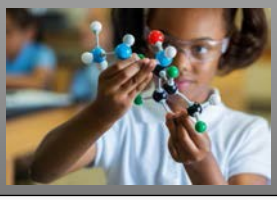

FATE FOUNDATION

Combating the Impact of COVID-19 on the Lives and Livelihood of Nigerians Women and other Protected Groupings: Policy Brief I

Saving Lives

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Preamble

This brief summarizes an otherwise detailed study which is the first part of a trilogy of analyses offering a social science perspective on a crisis that has been characterized as a social disease. Overall, the studies are intended to contribute to a body of knowledge geared towards assisting practitioners, analysts as well as the scientific and policymaking communities in mounting a coordinated response to the complex challenges of combating the spread of SARS-CoV-2. The full report is available on request and accessible at www.fatefoundation.org.

A key finding is that the contagion is spreading relentlessly, and how so? All the northern boundary states except Jigawa State (a breakpoint) are at a higher risk currently. Correspondingly, all the southern shoreline boundary states except Ondo (another breakpoint) are also at an elevated risk level. Amongst the northern states, Yobe is an outlier whereas among the southern states, Bayelsa is an outlier. The hazard rate for Yobe is 47 percent and for Bayelsa is 45 percent. This configuration with Jigawa and Ondo as outliers is consistent with their distinctive positioning in the evolutionary picture shown in Figure 5 of this brief.

What are the possible policy implications of this risk assessment? Essentially, it provides a guide for the efficient allocation of scarce testing resources. More energy should be directed to where the expected returns to testing are highest, assuming such dynamic adjustments (shift-on-the fly) are feasible. In turn, the feasibility depends on the flexibility of the testing regime and on how fungible the resources are. Such intelligent rebalancing of testing intensity to improve the value of the testing nationwide also ensures that testing is not so disparate across jurisdictions to unwittingly create yet more aggregate inequality in an already strikingly unequal society. But jurisdictions must get behind the program to better enable the onerous tasks now and ahead.

Two key messages: Smart testing to find the virus so that society can begin a near-normal life as folks learn to coexist with the pandemic. Urgent and continuing support to vulnerable groupings plus a conviction narrative rallying the citizens around the cause. On the optics, perhaps in these trying times, politically exposed persons could become more sensitive to crass display of wealth when most Nigerians are seriously immiserated?

Finally, what is the nature of that road ahead? This: If Nigeria is careful about the spectrum management of its lockdown, it would not have to experience a frustrating cycle of on and off lockdown episodes that will inevitably force Nigerians into a pandemic apathy with deadly consequences. Already there is a great deal of skepticism over the existence of the pandemic, astonishing as it may sound. The name of the road ahead is Learning to Coexist with the Pandemic—*what cannot be helped must be endured*.

A. Introduction

SARS-CoV-2, the strain of coronaviruses which causes the disease COVID-19, has beset the lives and livelihood of Nigerians. Life, as we know it, will never be the same again. Furthermore, it is just as important to note that how people are subjectively understanding this change matters hugely for how they respond individually and for where we end up collectively. For this and other reasons discussed below, an anchor message is crucial. It is also important to understand that the choice is neither about lives or livelihood nor about health or economics.

Moreover, as the scale and scope of the pandemic is unprecedented at least in recent memory, everyone is in a learning mode concurrently and many of us, more out of desperation and hope for a quick breakthrough than naiveté, are indiscriminately soaking up the barrage of information being churned out. Pundits feast on such frenzy and many consumers rarely pause sufficiently to subject the basis of the resulting recommendations to scrutiny. Fewer yet question the scientific basis for policy recommendations.

While we learn from each other (across countries) mostly about broad principles and feasible practices to deal with the pandemic, we must also be mindful of the influence of local socioeconomic environments on country-specific strategies. Even within the same country, one should be open to accommodating variations in approach to policy choices as well as to implementation methods. Because of the importance of milieu in prosecuting what is essentially a social disease, it is enlightening to describe the pandemic in social terms to enable more people relate to its terrible terms of engagement.

COVID-19 is a pandemic with diabolical features designed to exploit the attributes which make us human. We use our hands a lot and are given to touching our face. Given these predispositions, the imposition of social

distancing, lockdown, self-isolation, forced isolation (quarantine), stricter hygiene habits, altogether demand so much self-discipline, way beyond the customary experience of most folks. But that is not all of what this monster has foisted onto humanity. Other troubling features can be found in the complexities of how it propagates. Features like pre-symptomatic, symptomatic, and asymptomatic infections and the fact that there is yet no known cure and vaccine for the disease. Additionally, it is not clear that recovered patients are not susceptible to reinfection or would not develop long term disabilities as a consequence. On the contrary, evidence of the increasing likelihood of long term consequences is now beginning to emerge.

On the economic side, a couple of considerations come to mind. First, is the recognition that being a pandemic, its effect is worldwide which can mean that any expectation of significant external aid such as happened with the Ebola epidemic should be discounted. Furthermore, the scope to import medical supplies is severely limited. Most countries turned to self-preservation understandably and therefore may not have excess supply that can be exported. The scale of production overall has also been downsized as an unintended consequence of modern production arrangements that are marked by value chain dependencies. Consequently, lockdowns cause a break in the supply chain feeding the production processes, much like would happen if major bridges linking up a series of island communities in a nation were blown up.

The lesson here is that in the present circumstance, cooperation, sacrifice, discipline, patience, empathy, and integrity are as essential as material resources and medical proficiency for achieving success. The importance of recognizing and managing the demands imposed by the social dimension of the struggle should not be underestimated.

B. Focus

Clearly, it is the probable loss of lives from COVID-19 and its associated disruptions of economic activities. A complex problem that presents us with a dilemma—*to resolve the inherent difficulties in safeguarding our livelihood whilst attempting to save lives*. Combating each of the two problems can lead to loss of human lives, if not skillfully handled. With due credit to the artist, Figure 1 captures this dilemma vividly.

Figure 1. Boxed-in: The People v. the Pandemic and its Concomitants

No doubt, Nigeria's challenges seem to be hydra-headed, seemingly caught in a vicious cycle of poor governance and democratic distemper. But there are reasons for the nation's apparently cantankerous mood. Prolonged suffering over infrastructural deficiencies, massive youth unemployment, long term neglect of health and education, and generally too much misery amidst plenty. The conventional measure of income inequality is the Gini coefficient which, is an index of how unequal income distribution within a society is. The values of the coefficient range from zero percent for perfect equality to 100% for extreme inequality. According to a 2017 World Bank estimate, Sweden's inequality index value is 28.8% whereas Nigeria's score based on a 2009 survey is 43.3%. Additionally, a 2016 to mid-2017 poverty survey data for Nigeria by UNDP reveals that 53.5% of her population live below the poverty line. The norm for sub Saharan Africa is 44.7% suggesting that

Africa's most populous and richly endowed state is more impoverished than the average African nation.

Furthermore, when residents in highly developed countries such as the USA are struggling to cope with the adverse economic consequences of the pandemic, it is not difficult to imagine the challenges to Nigerians who mostly eke out a living. In the scheme of things, this predominant group of Nigerians view their socioeconomic circumstances as the overriding factor in their lives. Therefore, any containment strategy must factor in Nigeria's socioeconomic circumstances and its likely influence on people's subjective perception and probable response. It is such iterative thinking that makes the plan truly a strategy. It would be naïve to design a plan about people without any regard to how the people will react.

C. The Missing Links

- **Anchor Message:** Nigeria still awaits a clearly articulated combat strategy as a conviction narrative around which the people can rally. So far there has been no conviction narrative on what the strategy is, if at all, and the elements of it. Wash your hands constantly, practice social distancing, wear a face mask when outside, and stay indoors as much as possible, venturing outside only from necessity. If you experience any of the known symptoms, call the help hotline. Correct as far as exhortation goes. But surely there must be more, and there are. Currently, the most important message tinged with a great deal of hope, is that this war might turn out not to be a hunker down and it passes over so that we can get back to business as usual deal.

We may be facing a co-existential threat requiring us to remain vigilant far longer than customary. For most humans, staying alert 24x7 is daunting. Extending to several months, such high level of alertness would be nearly impracticable and hence unrealistic. Long before folks become terse or grumpy, what are the proposed supporting measures to strengthen these tough impositions thus, rendering them sustainable? In short, the expectation is to design and implement a strategy of transitioning to a *pandemic resilient society that can begin returning folks to normal life in abnormal times.*

- **A "Mobilize and Transition" Strategy:** What can we expect from the government especially by way of support to essential services personnel, often the low-income earners whose labor keep the rest of the society nearer to its customary lifestyle? Even if out of desperation, those who eke out a living are being turned loose to fend for themselves, the society has a moral obligation to offer these groupings a starter pack of essentials as part of returning to regular hustle. Surely, the state is aware of the stark inequality in the country. The economic dimension of the combat strategy, clearly integral to the flattening of the epidemic curve should also be a part of the focus. Therefore, survival strategy, general economic recovery, and effectively managing the implementation of the overall combat measures (process control) especially where the performance indicators are noisy or unreliable (as is to be expected when things are evolving so rapidly) are other dimensions of the emphases. But are they?

- **Superintendence - Process Control:** Fighting to limit the extent and rate of infection over time, the country's team of medical experts are leading

the charge. They deserve all the necessary support that can be mustered. There is yet no cure for this disease. Therefore, in the interim, much of the effort as appears to be the case must be devoted to patient care, infection prevention, and limitation of slippages. From a policymaking and management perspective, once these mitigation measures have been established, then for effectiveness, the command measures taken to establish them must be augmented with control instruments.

Control instruments are particularly useful tools for governing dynamic systems. A policymaker who has put measures in place would over time like to gauge the performance of those measures to determine at specified intervals whether to affect any adjustment, the degree of adjustment and the direction of change, including the feasibility of abandoning the policy altogether. For instance, where a significant proportion of the infections are unlinked to known cases, policymakers and experts in search of clues may consider patterns of sociocultural and economic activities as proxies in guessing the likely pattern of propagation in specific environments. Such an implicit assumption of isomorphism between community spread and pattern of livelihood appears entirely plausible and therefore worthy of serious consideration.

D. Insights

What do we make of the barrage of COVID-19 information being churned out and reported almost daily? The first caution is to note that the nature of a testing regime and reporting scheme is central to the number of cases reported regardless of other factors that may have contributed to those numbers. This

caveat holds irrespective of whether the case in point pertains to cross country or within country variations. The elements of a testing regime can be thought of as comprising of the selection strategy (i.e. decision about which segment of the population to be tested, or who gets tested when) and the implementation capacity. Also, recent discovery from antibody tests have shed new lights on the scale of asymptomatic infections, and how selection strategies based on taking cues from symptomatic cases most likely underestimates grossly, the number of infections.

> … SARS-CoV-2 is entirely different. We now know that COVID-19 patients have the heaviest viral load — and appear most infectious — at the onset of symptoms, not at the end. People who haven't yet developed any symptoms, and therefore wouldn't show up in the CDC's temperature checks, are responsible for more than 40% of the virus's spread. And only about 45% of cases early in an infection will develop a fever.

Other salient points include that testing capacity is determined by resource constraints such as financial, human, and supply chain limitations. The latter affecting timely provision of testing materials. To whom and where testing effort is directed can have dramatic differences on the number of confirmed cases as can the number of people tested (testing intensity), the lag in reporting, and the reliability of the test (the likelihood that you are actually infected if the test says so). Furthermore, most of the data in developing countries do not yet report publicly in sufficient detail both the demographic and socioeconomic profiles of the dead and the clinically confirmed cases, perhaps due to exigencies. Yet, these are salient statistics necessary in assuring a fair society which would be one in which unintentionally *social responsibilities do not get shifted to personal responsibilities,* and that such shifts where they occur, are not influencing which groupings are catching the disease. Keeping such statistics in view also helps to ensure that our most vulnerable groups are not callously being

disregarded.

1. Reading the Global Situation

Spain, Qatar, Italy, New Zealand, and Australia lead in testing intensity whereas Angola, Haiti, Mozambique, Nigeria, and Niger in rank order, lag as at 12 May 2020. Whereas many of the countries have shown dramatic increases in testing intensity over one-month period with some trebling while others quadrupled their performances, Nigeria's ranking among the countries in the Sub Sahara region remains unchanged in spite of what is almost a quadrupling of testing intensity. It overtook Niger, still outranked Angola but has been bested by Mozambique.

What does the global statistics mean for Nigeria? Despite not taking into consideration wealth disparities across countries and notwithstanding that wealth can partially explain variations in degree of testing intensity, still wealth alone scarcely explains Nigeria's regional standing. Nigeria's reported testing intensity says that 146 people in every one million has a chance of being tested and that if Nigeria, like India, were to test about a million of its residents, it will unlike India be contending with approximately 163,000 confirmed cases of COVID-19 rather than the currently reported 4,787 cases as at 12 May 2020.

