zones from March 2020 to September 2022

Month	Lagos (South-West)	Enugu (South-East)	Rivers (South-South)	FCT (North-Central)	Bauchi (North-East)	Kano (North-West)
MAR, 2020	82	2	1	28	2	0
APRIL, 2020	975	3	13	178	38	218
MAY, 2020	3968	15	193	482	200	735
JUNE, 2020	5567	243	848	1210	265	262
JULY, 2020	4611	546	737	1933	57	380
AUG, 2020	3017	355	350	1366	107	131
SEP, 2020	1323	127	291	540	32	10
OCT, 2020	1826	25	399	409	14	10
NOV, 2020	1951	18	154	652	57	48
DEC, 2020	8083	68	587	5313	250	529
JAN, 2021	20364	429	2187	5741	144	990
FEB, 2021	4788	327	921	1526	110	530
MAR, 2021	1317	99	262	308	257	69
APRIL, 2021	743	165	190	151	18	54
MAY, 2021	662	44	139	63	0	31
JUNE, 2021	607	0	63	26	0	7
JULY, 2021	6349	26	642	190	4	26
AUG, 2021	6294	66	2193	446	0	13
SEP, 2021	4080	126	1798	1189	59	127
OCT, 2021	1283	79	728	1538	91	183
NOV, 2021	355	29	216	236	99	75
DEC, 2021	13965	100	1350	3413	49	199

JAN, 2022	6238	62	2161	1277	85	291
FEB, 2022	503	0	133	168	3	46
MAR, 2022	284	0	78	252	0	17
APRIL, 2022	187	0	34	45	19	4
MAY, 2022	244	0	35	37	16	77
JUNE,2022	1327	0	135	91	1	30
JULY,2022	1598	0	555	235	0	44
AUG,2022	744	0	374	172	19	48
SEP,2022	678	0	207	168	0	148

Similarly, the religious festivals that took place within the period under study were tabulated as shown in Table 4.

Table 4: Religious festivities in Nigeria with date

S/No	Festival	2020 Date	2021 Date	2022 Date
1	Easter	12 Apr 2020	4 Apr 2021	17 Apr 2022
2	Eid al-Fitr	23–24 May 2020	12–13 May 2021	1st – 2nd May 2022
3	Eid ul-Adha	29–31 Jul 2020	19–21 Jul 2021	8th - 9th July, 2022
4	Christmas	25 Dec 2020	25 Dec 2021	Not applicable
5	New Year	1 Jan 2020	1 Jan 2021	Not applicable

Data were also extracted on these specific religious festivity periods across the zones based on the month they occurred. A total of 78 observations were recorded with 13 coming from each zone as shown in Table 5.

Table 5: Religious festive periods with accompanying spread

S/No	Festival	Date	Spread	Spread	Spread	Spread	Spread	Spread
			Lagos	Enugu	Rivers	FCT	Bauchi	Kano
1	Easter	Apr 2020	975	3	13	178	38	218
2	Eid al-Fitr	May 2020	3968	15	193	482	200	735
3	Eid ul-Adha	Jul 2020	4611	546	737	1933	57	380
4	Christmas	Dec 2020	8083	68	587	5313	250	529
5	New Year	Jan 2021	20364	429	2187	5741	144	990
6	Easter	Apr 2021	743	165	190	151	18	54
7	Eid al-Fitr	May 2021	662	44	139	63	0	31
8	Eid ul-Adha	Jul 2021	6349	26	642	190	4	26
9	Christmas	Dec 2021	13965	100	1350	3413	49	199
10	New Year	Jan 2021	6238	62	2161	1277	85	291
11	Easter	April 2022	187	0	34	45	19	4
12	Eid al-Fitr	May 2022	244	0	35	37	16	77
13	Eid ul-Adha	July, 2022	1598	0	555	235	0	44

Subsequently, using the data on Tables 4 and 5, a plot of Covid-19 spread during the festive and non festive periods was done.