A month later in June, the corresponding facts and prediction are that 517 persons in every one million have a chance of being tested and were a million persons to be tested under the current regime, an approximately 165,000 confirmed cases of the infection rather than the currently reported 16,000 cases are to be expected. Except South Africa, no other sub Saharan Africa country in our analyzed sample of countries features in the global league of nations with worrisome trend in the infection discovery rate.

We have calculated and presented in Table 2, a set of statistics—deaths per thousand of the population and case fatality rate—for gauging mortality from the pandemic within and across countries. For internal reckoning, deaths per thousand of the population can be compared against a country's mortality rate, where such data exists. For external comparison or to obtain a global perspective, the number of deaths per thousand of the population can be benchmarked against the global crude death rate or to the global mortality rate from the pandemic. For example, based on available data as at 12 May 2020, the global pandemic mortality rate is estimated to be 0.03748. Equivalently, 37 souls per million persons are lost to the pandemic. In Table 2 we have flagged (in purple color) countries with loss rates appreciably above our calculated global norm from the pandemic. In our sample, these countries are exclusively in North America and Europe.

The other set of relevant statistics, case fatality rate (CFR), is the proportion of the clinically confirmed cases which prove deadly. Cross-country comparison of CFR is tenuous because numerous variables which codetermine the value of CFR differ across jurisdictions. Without controlling for the influence of these factors, cross-national inferences cannot be considered conclusive. So, what can we surely say in comparative perspective about CFR? Without resorting to peer comparison, not much really. Among sub Saharan countries, Burkina Faso, Chad, Kenya, Niger, and Togo are ones to watch. Again, without moderating the CFR with the testing intensity, these remarks are at best tenuous. In the Middle East and North Africa region, Algeria and Iran are noteworthy; Canada and Mexico in North America; Haiti and Trinidad & Tobago in the Caribbean; Brazil in South America; none in Asia (Western Pacific), South East Asia, and Oceania. In Europe, we have France, Italy, Spain, and the United Kingdom. In

faring much better than the countries of Western Europe represented in the sample, Russia, Turkey, and Ukraine portrays Eastern Europe cluster as an outlier amongst European nations. As circumspect as we have been about cross-country comparisons of CFR, we have nonetheless color coded in green the countries which have shown a decline in their CFR. Adjusting for cross-country differences is not an issue here because internally the context is the same and so comparisons are meaningful. Among sub Saharan countries, Kenya and Togo are green lights. Conversely, Benin Republic shows a rise in CFR and is coded red. Nigeria has also recorded a decrease in CFR but is not as significant as the others and so was not color coded. Overall, most of the countries appear to be holding steady on case fatalities.

2. Reading Nigeria

Figure 2.1 shows Nigeria's epidemic curve which is an illustration of the frequency of new cases across time based on the onset of the pandemic in Nigeria on 27 February 2020. The cumulative cases since that onset is disaggregated in Figure 2.2 using colored lines to categorize the cases into actives, deaths, and recoveries. Clearly, the virus is still spreading. The question which then must be raised is how is that propagation?

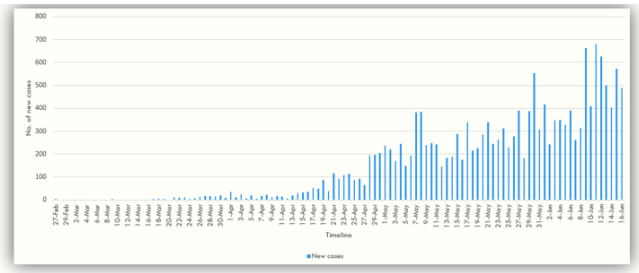

Figure 2.1. COVID-19 Epidemic Curve for Nigeria @ 16 June 2020

Notes: Rendition based on data from NCDC. All NCDC source data used in this study can be accessed from https://ncdc.gov.ng/diseases/sitreps/?cat=14&name=An%20update%20of%20COVID-19%20outbreak%20in%20Nigeria

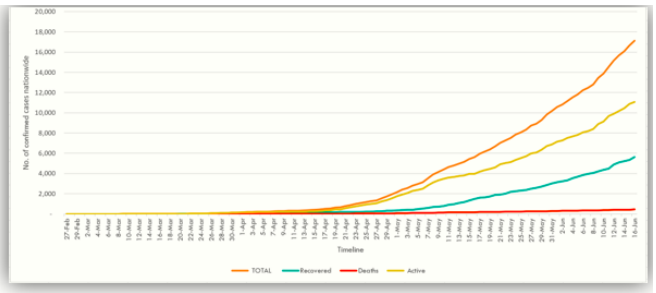

Figure 2.2. Nigeria: COVID-19 Profile @ 27 Feb – 16 June 2020

Notes: Calculations from NCDC data.

Figure 2.3 indicates that about 67 percent of the states have cases below 200; 2 of the states are within 1000 and 1400 cases. Lagos is not shown in the graph because it falls between 7451 and 7500 cases, clearly off the chart. Proportionately, Lagos State represents 2.7 percent of the jurisdictions but accounts for a whopping 43.5 percent of the caseload. Looking at Figure 2.3, the irony cannot be lost on the discerning reader who easily notices the skewed distribution of the cases, thus is reminded of Nigeria's highly unequal income distribution which shares a striking similarity in also being highly skewed to the right. The relative distribution of the caseload across states is mapped in Figure 2.4 indicating clearly that Lagos, FCT and Kano are the heavy hits with cases in the thousands and altogether accounting for 58 percent of the load.

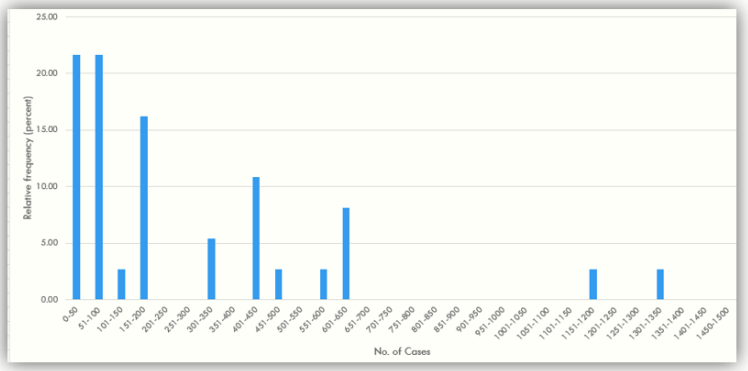

Figure 2.3. Nigeria: Relative Frequency Distribution of COVID-19 Caseload @ 16 June 2020

Notes: Calculations from NCDC data. Lagos State is in the closed interval 7451-7500 and so is off the chart. Although representing 2.75% of the 37 jurisdictions, it accounts for 43.51% of the case load. Clearly the configuration of the pandemic in Nigeria is highly skewed to the right, like Nigeria's (highly unequal) income distribution.

Although the epidemic curve plots the arrival of new cases over time, nonetheless we must be mindful that the frequency of new cases or its rate of arrival is partly conditional on the testing regime (intensity and selected locale, both of which can vary). The numbers for daily tests over a period of two months tabulated in Table 3 indicate that the testing intensity has indeed been changing. In the same Table 3, we tabulated the values of a constructed variable, *marginal hazard rate*, defined to be the ratio of the number of new cases uncovered in a day to the number of tests conducted on that same day. Examining those values indicates that there were indeed very grim days in this country during the months of April, May, and June when one in every three Nigerians who was

tested for SARS CoV-2 virus infection proved to be positive. Also, whenever the marginal hazard rate is rising, the hazard rate (which is simply the cumulative average value) increases. Conversely, whenever the marginal rate is declining, then the hazard rate will decline correspondingly. Thus, the marginal rate is a trend-setter. The marginal hazard rate by virtue of its relationship to the (average) hazard rate is a leading indicator of the trend in infections. Therefore, it is a key statistic to be watched closely.

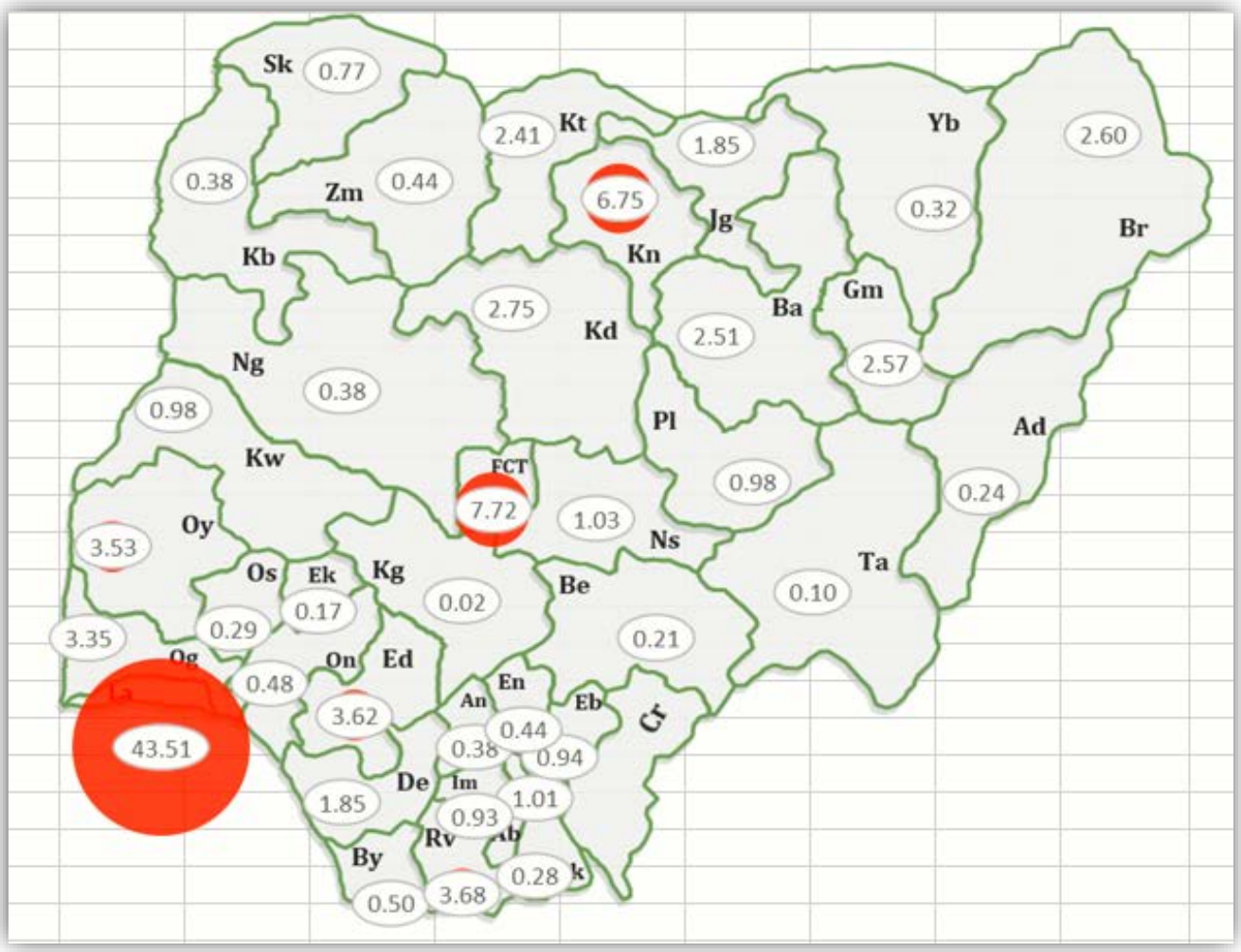

Figure 2.4. Nigeria: Spatial Distribution of COVID-19 Caseload @ 16 June 2020

Notes: Calculations from NCDC data. The numbers represent the proportion of caseload in each state.

3. Our Strengths

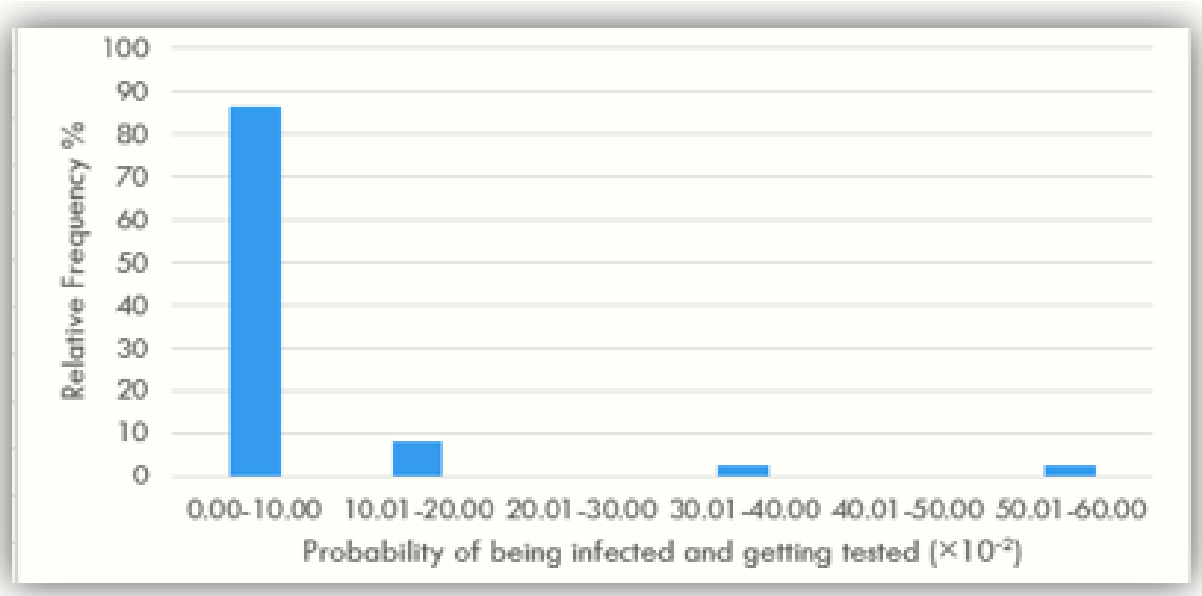

Figure 3.1. Relative Frequency Distribution of Emergency Response Capacities @ 16.6.2020

Notes: Calculations from NCDC data. The values are calculated as the joint probability of showing symptoms and getting tested, i.e. $P(Y \cap T)$ where P is probability, Y denotes infected and T denotes getting tested.

The probabilities are expressed in percentages. Note that this measure does not consider asymptomatic cases; just those who get tested based on having manifested symptoms compatible with the virus infection and found to be indeed infected.

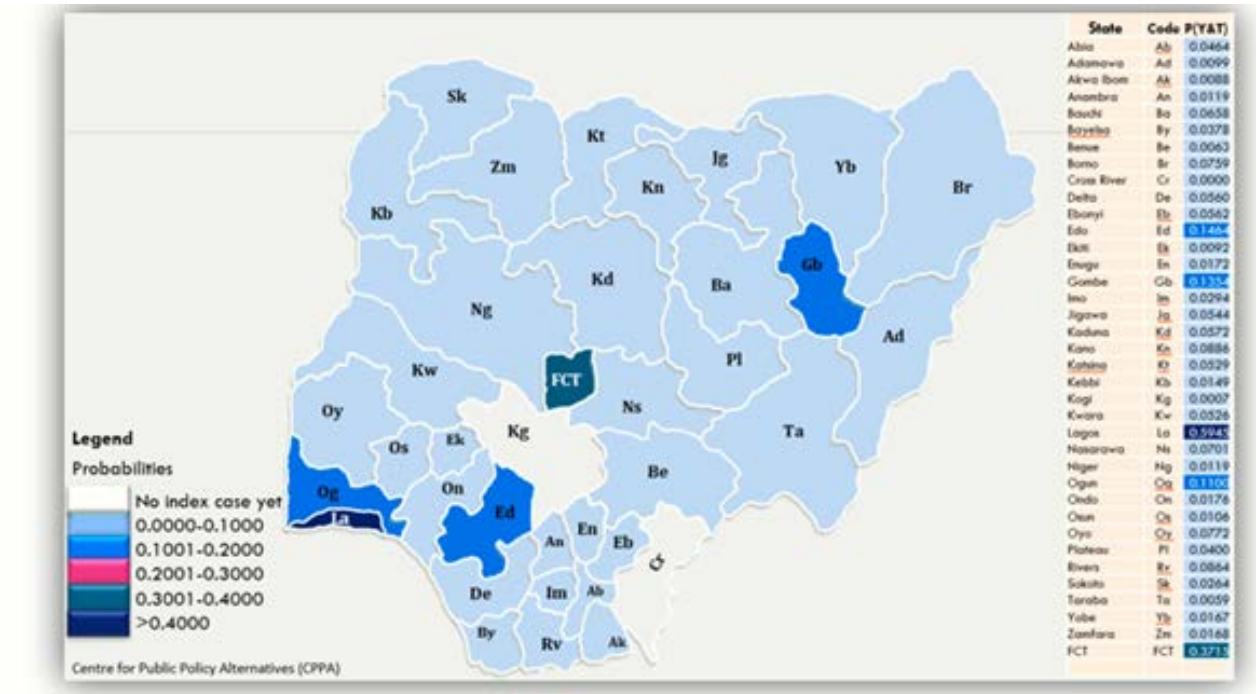

Figure 3.2. Rank Ordering of Emergency Response Capacities @ 16 June 2020

Note: Calculations from NCDC data.

To date, we are not aware of any country where immediately getting tested on demand for the SARS CoV-2 virus infection is a foregone conclusion. On the contrary, there are many places, developed countries included, where getting tested is still not guaranteed even for patients showing symptoms of the disease. Therefore, assessing testing capacity is a useful enterprise and accordingly we have constructed a measure of that strength or weakness as the case maybe. To measure the capacity of a state to attend to the COVID-19 emergency needs of its citizens in the first instance, we derive a *first-responder estimator*. This estimator of the capacity of the state to respond to distress calls from susceptible individuals is measured as the *probability of being infected* and *getting tested*. In plain words, the measured strength of each of the 37 jurisdictions is the likelihood of testing a person who has developed signs and symptoms compatible with the virus infection.

Figure 3.1. indicates that over 86 percent of the jurisdictions or 32 states fall in the category of 0-10 percent capacity suggesting that overall, testing capacity is still exceptionally low. In Figure 3.2, a light blue color code is used to identify this low capacity grouping. Outside this grouping, there are three other distinct categories which we can classify as platinum, gold, and silver stars of emergency response. Three jurisdictions fall in the 10-20 percent interval, our silver star performers. FCT falls in the 30-40 percent interval (the gold star), and Lagos State is our "poster child" of emergency response capacity in the range of 50-60 percent likelihood of testing a resident who has developed signs and symptoms compatible with the virus infection (platinum). Although nowhere closer to the 95 percent or more likelihood that most people would prefer if found in that situation, nonetheless these are remarkable standings relative to the rest of the

country. We can reasonably conclude that persons living outside of Lagos State and FCT thus far face the dim prospect of getting tested if they are showing symptoms of the disease. Figure 3.3 maps these capacities across the 37 jurisdictions. The estimates are expressed in percentages as the joint probability of being infected and getting tested.

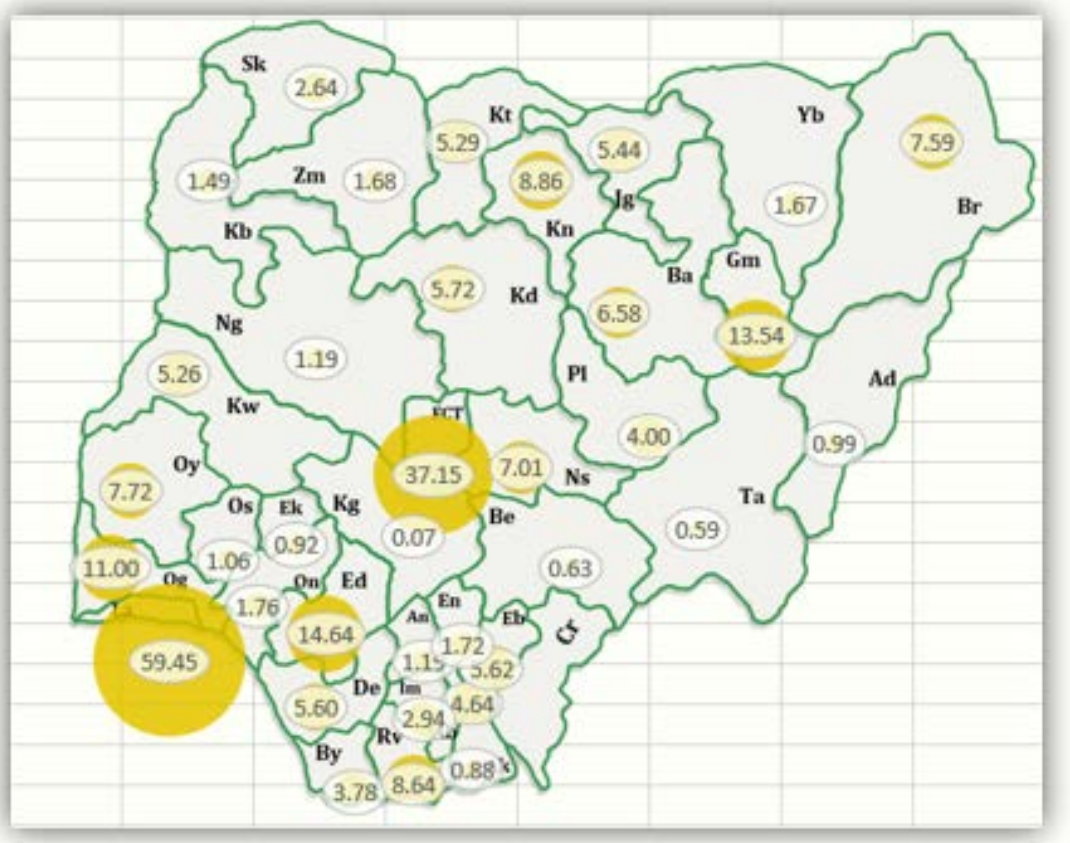

Figure 3.3. Spatial Distribution of Emergency Response Capacities :16 June 2020

Notes: Calculations from NCDC data. The numbers are in percentages and indicate the likelihood of showing symptoms and getting tested. For the interpretation of the state codes, see Figure 3.2.

Contrasting emergency capacity and base capacity is much like comparing a fire alarm to a smoke detector. Both are enunciators. However, in one case the fire is already raging whereas in the other, imminent fire is being signaled. Base capacity is measured as testing intensity. Testing intensity is computed as the unconditional probability of getting tested, i.e. the odds of getting tested

regardless of clinical condition. Equivalently, the odds of getting tested whether a susceptible individual is manifesting symptoms or not. In practice, most countries are so overwhelmed with demands for testing that only those most likely to be infected are being prioritized for testing anyways. Therefore, in analyzing the scale and scope of a testing regime for a disease that can be transmitted symptomatic and asymptomatically, focusing only on the testing of symptomatic cases obviously introduces an insurmountable selection bias into the equation. Therefore, our calculations and the associated inferences are clearly approximations.

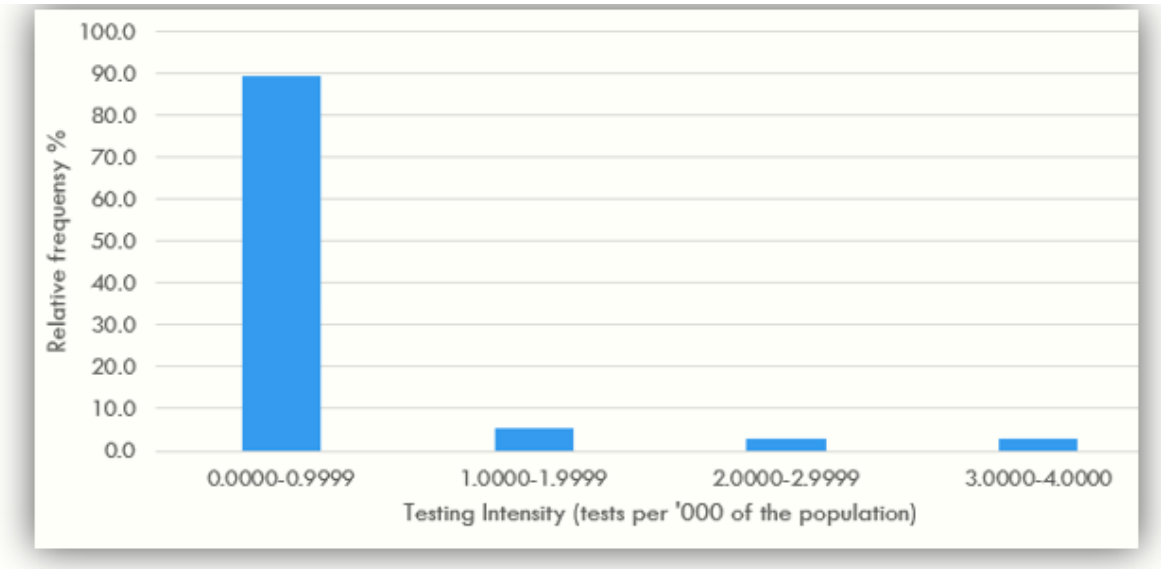

Figure 4.1. Relative Frequency Distribution of Testing Intensity: 16 June 2020
Note: Calculations from NCDC data. Testing intensity is the number of people getting tested per thousand persons in the population. It represents the unconditional probability of getting tested, i.e. ideally the odds of getting tested regardless of clinical condition= of whether susceptible a individual is manifesting symptoms or not).