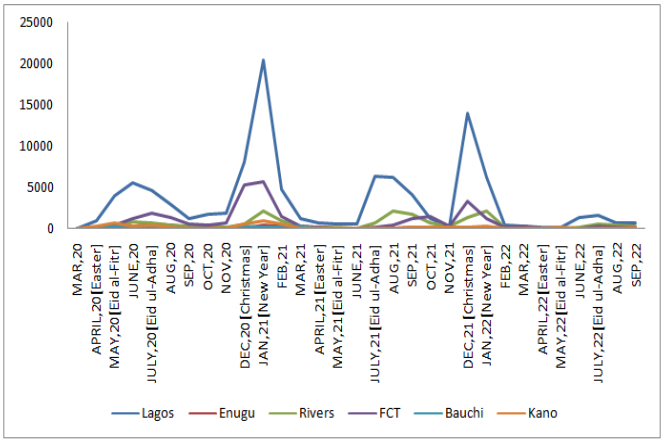

Figure 2: Covid-19 Trend from March, 2020 to September, 2022

From Figure 2, Lagos state peaked more than other states at 20,365 confirmed cases while Enugu state had the least peak at 546 confirmed cases. A closer look at the six states shows an almost perfect trend in the plot. For instance, the trend began to rise for all the states at the same time from April 2020 during Easter festivity period, and peaking at June/July 2020 during Eid ul-Adha. After August 2020 when there were no festivals, the trend began to fall for all the states. It maintained an almost flat trend till late November when it began to rise again for all of them during Christmas and New Year festivities. Between the periods of November 2020 to January 2021, the trend attained its highest peak for the six states. Once again, the trend tilted down just after January 2021. It remains down till early June 2021 when it appears to rise again. This unique trend tend to repeat itself again in 2022 only that the rate of spread of the disease seem to have remarkably reduced. A striking thing about the trend is that there is a uniform trend peculiar to the states. If the trend goes up at specific period, it does so for all the states and vice versa.

From the plot in Figure 2, it is evident that the spread of the disease peaks during religious festivities. Hence, to find out if the sudden increase of the disease spread during religious festivities is significant or not, the one sample *t* test was carried out for that purpose.

The mean spread of Covid-19 in Nigeria across the geopolitical zones and for the period under study was computed from Table 5 to give $\bar{x} = 869.0968$. Hence, using the test population mean value of 8.69.0968 and the sample data in Table 7, the one sample t test for each of the zones was computed as shown in Table 8.

Table 6: One Sample *t* Test

		Test Value = 869.096774193548					
						95% Confidence Interval of the Difference	
state		t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Lagos	Spread	2.596	12	.023	4360.67246	700.2016	8021.1433
Enugu	Spread	-15.602	12	.000	-756.94293	-862.6477	-651.2382
Rivers	**Spread**	**-.899**	**12**	**.386**	**-190.40447**	**-651.6262**	**270.8172**
FCT	**Spread**	**1.048**	**12**	**.315**	**596.90323**	**-644.5901**	**1838.3965**
Bauchi	Spread	-35.625	12	.000	-801.40447	-850.4178	-752.3912
Kano	Spread	-6.935	12	.000	-593.86600	-780.4509	-407.2811

From Table 6, it is obvious that 4 of the geopolitical zones (Lagos, Enugu, Bauchi and Kano) had their p value < 0.05 while 2 of the geopolitical zones (Rivers and FCT) had their p value > 0.05.. In summary, findings reveal a consistent increase in spread during every religious festival across the geopolitical zones. However, only four of the zones (Lagos, Enugu, Bauchi and Kano) had their increase being significant at p = 0.023, 0.000, 0.000 and 0.000 respectively when tested with a one sample t test.

4. DISCUSSION ON FINDINGS

Based on the findings, it is obvious that social gatherings especially during religious festivities contribute so much to the spread of Covid 19 disease this is evident in the recorded high peaks during such period. The findings coincidentally are consistent with previous work on social distancing. (Andre et al, 2021; Nande et al, 2021; Qian et al, 2020; Xutong et al, 2020).