Figure 4.1 shows that about 90 percent of the states are struggling to reach the level of testing one person per thousand residents in each jurisdiction. The Federal Capital Territory, Abuja leads in the test ranking, followed by Lagos State, Edo State, and Gombe State. Why is the testing intensity so highly skewed? This raises yet more questions such as which kind of "find the virus

regime" is Nigeria operating? Is Cross Rivers State indeed virus-free if by comparison to the rest of the states, no sampling is yet to be conducted? Given its apparent outlier status as implied in Figure 4.2, Why has Cross Rivers State not been sampled?

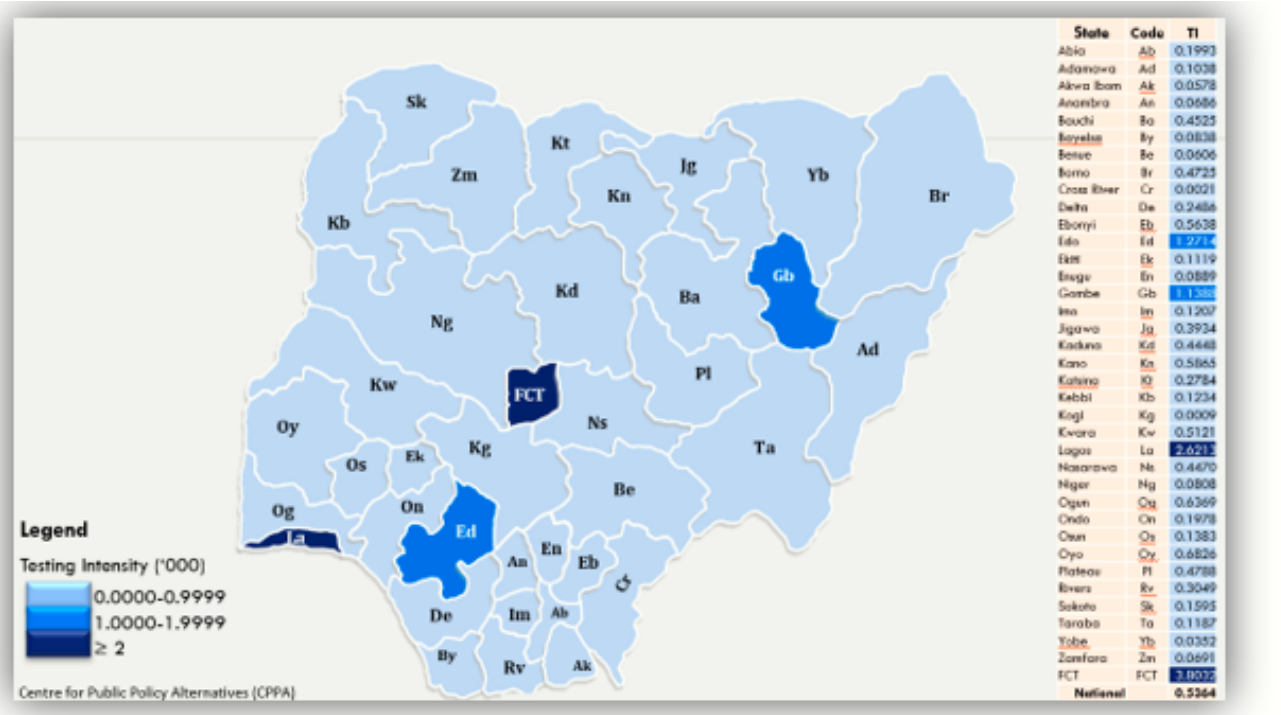

Figure 4.2. Spatial Distribution of Testing Intensity: 16 June 2020

Note: Calculations from NCDC data. So far only 4 tests have been recorded for Kogi State, a result which the State Government disputes. Moreover, it outrightly rejects the results of the first two of the four tests conducted in the state.

4. Evolution: COVID-19 in Time and Space

The following snapshots sequenced in Figure 5 show how like a blemish the presence of SARS-CoV-2 is spotting Nigeria. Then insidiously but relentlessly like a pall it seeks to envelope the country. The picture shows also how the testing regime is shaping both the depth and breadth of the detections across the country daily. Evidently, more testing continues to uncover more cases which suggests that the virus is spreading relentlessly across the country and in its trail, wasting away through sickness and death precious human resources, our developmental ingredient.

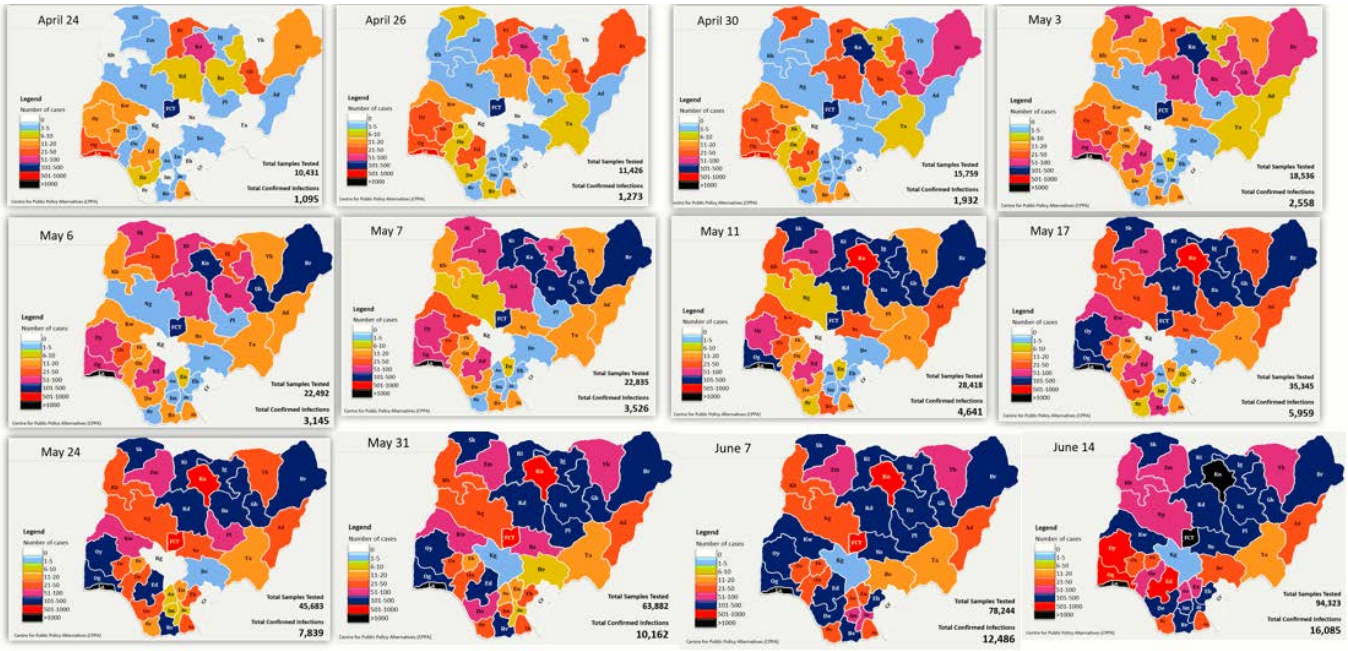

Figure 5. Evolution of Cases based on Testing Intensity and Incidence: 24 April - 14 June 2020

Notes: Rendition based on NCDC data.

5. A Risk Assessment: How Relentless the Spread?

The question of how relentless the spread, is addressed by calculating hazard rates across the 37 jurisdictions (Figure 6.1). Hazard rate is informative as an indicator because it estimates the scale of the infection based on the intensity of the testing. Testing in areas where hazard rates are higher can be expected to yield more clinically confirmed cases of the pandemic than in areas with relatively lower rates. Whereas testing intensity points to the aggressiveness of the discovery process, the utility of that effort is underscored by the hazard rate because if as indicated by it (the hazard rate), the more you test, the more you discover, the incentive to invest in testing is boosted.

The picture in Figure 6.1 makes a remarkably interesting lineup. All the northern boundary states except Jigawa State (a breakpoint) are at a higher risk currently. Correspondingly, all the southern shoreline boundary states except

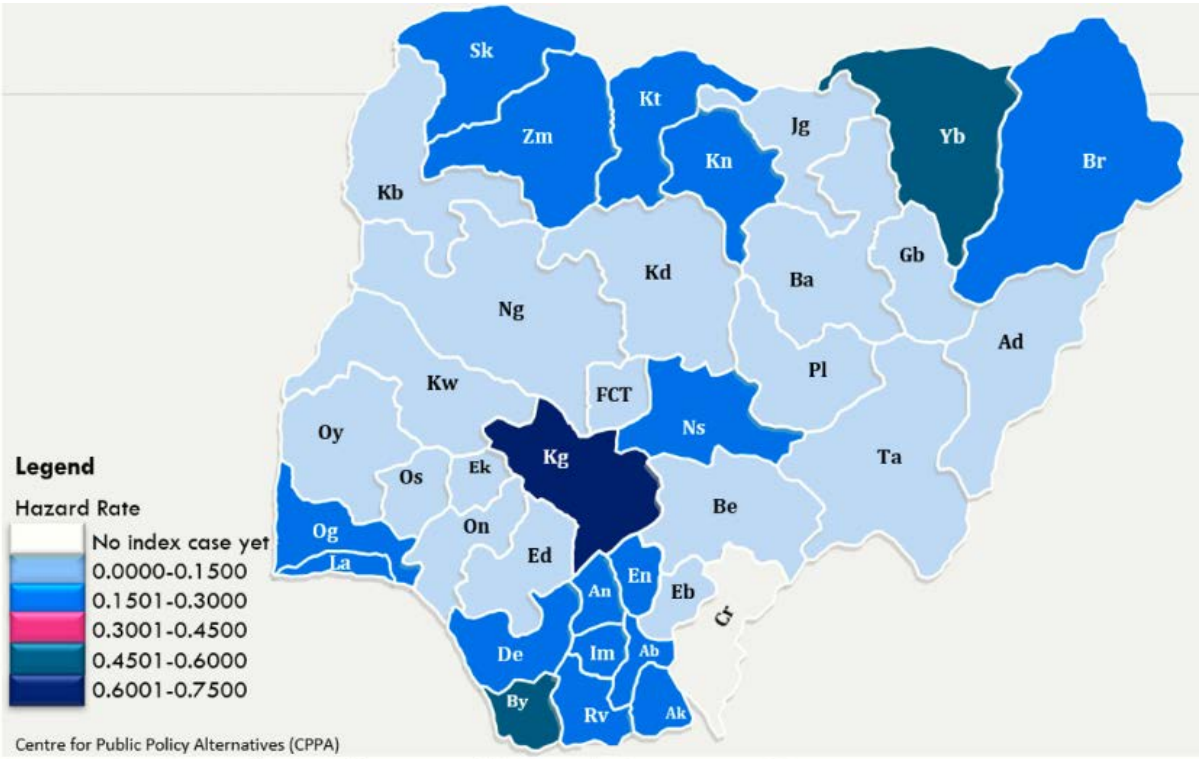

Figure 6.1. Spatial Distribution of Hazard Rates @ 16 June 2020

Note: Calculations from NCDC data.

Ondo (another breakpoint) are also at an elevated risk level. Amongst the northern states, Yobe is an outlier whereas among the southern states, Bayelsa is an outlier. The hazard rate for Yobe is 47 percent and for Bayelsa is 45 percent. This configuration with Jigawa and Ondo as outliers is consistent with their distinctive positioning in the evolution depicted in Figure 5.

Also, about half of the states (19) have hazard rates of 15 percent or less (a not insignificant number) whereas the other 40 percent (15) fall between 15 and 30 percent (Figure 6.2). At 75 percent, the hazard rate for Kogi State is extreme, meaning that 7 in every ten people tested are expected to be infected. But the anomaly is also driven by its absolutely unacceptably low testing intensity and the controversy surrounding the few conducted test results. So far only 4 tests have been recorded for Kogi State, a result which the State Government disputes. Moreover, it outrightly rejects the results of the first two of the four tests conducted in the state.

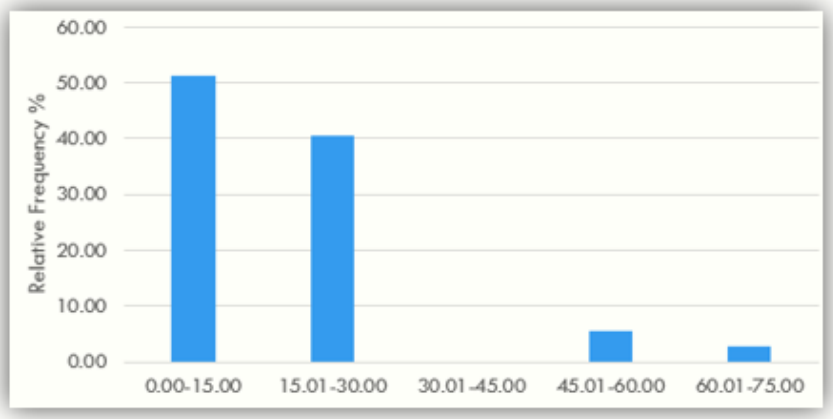

Figure 6.2. Relative Frequency Distribution of Hazard Rates @ 16 June 2020

Note: Calculations from NCDC data.

What are the possible policy implications of this risk assessment? Essentially, it provides a guide for the efficient allocation of scarce testing resources. More energy should be directed to where the expected returns to testing are highest, assuming such dynamic adjustments (shift-on-the fly) are feasible. In turn the feasibility depends on the flexibility of the testing regime and on how fungible the resources are. Such intelligent rebalancing of testing intensity to improve the value of the testing

nationwide also ensures that testing is not so disparate across jurisdictions to unwittingly create yet more aggregate inequality in an already strikingly unequal society. But jurisdictions must get behind the program to better enable the onerous tasks now and ahead.

6. Measuring Vulnerabilities: Mapping the Changing Distribution of Contagious Potential

We began our analyses of the Nigerian circumstance by identifying strengths across jurisdictions. Then followed with an assessment of how relentless the spared is. Now we conclude this section with measuring vulnerabilities and exploring ways of leveraging strength to confront vulnerabilities. In waging a contagion war, coordination is crucial. Therefore, mapping vulnerabilities helps in efficient resource allocation because a coordinator is then enabled to effectively rebalance her activities portfolio, i.e. identify, marshal, and redirect resources and effort in order of priority.

In an efficient pursuit of the overall goal (i.e. flattening of the curve), the key policy variable is the conditional contagious potential herein defined as the ratio of new infections to the number of infectious disseminators. The qualifier—conditional—is a stark reminder that as with other policy variables, much depends on the testing regime and reporting scheme. The contagious potential depends on the number of active cases which in turn depends on the testing regime and the reliability of the tests. More recently, it has been reported in the USA that tests for SARS-CoV-2 exhibit up to 30 percent false negatives, meaning that patients are being falsely diagnosed to be non-infectious when in

fact they are infected. For a disease that can be communicable pre-symptomatic and asymptomatic, such a finding is a seriously complicating factor.

To capture the force of the pandemic across space at any given time, epidemiologists use the term R-naught (R_0) measured as the average number of people each sick person infects. If R_0 exceeds 1, cases grow exponentially, and the spread becomes even more challenging to contain. However, because R_0 is only an average, knowledge of its distribution is just as important as details of the control instruments employed in various places to contain the spread. This includes information about how the instruments currently in place are working out. After all, such is the whole idea of knowledge commons; of learning from each other through sharing. Economists tout this idea as a part of agglomeration economies and argue this factor as one of the perceived benefits of urban settings—large gatherings to generate and share mutual benefits. So, how much of the process variables are shared with the Nigerian scientific community?

Measuring vulnerabilities holds yet more valuable lessons for policymaking and we shall conclude this assessment on that note. It begins with first noting that rare events such as pandemics have a "heavy tail." In plain speak, it says that certain aspects of an event considered to be outliers and thus ordinarily subject to rare occurrences are on the contrary commonplace. Potential flash points or surges in the arrival of infections are one such instance. So, lesson number one is to keep an eye on not just the average value of R-naught (the national average) but more importantly on how the value varies across states (its distribution). The other lesson learned is that the term potential flash points refers to areas more prone to developing a surge in caseloads beyond the ability

of local hospitals to respond.

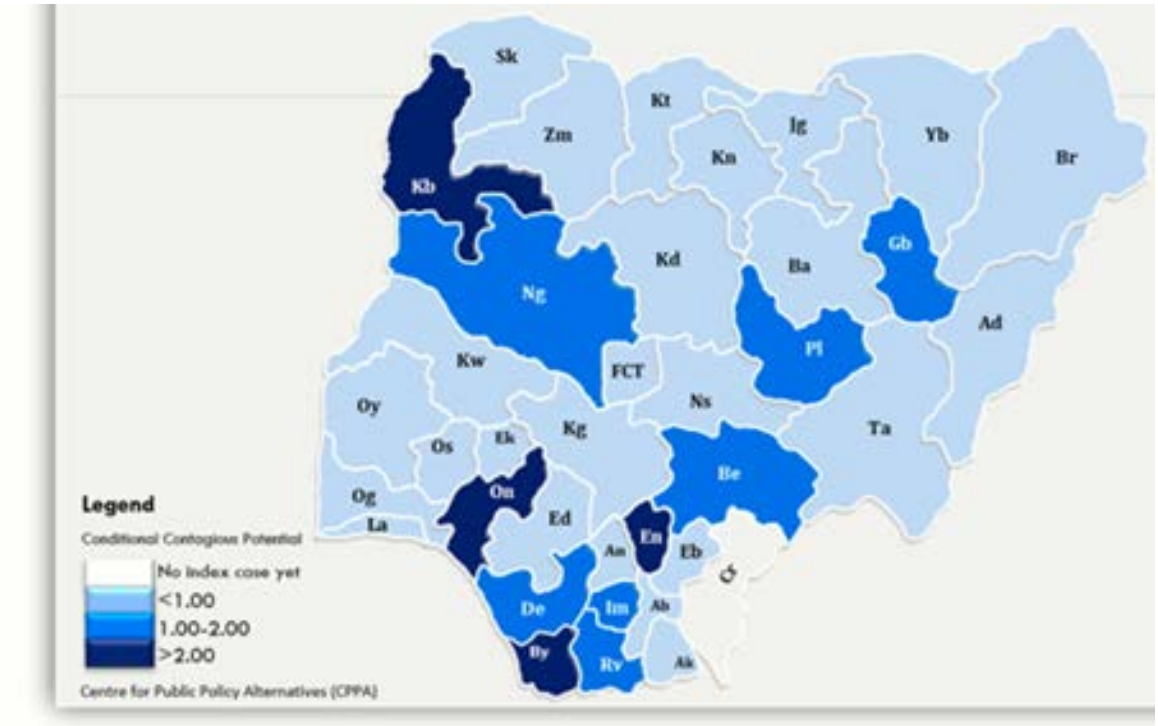

Figure 7. COVID-19 Contagious Potential @ 9-16 June 2020

Notes: Calculations from NCDC data. Values of R_0 greater than 1 implies that cases grow exponentially and the pandemic spreads across the population.

Accordingly, indiscriminate rather than targeted or qualified reopening of churches, mosques, and interstate travels are vulnerabilities that can easily morph into superspreading events, rare as they may seem superficially. For instance, whereas the current estimate of the contagious potential (R-naught) is 0.45 percent, there are zones which currently exceed 1 and thus are superspreading (see Figure 7). Certainly, those areas—Kobe, Niger, Gombe, Plateau, Benue, Enugu, Imo, Rivers, Bayelsa, Delta, and Ondo—should automatically not be included in the initial batch of contemplated reopening scheme but ideally should be subject to continued closer observation. Of course, this configuration is current as at 16 June 2020 but is constantly changing. So, readings should be taken periodically to ascertain current configuration and

policy levers readjusted accordingly.

7. Addressing Vulnerabilities: Social Distancing:

We have been told repeatedly that the elements of a containment strategy are comprised of five key weapons namely, social distancing, contact tracing, testing, isolation, and treatment; more recently with emphasis, wearing face masks. Of these elements, the practice of social distancing is largely a matter of individual choice and responsibility even though the consequences are widespread, extending beyond the immediate effects on the person who done it. Thus, social distancing is a social responsibility because of its generalized externalities. However, the ability to practice social distancing depends on one's circumstances. People who work in close quarters such as in construction are constrained in their practice of social distancing. First responders like paramedics, police, fire and rescue services, healthcare workers, cashiers, and clerks at checkout counters in the supermarkets belong in this category, as are Uber drivers, bus drivers and conductors engaged in mass transit systems here in Nigeria. Furthermore, people's perception of the trustworthiness of their institutions affect their reactions to warnings and injunctions from governments and public health experts. If people disregard warnings, things are liable to get worse.

As at 3 June 2020, over 70 percent of the infections are unlinked to either known cases or other epidemiological information which, is a nerdy way of saying that regarding the facts of who acquired infection from whom, the public health authorities are clueless to the tune of over 70 percent as at last month. Therefore, how and from whom SARS CoV-2 is being spread is anyone's guess. Essentially it is largely up to individuals to safeguard their health. The observed

increasing rate of community infection could well be due to flagrant disregard of precautionary measures by people out there, presumably due to their skepticism over government guidelines at which they look askance, again due to distrust of leadership.

Trust amongst citizens and between citizens and their government is apparently a recurring cross-cutting theme that must be addressed. As highlighted previously, the absence of an anchor message or a conviction narrative as part of the combat plan does not help matters either. Social circumstances are also salient factors in the ability to practice safe social distancing. Examples are family size, size of home and the population density in a person's location. So, what can and should be done?

E. Foresight: The Road Ahead

8. Lagos

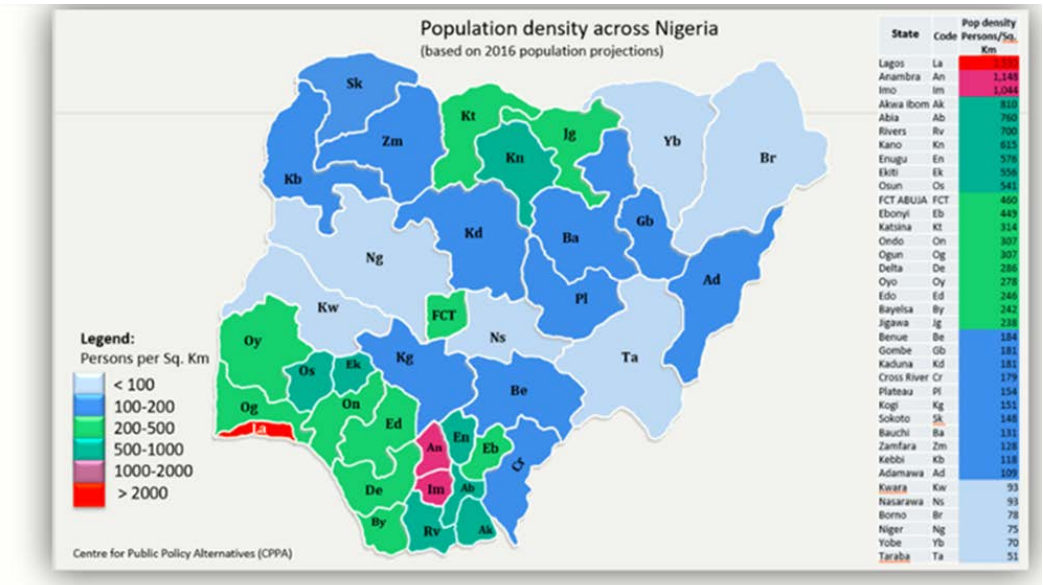

Figure 8. Population Density based on 2016 Projections

Notes: Mapping by CPPA based on data from the National Bureau of Statistics
https://nigerianstat.gov.ng/resource/POPULATION%20PROJECTION%20Nigeria%20sgfn.xls

Lagos State is the densest state in Nigeria (Figure 8) and by far the state with the highest number of confirmed COVID-19 cases in the Federation. Also, Lagos State is a business environment fostering a well-known and sizable informal economy upon which depends the livelihood of many of its numerous residents. Therefore, it is valuable to consider the ecological meaning of "social distancing" with Lagos as archetypical. NCDC mandates maintaining at least "2 metres (5 feet)" physical distance between persons whereas the World Health Organization guidelines specify at least 1 metre or (3 feet; a metre is 3.281 feet). Based on the guideline from the Nigerian authorities, their specification implies a per capita bubble of 12.56 square metres (Figure 9).

Figure 9. The concept of Social Distancing Bubble
Source: Google Images

Now consider the densest part of Lagos (Figure 10) accommodating 75,000 persons per square kilometer or 13 persons per square meter. Local social distancing requirement seeks to reallocate to one Lagosian, a space that ordinarily accommodates 163 residents. Thus, for people to comply with the social distancing requirement and yet continue conducting their affairs as usual is a practical impossibility. Folks must either assume a calculated risk in not complying with the safety requirement but continue business as usual. Alternatively, forego business as usual and enter a lockdown mode either in the tacit understanding or vocalized appeal to the authorities to be mindful that

lockdown is not a binary affair. There is no such thing as total lockdown, at least not over an extended period.