5. IMPLICATION OF THE FINDINGS

Based on the results, it is evidently clear that Social gatherings in Nigeria especially during religious festivities is a catalyst to the spread of Covid 19 disease. What this means is that should there be another wave, the federal government should do a lot more in promoting social distancing as there

doesn't seem to be enough awareness on the issue to educate the masses. Religious bodies should adapt measures that curtails social gathering during religious festivities.

6. CONCLUSION

In this study, an investigation was carried out to ascertain the effect of social distancing especially through religious festivities on Covid 19 spread. Findings reveal that indeed, gatherings during religious festivities directly increase the spread of Covid 19. It is believed that the findings of this paper shall influence government policies in Covid 19 management should there be another wave in the country.

REFERENCES

1. Alacacı, C., Lewis, S., O'Brien, G. E., & Jiang, Z. (2011). Pre-Service elementary teachers understandins of graphs. Eurasia Journal of Mathematics, Science & Technology Education, 7(1), 3-14
2. André Souza Melo, Ana Iza Gomes Penha Sobral, Marcelo Luiz Monteiro Marinho, Gisleia Benini Duarte, Amanda Aires Vieira and Marcos Felipe Falcão Sobral (2021). The impact of social distancing on COVID-19 infections and deaths. *Trop Dis Travel Med Vaccines* **7**, 12. https://doi.org/10.1186/s40794-021-00137-3
3. Akinyode Babatunde Femi and Oluwafolakemi Emilia Martins (2017), Effects of Poverty on Urban Residents' Living and Housing Conditions in Nigeria. Journal of Arts and Humanities 6(3):38. Retrieved from: https://doi.org/10.18533/journal.v6i3.1136
4. Ben Hu, Hua Guo, Peng Zhou and Zheng-Li Shi, (2020), Characteristics of SARS-CoV-2 and COVID-19. Int. J Infect Dis, 98: 218–224. http://dx.doi.org/10.1016/j.ijid.2020.06.067
5. Billy K., Understanding the True Meaning of Christmas. St. Francis of Assisi Forum, Ann Arbor(2018), Retrieved from: https://www.academia.edu/38987306/Understanding_the_True_Meaning_of_Christmas
6. Bowen, G. M., & Roth, W-M. (2005). Data and graph interpretation practices among preservice science teachers. International Journal of Science Education, 42(10), 1063–1088
7. Ebere R. A., Sandra I. I, Chizuruoke S.N., Nnaemeka O. N, Chika I. N. and Clement A.M, (2020), The COVID-19 pandemic and social distancing in Nigeria: ignorance or defiance. Pan Africa Medical Journal, 35(2):52. https://doi.org/10.11604/pamj.2020.35.2.23649
8. Joel K Kelso, George J Milne and Heath Kelly, Simulation suggests that rapid activation of social distancing can arrest epidemic development due to a novel strain of influenza. BMC Public Health, 2009, 9:117. http://dx.doi.org/10.1186/1471-2458-9-117
9. Kayode P. Ayodele, Hafeez Jimoh, Adeniyi F. Fagbamigbe, Oluwatoyin H. Onakpoya, The dynamics of COVID-19 outbreak in Nigeria: A sub-national analysis, Scientific African, 2021, Volume 13, e00914, ISSN 2468-2276. https://doi.org/10.1016/j.sciaf.2021.e00914.
10. Khansa AhmadID, Sebhat Erqou, Nishant Shah, Umair Nazir, Alan R. Morrison,Gaurav Choudhary, Wen-Chih Wu (2020), Association of poor housing conditions with COVID-19 incidence and mortality across US counties, PLoS ONE 15(11):e0241327, Retrieved from:https://doi.org/10.1371/journal.pone.0241327
11. Kurt M. Simmons (2015), The origins of Christmas and the date of Christ's birth. JETS, 58/2, 299–324. Retrieved from: https://www.etsjets.org/files/JETS-PDFs/58/58-2/JETS_58-2_299-324_Simmons.pdf
12. LUMC-COVID-19 Research Group., Chen, Q., Toorop, M.M.A. (2020). Why crowding matters in the time of COVID-19 pandemic? - a lesson from the carnival effect on the 2017/2018 influenza epidemic in the Netherlands. *BMC Public Health* 20, 1516. https://doi.org/10.1186/s12889-020-09612-6
13. Nande A, Adlam B, Sheen J, Levy MZ, Hill AL (2021) Dynamics of COVID-19 under social distancing measures are driven by transmission network structure. PLoS Comput Biol 17(2): e1008684. https://doi.org/10.1371/journal.pcbi.1008684
14. National Bereau of Statistics (17 November 2022), Nigeria launches its most extensive national measure of multidimensional poverty, Abuja. Retrieved from: https://nigerianstat.gov.ng/news/78
15. National Bureau of Statistics (2020). Retrieved from:https://nigerianstat.gov.ng/download/1241121
16. Nigerian Centre for Disease Control (2020), Retrieved from:https://ncdc.gov.ng/diseases/sitreps/?cat=14&name=An%20update%20of%20COVID
17. Omonigho T. Okhankhuele and Zacheus O. Opafunso (2015), Rural-Urban Migration in Nigeria: "who migrates most"? A Case Study of Ogun Waterside Local Government Area of Ogun State, Nigeria. British Journal of Economics Management & Trade 8(3):180-189. Retrieved from: https://doi.org/10.9734/BJEMT/2015/15845
18. Piwat Suppawittaya, Pakara Yiemphat and Pratchayapong Yasri , (2929), Effects of Social Distancing, Self-Quarantine and Self-Isolation during the COVID-19 Pandemic on People's Well-