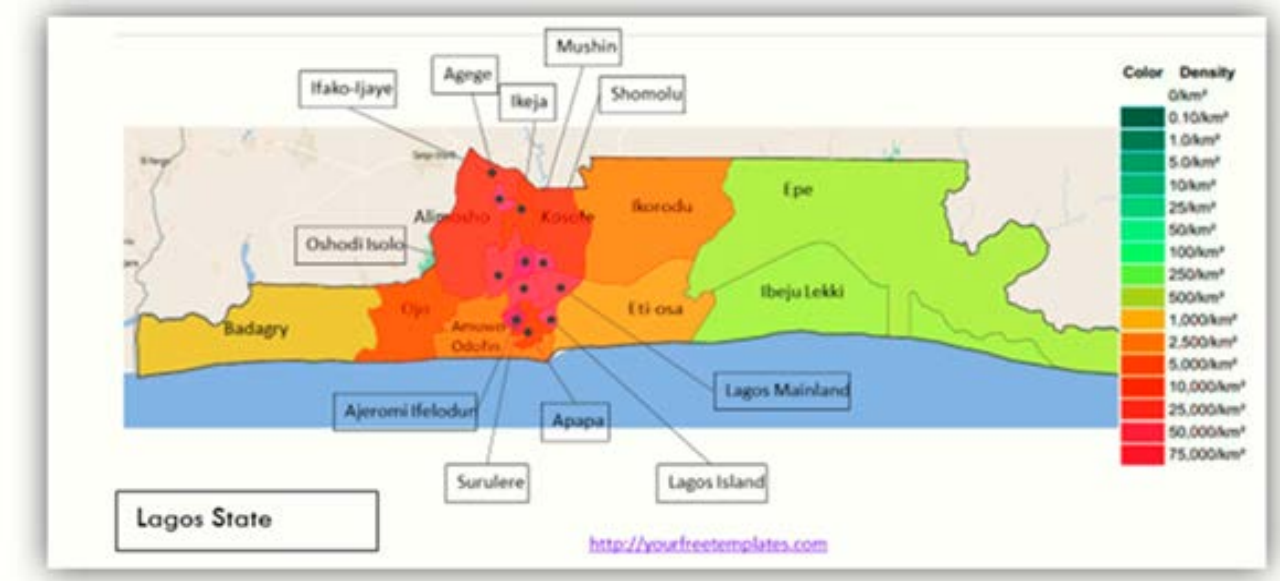

Figure 10. Population Density of Lagos by Local Government Area

It is always as it should be, a matter of degree in so far as the spectrum management of the lockdown is concerned. Under such an arrangement, shock therapies or sudden shifts (jump discontinuities) are unnecessary when either readjusting the location of various communities on the lockdown spectrum or considering the reopening of various aspects of business activities. All readjustments would be gradual and less jumpy. Thus, each community given its specific circumstances mobilizes accordingly in pursuit of its aspiration to transition into the next less constraining band in the spectrum.

As a piece of anecdotal evidence, we have observed that in certain parts of Lagos, block-social distancing ethos (Figure 11) appears to have bubbled up as people coalesced into trust networks to adapt. This is more apparent among the squatters/itinerant residents of affluent neighborhoods of Lagos State, amongst street hawkers, domestic workers, and community-bound artisans altogether

comprising that chunk of the informal economy which is the hallmark of Lagos. It is not as if these groupings would disappear. They had to adapt. Therefore, these vulnerable groupings ought to be identified and supported. The Lagos State Ministry of Commerce, Industry and Cooperatives can get a grip on this if so charged and enabled.

Figure 11: Block Social Distancing Bubbles
source: Google Images

The lesson here is that there should be no absolutes. Rather, the thinking must be in relative terms, guided by science and data. It is not about whether to lockdown or not. Instead the focus ought to be on cleverly managing the lockdown to indeed keep the locks down rather than precipitate eruptions and pockets of revolts in response to foreseeable policy missteps such as with the catastrophic reopening of banking services in the month of May. Nigeria is not alone in the conundrum created by social distancing challenges and in juggling the daily constraints imposed on the people by socioeconomic pressures as evidenced in this by now all too familiar image of the struggle. The picture in Figure 12 captures a day in the struggle by Kenyans but it could have been from anywhere else on the continent or the Americas.

So, what is the nature of that road ahead? This: If Nigeria is careful about the spectrum management of its lockdown, it would not have to experience a frustrating cycle of on and off lockdown episodes that will inevitably force Nigerians into a pandemic apathy with deadly consequences. Already there is a

great deal of skepticism over the existence of the pandemic, astonishing as it may sound. The name of the road ahead is Learning to Coexist with the Pandemic—what cannot be helped must be endured.

Kenyan police hold back ferry passengers causing a crowd to form outside the ferry in Mombasa, Kenya on Friday, March 27, 2020. © 2020 AP Photo

Figure 12. Social-distancing challenges: health v. economics/lives v. livelihood in Kenya
Notes: source https://www.sunstar.com.ph/article/1850517/Network/World/Virus-prevention-measures-turn-violent-in-parts-of-Africa

9. Mobilize (to find the Virus) and Transition (to Resilience)

Must the choice be health versus economics, lives versus livelihood? Should the question not be why an either or? Nigerians do not necessarily have to choose between their lives and livelihood because a more accommodating alternative is

evolving. An alternative implicit in government's easing of socioeconomic activities. Decisions that we presume are guided by data and science.

As disease detectives, epidemiologists have devised Who Acquires Infection From Whom (WAIFW) matrices as a framework to examine "how the pathogen moves between different groups" thus helping experts to identify and distinguish between communities which act as reservoirs to maintain the infection and those which are subject to spillover events, an essential process in a "find the virus regime." The framework has also been suggested as "central to understanding the efficacy of the social distancing" now prevalent as a proactive combat measure against the pandemic. In the context of a find the virus regime, contact tracing is like taking a picture after the event has occurred rather than as it is happening. It is an attempt to map the pathway of a disease that can only be discovered after it has attacked rather than being caught in the act. Nonetheless establishing a historical chain of contacts from infected disseminators constitute a body of narratives crucial to mapping the transmission path of the virus.

Jointly, contact tracing and testing are essential to any mobilize and transition plan. However, testing in this instance must be proactive or smart to constitute an essential element of a "find the virus regime," according to which epidemiologists predict likely reservoirs based on data from contact tracing and imposed priors. In the Nigerian case where contract tracing is blunted, and by no means the only jurisdiction where that instrument have become ineffectual, a reasonable prior could be to assume that the topology of the transmission path is isomorphic with local socioeconomic networks—i.e. *follow livelihood, find the virus*.

10. More About Lagos

There must be a plan to safeguard livelihood whilst saving lives. Things should not be left simply to evolve. For instance, it is conceivable that where the relevant data exists such as implied by Figures 13.1 to 13.3, smart testing can be deployed to obtain vital information for identifying reservoirs of the disease which can then be managed proactively. Presumably, the Lagos State Ministry of Commerce, Industry and Cooperatives as well as the Lagos State Ministry of Wealth Creation and Employment in the service of artisans and trade associations hold a rich database of socioeconomic (i.e. transactional) networks. Such valuable intelligence can be insightful in conjecturing the applicable socioeconomic structure and connectivity (network architecture) helpful in detecting important interfaces (super nodes) between social groups or interacting economic communities. Predictive testing can then be implemented to detect safe regimes where near-normal economic activities can be reactivated.

In what appears to be happening already, supervised reactivations then happen under continued close observation with clearly defined performance criteria for the purpose of process control. Process control is implemented by adjusting policy instruments accordingly, something that the state also seems to be doing based on its stand on some of the recent nationwide policy enunciations which it felt imprudent to adopt and hence balked at.

Safe regimes can also be created through individuals coming together to form coalitions as a network of trusted community subject to own safety rules such as in gated residential communities, voluntary group segregation, or economic blocs. Presumably, such intelligent approach to lockdown (spectrum management) can lessen the severity of the economic and psychic costs of

ongoing interventions. In summary, innovation in organization and management (of lockdowns) is the prize sought.

Figures 13.1-13.3 project a periodic three-week incidence progression of clinically confirmed cases across local governments in Lagos State. As usual, these results should be absorbed with the understanding that we have not controlled for the differences in testing intensity across the local government areas; such fine data set is not publicly available. Nonetheless, there is no gainsaying that increases in the order of ten times or more within a three-week interval is quite alarming even with size effect. The latter is a nerdy way of saying that growth rates from a small base tend to appear larger than otherwise. For example, a movement from two to four is a doubling of growth whereas the same unit move from a four to six is a half. Except for Epe, Ojo, and Ajeromi each of which had a zero base, the other local government areas each recorded a weekly average increase in infections ranging from 100 to 800 percent. Clearly, SARS-CoV-2 was furiously spreading in April/May 2020. Although limited to 11 of the 20 local governments, the latest update shown in Figure 13.3 suggest a reduction in the growth rate of the infection in the subsequent three weeks in May when it now ranged between a weekly average of 20 to 90 percent approximately. A more reliable statistic would be the contagious potential, but data is not publicly available.

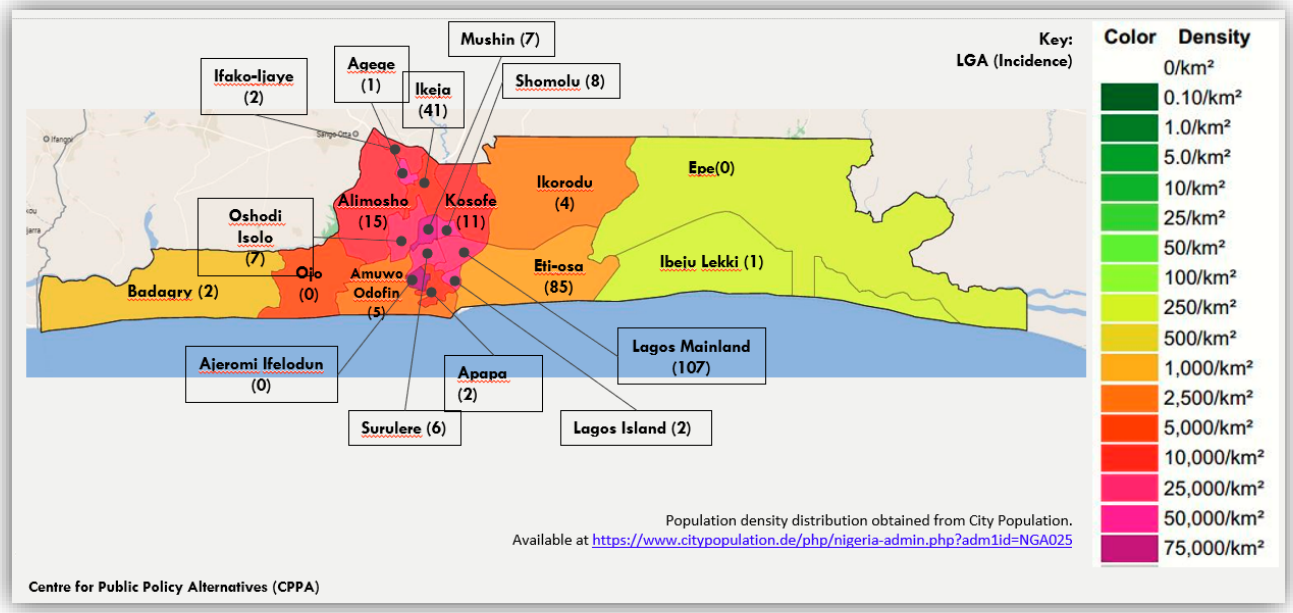

Figure 13.1. COVID-19 Incidence in Lagos State by Local Government Area @ 18 April 2020

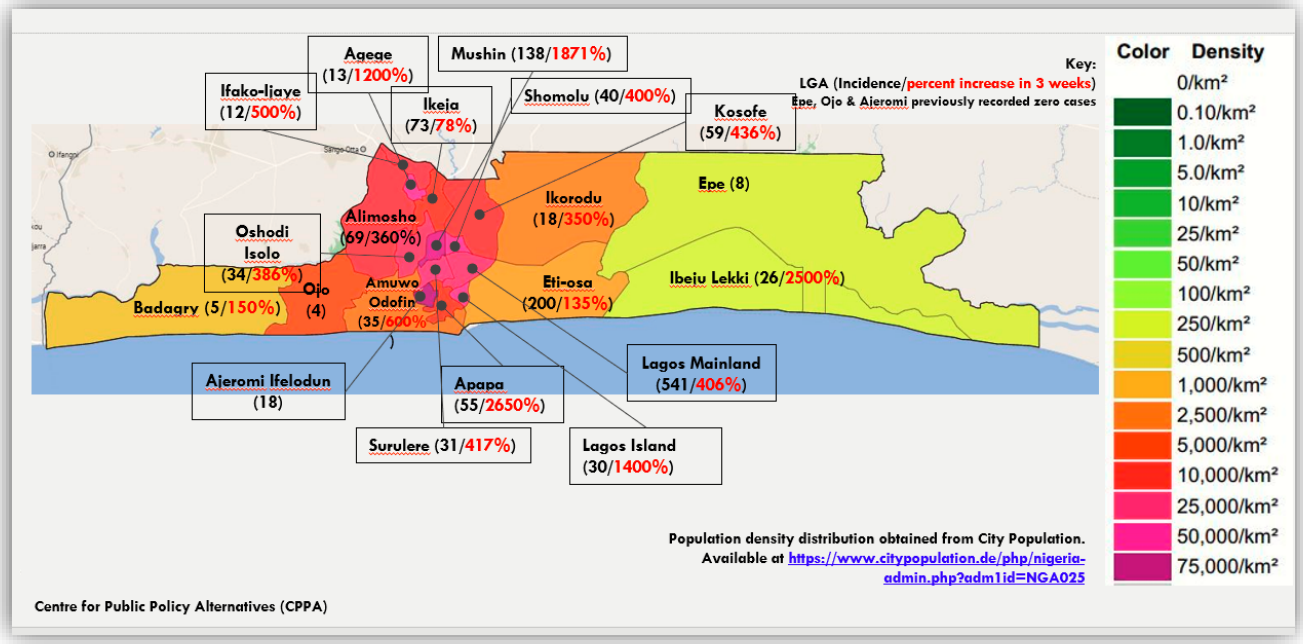

Figure 13.2. COVID-19 Incidence in Lagos State by Local Government Area @ 8 May 2020

Notes: Epe, Ojo and Ajeromi each had a base of zero case. Rate of increases in infections is not conditioned on testing scale across the Local Government Areas (LGA) because the relative frequency distribution of the testing across the LGAs is not available.

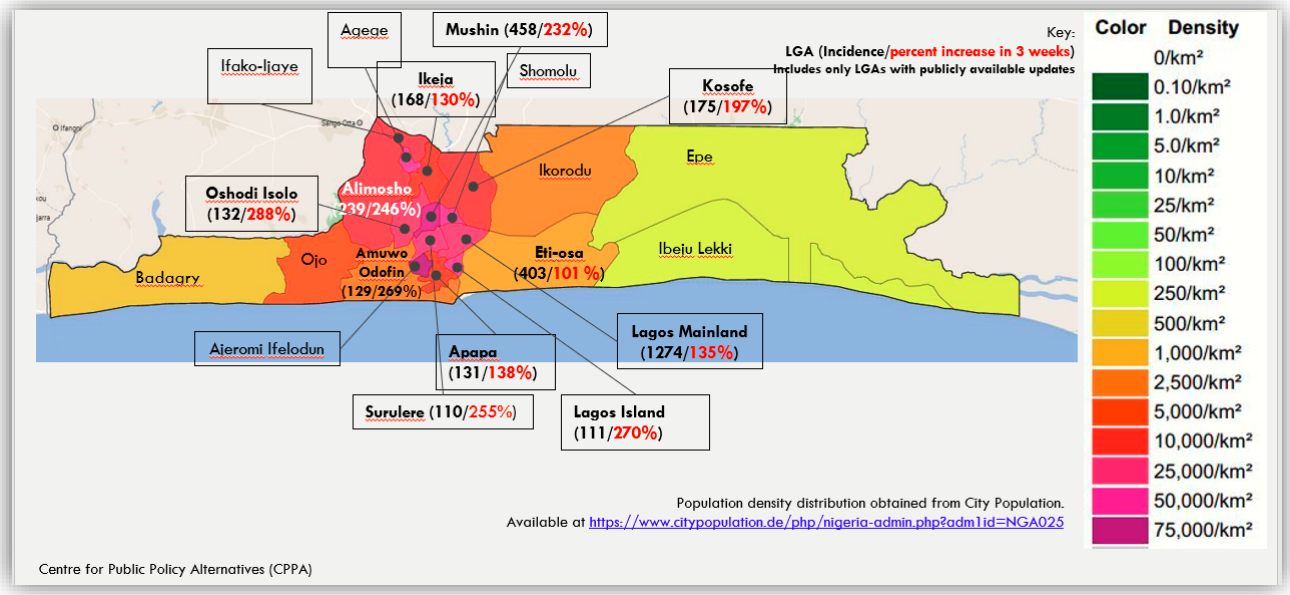

Figure 13.3. COVID-19 Incidence in Lagos State by Local Government Area @ 29 May 2020

F. Summarizing Thematically

Leadership and Messaging

- People's subjective understanding of the pandemic is key to how the disease plays out in the society. Combating the disease entails a great deal of personal sacrifice that will not be forthcoming in full measure if there is no buy-in from the populace.
- Buy-in such as happened in New Zealand requires credible political leadership.
- From the political leadership, it would be useful to hear a conviction narrative clearly articulating an overall combat strategy that can be a rallying point for the people.
- The social and economic aspects of the pandemic suggest cooperation, sacrifice, discipline, patience, empathy, and integrity to be as important as

material resources and medical proficiency for conquering the challenges of the pandemic.

Social Protection, Testing, Facilitation, and Strategy

- The probable loss of lives from COVID-19 and the immediate threat of starvation and/or death are not a binary question of either-or. Rather, it is a complex problem that presents us with a dilemma—*to resolve the inherent difficulties in safeguarding our livelihood whilst attempting to save lives.*
- The complexity of balancing the danger presented by the virus against the equally lethal human and economic costs of prosecuting the war against the virus requires both a survival strategy and a strategy for general economic recovery.
- Testing, its reliability, and how it is organized matter crucially in forming a fair assessment of the situation reports constantly being disseminated.
- Data is still not reported in sufficient detail about demographic and socioeconomic profiles of the dead and clinically confirmed cases. Such details help to determine that society is not unintentionally shifting social responsibilities to personal responsibilities, and that such shifts where they occur, are not influencing which groupings are predominantly catching the disease. Calling for aggregate statistics on demographic and socioeconomic profiles of the patients helps to ensure that our most vulnerable groups are not being disregarded callously.
- As a trend-setter, marginal hazard rate is a useful pointer in spotting where optimally testing should be directed.
- So far, operational command and control mechanisms appear to be a mixed bag. Commands are sharp but monitoring and enforcement are

necessarily blunt instruments. Blunt because their efficacy is dependent on a widely dispersed set of actors and factors. Some of the necessary drivers need not be pecuniary. Here, mindset is crucial. Unfortunately, lots of people by their behavior appear to be either skeptical of the pandemic, reckless, pessimistic, or totally unconcerned. Policymaking can do little about measures which require self-help and commitment if the subject is unwilling to participate.

- If attitude is a problem, then policymakers ought to be interested in research on medical anthropology as part of the mobilize and transition effort.

- We have also come to understand that the socially beneficial idea of finding safe regimes means that there are yet others who must remain under lockdown or forcibly constrained in their socioeconomic endeavors. Others who may have to stay down so that all of us can be safer. Therefore, the following issues must remain in focus.

    - The scale and nature of relief resources that have been marshalled.

    - Monitoring and evaluation of ongoing roll out of the alleviation programs.

    - A view which is strongly shared by some of the donors is to specify performance yardsticks against which management of the assembled resources must be appraised.

G. Recommendations

1. The pandemic is still raging. Therefore, it is not too late to deliver a conviction narrative around which the people can rally.
2. Socially prepare Nigerians to begin learning to lead near-normal lives in abnormal times, accepting that life will never be as it was in the beginning, nor is it necessary that it reverts.
3. Design an ecologically rational co-existential strategy, meaning that the resilience plan must first acknowledge Nigeria's pre-COVID-19 hostile business environment. Then recognize that depending on the lessons learned from the current adversity and how far those lessons go in influencing both the immediate and future course of conduct, the new business environment may not be necessarily worse than status quo ante. Therefore, the current hardship may be an opportunity to go forward right or sink deeper with far dimmer prospects of emerging.
4. In the journey to resilience, coopt Nigeria's scientific community to craft robust guidelines for coexisting with COVID-19.
5. Emphasize the role of academia and the media in establishing *Nigeria's COVID-19 Knowledge Commons* as the credible voice of Nigeria's scientific community on the pandemic.
6. Evidently, contact tracing is not scaling up suitably. Therefore, it bears repeating that whatever may be the reason for the gloomy condition of contact tracing, adequate resourcing of NCDC must remain paramount. As a vital component of process control and in the overall context of the envisaged programmed return to near normalcy, their task is about to ramp up.

7. Notwithstanding enormous political and social pressures appearing in all conceivable forms to lobby for social activities and business services to be reopened, the reopening scheme must remain merit based. It should be approached on a risk-based assessment. Reopening of churches, mosques, hotels, and interstate travels are glaring examples. On this score, Lagos State is blazing the trail.

H. Concluding Remarks

We are only human. So, let us end on a note of humility, not hubris. If history is any guide, we should expect that while society struggles to adapt to the changes induced by the virus, the virus could already be evolving. In turn, these dynamics reshape the environment. In the presence of such flux and rapid learning, mistakes are inevitable. Therefore, robustness of systems is more important than precision; better to be vaguely correct than elegantly wrong. Moreover, decision making in such uncertain environment with severe information limitations may often come to rely on a rule of thumb (heuristics) than complex reasoning requiring detailed analysis and more information.

Whilst acknowledging that often facts don't change minds, still by providing analytic lenses through which Nigerians can view events affecting their lives, livelihood, and those of fellow citizens, this study will have helped some people gain a keen perspective on the issues at stake. When these gains influence people's beliefs, it can lead them to choose wisely among competing alternatives.

Here is a parting shot which although is directed to the United States by the author, nonetheless is considered to be relevant for Nigeria and supposedly many other jurisdictions. Therefore, we shall end on the points stressed thereby.

Even within academic psychology, scholars are prone to focusing on individuals who make suboptimal choices—workers who do not save, or employees who choose bad retirement investments. In the pandemic, this urge is a red herring; it is too easy to focus on people making bad choices rather than on people *having* bad choices. People should practice humility regarding the former and voice outrage about the latter.

… The bad judgments that really deserve shaming include the failure to facilitate testing, failure to protect essential workers, failure to release larger numbers of prisoners from facilities that have become COVID-19 hot spots, and failure to create the material conditions that permit strict isolation. … half-hearted reopening is a psychological morass, a setup for defeat that will be easy to blame on irresponsible individuals while culpable institutions evade scrutiny.

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30 June 2020

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Tables

Table 1. Testing for SARS-CoV-2 Infections: A Global Perspective @12 May and 16 June 2020

	Country/Region	*Number of Tests*		*Confirmed Cases*		*Tests/'000 population*		*Hazard Rate %*	
		12 May	16 June	12 May	16 June	12 May	16 June	12 May	16 June
	Global	NA	NA	4,337,602	8,282,646	NA	NA	NA	NA
	Sub Saharan Africa								
1	Angola	3,000	10,000	45	148	0.094	0.314	1.50	1.48
2	Benin Republic	25,015	37,301	327	532	2.120	3.161	1.31	1.43
3	Burkina Faso	NA	NA	766	895	NA	NA	NA	NA
4	Cameroun	NA	NA	2,689	9,864	NA	NA	NA	NA
5	Chad	NA	NA	357	853	NA	NA	NA	NA
6	Ethiopia	39,048	192,087	261	3,630	0.348	1.714	0.67	1.89
7	Ghana	162,184	255,971	5,127	12,193	5.332	8.415	3.16	4.76
8	Kenya	32,938	121,956	715	3,860	0.627	2.320	2.17	3.17
9	Mozambique	4,365	20,263	104	638	0.135	0.626	2.38	3.15
10	Namibia	1,543	5,919	16	34	0.618	2.372	1.04	0.57
11	Niger	5,642	6,317	854	1,016	0.242	0.271	15.14	16.08
12	Nigeria	29,408	103,799	4,787	17,164	0.146	0.517	16.28	16.54
13	Rwanda	43,379	96,801	286	636	3.435	7.666	0.66	0.66
14	South Africa	369,697	1,148,933	11,350	76,334	6.313	19.620	3.07	6.64
15	Togo	11,041	25,589	199	537	1.366	3.166	1.80	2.10
	MENA								
16	Algeria[#]	6,500	NA	6,067	11,147	0.151	NA	93.34	NA
17	Iran	615,477	1,293,609	110,767	192,439	7.423	15.601	18.00	14.88
18	Qatar	135,294	300,499	25,149	82,077	47.773	106.108	18.59	27.31
	North America								
19	Canada	1,145,683	2,216,730	71,157	99,467	30.624	59.253	6.21	4.49
20	Mexico	135,116	415,097	36,327	150,264	1.059	3.254	26.89	36.20
21	USA	9,935,720	25,729,368	1,408,636	2,208,400	30.159	78.098	14.18	8.58
	Caribbean								
22	Dominican Republic	42,615	112,603	10,900	23,686	3.968	10.485	25.58	21.03
23	Haiti	1,296	9,047	209	4,441	0.115	0.803	16.13	49.09
24	Jamaica	7,271	16,947	505	621	2.466	5.749	6.95	3.66
25	Trinidad & Tobago	2,358	4,111	116	123	1.690	2.947	4.92	2.99
	South America								
26	Argentina	87,547	245,059	6,563	34,159	1.955	5.472	7.50	13.94
27	Brazil	735,224	1,628,482	177,602	928,834	3.484	7.716	24.16	57.04
28	Chile	303,340	873,533	31,721	215,871	16.006	46.092	10.46	24.71