Being, and How to Cope with It. International Journal of Science and Healthcare Research, Vol.5; Issue: 2, Retrieved from: https://ijshr.com/IJSHR_Vol.5_Issue.2_April2020/IJSHR003.pdf

19. Qian, M., Jiang, J. (2022), COVID-19 and social distancing. J Public Health (Berl.) 30, 259–261. Retrieved from: https://doi.org/10.1007/s10389-020-01321-z
20. Renyi Z., Yixin L, Annie L. Z., Yuan W., Mario J. M. (2020), Identifying airborne transmission as the dominant route for the spread of COVID-19. Proceedings of the National Academy of Sciences, 117 (26), http://dx.doi.org/10.1073/pnas.2009637117
21. Harit .S (2017) : Eid Mawlid al-Nabi, Eid al-Fitr and Eid al-Adha; optimism and impact on analysts' recommendations: Evidence From MENA region, Arab Economic and Business Journal,, 2017, Vol. 12, Iss. 1, pp. 57-67, http://dx.doi.org/10.1016/j.aebj.2017.04.001
22. UNDP(2020). The Covid-19 Pandemic in Nigeria: Citizen Perceptions and the Secondary Impacts of Covid-19. Brief 4, UNDP. [Internet], Retrieved from: https://www1.undp.org/content/dam/nigeria/docs/Sustainable%20Development/UNDP_NG_Brief4_COVID19%20CitizenPerceptions_Nigeria.pdf
23. Seidlein Von, L., Alabaster, G., Deen, J., and Knudsen, J. (2021), Crowding has consequences: Prevention and management of COVID-19 in informal urban settlements. *Building and environment*, *188*, 107472. https://doi.org/10.1016/j.buildenv.2020.107472
24. Whittaker, C., Salend, S. J. and Elhoweris, H. (2009), Religious diversity in schools: Addressing the issues. Intervention in School and Clinic, 44(5), 314-319. http://dx.doi.org/10.1177/1053451208330892
25. WHO (2020), Transmission of SARS-CoV-2: implications for infection prevention precautions Scientific brief. Retrieved from: https://apps.who.int/iris/bitstream/handle/10665/333114/WHO-2019-nCoV-Sci_Brief-Transmission_modes-2020.3-eng.pdf
26. Xutong Wang, Remy F. Pasco, Zhanwei Du, Michaela Petty, Spencer J. Fox, Alison P. Galvani, Michael Pignone, S. Claiborne Johnston, and Lauren Ancel Meyers (2020), Impact of Social Distancing Measures on Coronavirus Disease Healthcare Demand, Central Texas, USA. Emerg Infect Dis. 26(10): 2361–2369. doi: 10.3201/eid2610.201702