29	Peru	532,169	1,396,605	72,059	237,156	16.369	42.959	13.54	16.98
30	Venezuela	525,902	1,081,542	423	3,150	18.442	37.928	0.08	0.29
	Asia (Western Pacific)								
31	China	NA	NA	82,919	83,221	NA	NA	NA	NA
32	Japan	223,649	344,526	15,968	17,587	1.763	2.716	7.14	5.10
33	South Korea	680,890	1,119,767	10,936	12,155	13.292	21.860	1.61	1.09
	South East Asia								
34	India	1,759,579	5,921,069	74,292	354,161	1.288	4.333	4.22	5.98
35	Sri Lanka	37,662	88,734	889	1,915	1.766	4.161	2.36	2.16
	Europe								
36	France**	1,384,633	1,384,633	178,225	157,716	21.260	21.260	12.87	11.39
37	Germany	2,755,770	4,694,147	173,171	188,382	32.997	56.206	6.28	4.01
38	Italy	2,673,655	4,695,707	221,216	237,500	44.156	77.551	8.27	5.06
39	Russia	5,805,404	5,395,417	232,243	545,458	39.798	105.541	4.0	3.54
40	Spain	2,467,761	4,826,516	269,520	291,408	52.801	103.270	10.92	6.04
41	Turkey	1,440,671	2,721,003	141,475	181,298	17.268	32.614	9.82	6.66
42	Ukraine	187,307	507,251	16,023	32,476	4.258	11.530	8.55	6.40
43	United Kingdom	2,007,146	6,981,493	226,463	298,136	29.722	103.384	11.28	4.27
	Oceania								
44	Australia	877,927	1,844,126	6,964	7,347	34.834	73.171	0.79	0.40
45	Fiji	1,300	2,431	18	18	1.461	2.731	1.38	0.74
46	New Zealand	197,084	312,648	1,497	1,506	41.205	65.367	0.76	0.48

Notes: MENA means Middle East and North Africa. Population figures were obtained from United Nations World Population Prospects (WPP), 2019. Data on testing is from https://www.worldometers.info/coronavirus/. All computations by the author. Based on the number of people tested, *hazard rate* is a value which estimates the chances of testing positive, assuming that the test is discerning. The value is obtained as the ratio of clinically confirmed cases to the number of susceptible persons tested. Ideally, the hazard rate should be viewed in conjunction with the testing intensity (tests/'000 of the population). The higher the number of tests conducted, the more trustworthy is the hazard rate as an indicator. To make the hazard rates comparable across countries, it would have to be qualified with the testing intensity which practically estimates the odds of being tested in each population. It can be viewed as a proxy for the testing regime. Whereas some regimes are relatively proactive, others test only cases showing symptoms or suspected of having been exposed. "#" indicates that data for Algeria is problematic; details are discussed in the main text in conclusion of this section. Total tests for Algeria are no longer published on Worldometer. "**" says that test data from France has remained the same since 12 May 2020 update whereas the number of confirmed cases reduced by approximately 20,000 perhaps due to a reporting error during 12 May 2020 updating. However, current data for France on Worldometer appears consistent with media reports.

Table 2: COVID-19 Fatalities - A Global Perspective @ 12 May and 16 June 2020

	Country/Region	*Deaths*		*Population @ 2019 ('000)*	*Deaths/ '000 population*		*CFR (%)*	
		12 May	16 June		12 May	16 June	12 May	16 June
	Global	**289,071**	**445,188**	**7,713,468**	**0.03748**	**0.05772**	**6.66**	**5.37**
	Sub Saharan Africa							
1	Angola	2	6	31,825	0.00006	0.00019	4.44	4.05
2	Benin Republic	2	9	11,801	0.00017	0.00076	**0.61**	**1.69**
3	Burkina Faso	51	53	20,321	0.00251	0.00261	6.66	5.92
4	Cameroun	125	276	25,876	0.00483	0.01067	4.65	2.80
5	Chad	40	74	15,947	0.00251	0.00464	11.20	8.68
6	Ethiopia	5	61	112,079	0.00004	0.00054	1.92	1.68
7	Ghana	22	58	30,418	0.00072	0.00191	0.43	0.48
8	Kenya	36	105	52,574	0.00068	0.00200	**5.03**	**2.72**
9	Mozambique	0	4	32,366	0.00000	0.00012	0.00	0.63
10	Namibia	0	0	2,495	0.00000	0.00000	0.00	0.00
11	Niger	47	66	23,311	0.00202	0.00283	5.50	6.50
12	Nigeria	158	455	200,964	0.00079	0.00226	3.30	2.65
13	Rwanda	0	2	12,627	0.00000	0.00016	0.00	0.31
14	South Africa	206	1,625	58,558	0.00352	0.02775	1.81	2.13
15	Togo	11	13	8,082	0.00136	0.00161	**5.53**	**2.42**
	MENA							
16	Algeria	515	788	43,053	0.01196	0.01830	8.49	7.07
17	Iran	6,733	9,065	82,914	0.08120	0.10933	6.08	4.71
18	Qatar	14	80	2,832	0.00494	0.02825	0.06	0.10
	North America							
19	Canada	5,169	8,213	37,411	**0.13817**	0.21953	7.26	8.26
20	Mexico	3,573	17,580	127,576	0.02801	0.13780	9.84	11.70
21	USA	83,425	119,132	329,450	**0.25323**	0.36161	5.92	5.39
	Caribbean							
22	Dominican Republic	402	615	10,739	0.03743	0.05727	3.69	2.60
23	Haiti	16	76	11,263	0.00142	0.00675	7.66	1.71
24	Jamaica	9	10	2,948	0.00305	0.00339	1.78	1.61
25	Trinidad & Tobago	8	8	1,395	0.00573	0.00573	6.90	6.50
	South America							
26	Argentina	319	878	44,781	0.00712	0.01961	4.86	2.57
27	Brazil	12,404	45,456	211,050	0.05877	0.21538	6.98	4.89
28	Chile	335	3,383	18,952	0.01768	0.17850	1.06	1.57
29	Peru	2,057	7,056	32,510	0.06327	0.21704	2.85	2.98
30	Venezuela	10	27	28,516	0.00035	0.00095	**2.36**	**0.86**

	Asia (Western Pacific)							
31	China	4,633	4,634	1,433,784	0.00323	0.00323	5.59	5.57
32	Japan	657	927	126,860	0.00518	0.00731	4.11	5.27
33	South Korea	258	278	51,225	0.00504	0.00543	2.36	2.29
	South East Asia							
34	India	2,415	11,921	1,366,418	0.00177	0.00872	3.25	3.37
35	Sri Lanka	9	11	21,324	0.00042	0.00052	1.01	0.57
	Europe							
36	France	26,991	29,547	65,130	0.41442	0.45366	15.14	18.73
37	Germany	7,738	8,910	83,517	0.09265	0.10668	4.47	4.73
38	Italy	30,911	34,405	60,550	0.51050	0.56821	13.97	14.49
39	Russia	2,116	7,284	145,872	0.01451	0.04993	0.91	1.34
40	Spain	26,920	27,136	46,737	0.57599	0.58061	9.99	9.31
41	Turkey	3,894	4,842	83,430	0.04667	0.05804	2.75	2.67
42	Ukraine	425	912	43,994	0.00966	0.02073	2.65	2.81
43	United Kingdom	32,692	41,969	67,530	0.48411	0.62149	14.44	14.08
	Oceania							
44	Australia	97	102	25,203	0.00385	0.00405	1.39	1.39
45	Fiji	0	0	890	0.00000	0.00000	0.00	0.00
46	New Zealand	21	22	4,783	0.00439	0.00460	1.40	1.46

Notes: MENA is Middle East and North Africa. Computation by the author. Data source https://www.worldometers.info/coronavirus/. Population figures were obtained from United Nations World Population Prospects (WPP), 2019. Global crude death rate is 7.5%. CFR is Case Fatality Rate defined as the proportion of the clinically confirmed cases which prove deadly. Cleary from the definition, CFR depends on the testing regime in place. As detailed in the main text, ideally to make the numbers comparable, they should be adjusted for differences due to variations in the testing regime of individual countries. Hence, we compare changes over time in CFR within the same country only. Remarkably many countries appear to be holding steady on case fatalities.

Table 3. Nigeria: Testing Scale - National Aggregates

Date	*Cumulative Total Tests*	*New (daily) Tests*	*New Cases*	*Total Infections*	*Marginal Hazard Rate %*	*Hazard Rate %*
17-Apr	7,153	504	51	493	10.12	6.89
18-Apr	7,636	483	48	541	9.94	7.08
19-Apr	8,003	367	86	627	23.43	7.83
20-Apr	8,587	584	38	665	6.51	7.74
21-Apr	8,934	347	117	782	33.72	8.75
22-Apr	9,522	588	91	873	15.48	9.17
23-Apr	10,061	539	108	981	20.04	9.75
24-Apr	10,431	370	114	1,095	30.81	10.50
25-Apr	10,918	487	87	1,182	17.86	10.83
26-Apr	11,426	508	91	1,273	17.91	11.14
27-Apr	12,004	578	64	1,337	11.07	11.14
28-Apr	12,828	824	195	1,532	23.67	11.94
29-Apr	13,689	861	196	1,728	22.76	12.62
30-Apr	15,759	2,070	204	1,932	9.86	12.26
1-May	16,588	829	236	2,168	28.47	13.07
2-May	17,566	770	220	2,388	28.57	13.59
3-May	18,536	970	169	2,557	17.42	13.79
4-May	19,512	976	245	2,802	25.10	14.36
5-May	21,208	1,696	148	2,950	8.73	13.91
6-May	22,492	1,284	195	3,145	15.19	13.98
7-May	23,835	1,343	381	3,526	28.37	14.79
8-May	25,015	1,180	386	3,912	32.71	15.64
9-May	25,951	936	239	4,151	25.53	16.00
10-May	27,078	1,127	248	4,399	22.01	16.25
11-May	28,418	1,340	242	4,641	18.06	16.33
12-May	29,408	990	146	4,787	14.75	16.28
13-May	30,657	1,249	182	4,969	14.57	16.21
14-May	31,702	1,045	188	5,157	17.99	16.27
15-May	32,924	1,240	288	5,445	23.23	16.54
16-May	33,970	1,028	176	5,621	17.12	16.55

17-May	35,345	1,375	338	5,959	24.58	16.86
18-May	36,899	916	216	6,175	23.58	16.73
19-May	38,231	1,332	226	6,401	16.97	16.74
20-May	40,043	1,812	284	6,685	15.67	16.69
21-May	41,907	1,864	339	7,024	18.19	16.76
22-May	43,328	1,421	245	7,269	17.24	16.78
23-May	44,458	1,130	265	7,534	23.45	16.95
24-May	45,683	1,225	313	7,847	25.55	17.18
25-May	46,803	1,120	229	8,076	20.45	17.26
26-May	48,544	1,741	276	8,352	15.85	17.21
27-May	49,966	1,422	389	8,741	27.36	17.49
28-May	58,726	1,038	182	8,923	17.53	15.19
29-May	60,825	2,099	387	9,310	18.44	15.31
30-May	62,583	1,758	553	9,863	31.46	15.76
31-May	63,882	1,300	307	10,170	23.62	15.92
1-Jun	65,885	2,003	416	10,586	20.77	16.07
2-Jun	69,801	3,916	241	10,827	6.15	15.51
3-Jun	71,336	1,535	348	11,175	22.67	15.67
4-Jun	73,064	1,728	350	11,525	20.25	15.77
5-Jun	74,999	1,935	328	11,853	16.95	15.80
6-Jun	76,802	1,803	389	12,242	21.58	15.94
7-Jun	78,244	1,442	260	12,502	18.03	15.98
8-Jun	79,948	1,704	315	12,817	18.49	16.03
9-Jun	82,935	2,987	663	13,480	22.20	16.25
10-Jun	85,375	3,756	409	13,889	10.89	16.27
11-Jun	88,432	3,058	681	14,570	22.27	16.48
12-Jun	90,464	2,032	627	15,197	30.86	16.80
13-Jun	92,924	2,460	501	15,698	20.37	16.89
14-Jun	94,323	1,399	403	16,101	28.81	17.07
15-Jun	96,402	2,079	573	16,674	27.56	17.30
16-Jun	103,799	7,397	490	17,164	26.62	16.54
17-Jun	106,006	2,207	587	17,751	26.60	16.75

Notes: Computations from NCDC data. As testing is not a guaranteed outcome for citizens, the hazard rate is the probability of being infected if tested. Because the value of the hazard rate keeps changing with the number of tests, we have also reported the marginal hazard rate to highlight this phenomenon. Observe that whenever the marginal rate exceeds the (average) hazard rate, the hazard rate increases. Conversely, when the marginal rate is lower than the hazard rate, the hazard rate will decline. Thus, the marginal rate is the trend-setter. The period covered by the sample is based on the earliest available complete data set. The entry for total tests on 28 May 2020 includes additional 7,722 tests not initially captured. There have also been revisions in some of the figures for "new tests" in June to include backlogs from reactivated diagnostic laboratories. Correspondingly, there have also been revisions in the figures for "new cases."