Nigeria

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NIGERIA COUNTRY REPORT

FOR USE IN RADIOLOGY OUTREACH INITIATIVES

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I: General Country Profile

A. Geography and Population

The Federal Republic of Nigeria, Africa's most populous country and largest economy, is located on the west coast of Africa. The country has a total land area of 923,768 square kilometers (356,668 square miles), a coastline of 853 kilometers (530 miles) and territorial waters that extend 12 nautical miles out to sea. It is bordered by the Atlantic Ocean in the south and Niger and Chad to the north. Benin lies to the west, while Cameroon represents the eastern border. The capital city, Abuja, is in the center of the country and has a population of 3 million. Lagos, the most populated state is located to the southwest of Abuja, and is twice the size of Abuja and has an estimated population of 18 million. Nigeria's climate varies greatly throughout the country. There is more variability in weather and climate in the northern part of the country. The country's terrain varies considerably, with plains in the north, lowlands in the south, and hills and plateaus in the central region. Coastal swamps and tropical forests dominate the southern terrain, while the north is mostly savannah and semi-desert.

The Niger River and the Benue River are the two main rivers within the country. The Niger River enters Nigeria in the northwest and the Benue River enters through various regions of swamps and tropical rain forests it flows southward to its delta in the Gulf of Guinea.

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Table I: An Overview of Nigeria in Facts and Numbers

Capital	Abuja
Largest City	Lagos
Total Population	174.5 million
Population world rank	8
Percent of total population in rural areas (2011)	50.4 %
Total Area	923,768 sq. km (356,668 sq. mi)
Gross national income per capita	2,450 USD
Life expectancy at birth m/f	49.39/55.77 years
Infant Mortality Rate	72.97 deaths/1,000 live births
Total expenditure on health per capita (2011)	139 USD
Total expenditure of GDP on health (2011)	5.3 %

Table II: Stratified Age distribution (2013 estimate, United Nations)

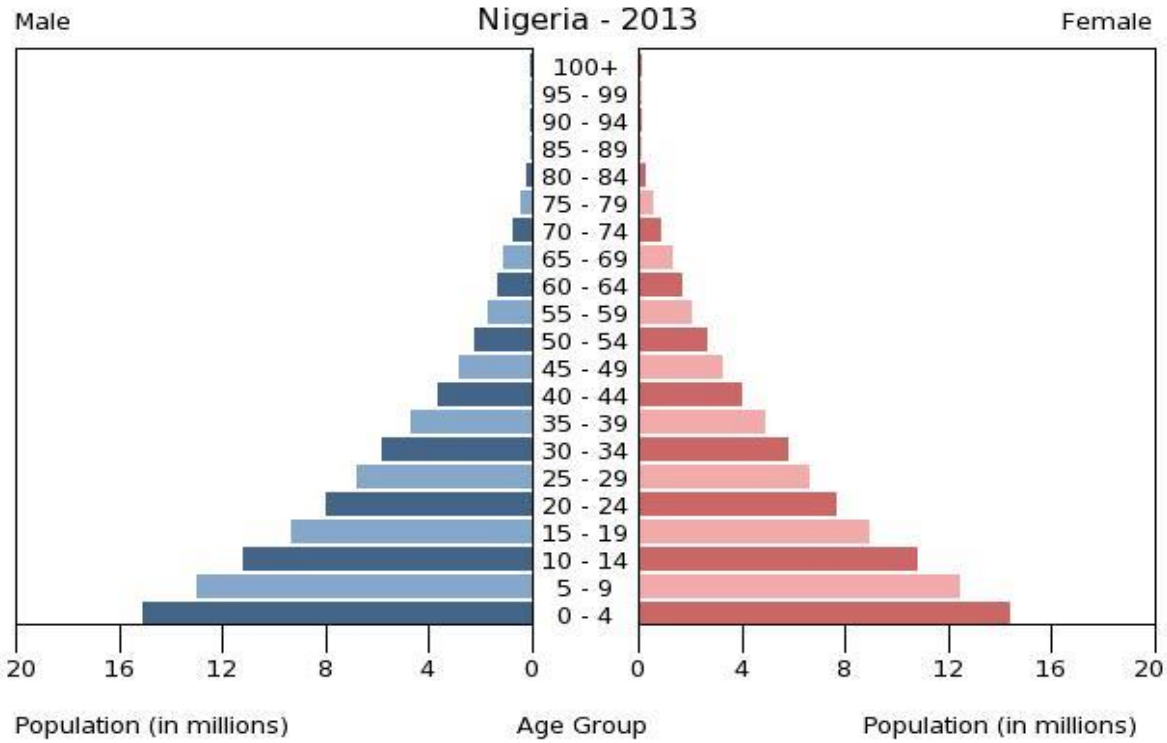

Table III: United Nations (UN) human development index score: 153

Age (years)	Percent of Pop. (%)
0-14	43.8
15-24	19.3
25-54	30.1
55-64	3.8
65+	3

B. Culture and History

The Nigerian people are a diverse mix of more than 250 ethnic groups. Major ethnic groups include the Hausa and Fulani comprising 29% of the country's population, the Yoruba 21%, Igbo (Ibo) 18%, Ijaw 10%, Kanuri 4%, Ibibio 3.5%, and the Tiv, 2.5%. English is the official language of the country, though Hausa, Yoruba, Igbo (Ibo), Fulani, and more than 500 other indigenous languages are spoken. There is an equal divide between Islam in the north and Christianity in the south. There are also a widespread variety of traditional religious practices. This, superimposed on ethnic and regional differences, has historically led to sectarian conflicts amongst the population.

Nigeria gained independence from Britain in 1960. The country itself was formed in 1914 when the British government amalgamated three of its colonial territories. These territories were: Lagos, which was annexed by British government in 1861, The Southern Provinces, in which British government established rule between 1885 and 1894, and The Northern Protectorate, which was controlled by the British government in 1903. Until 1914, the three were governed by Britain as separate but related territories. Between 1922 and 1947 when the constitution was signed into law, a policy of regional representation saw increased local involvement in the government of the country. The constitution of 1954 created regional governments and the first federal elections took place in 1959. In 1963, Nigeria established itself as a republic within the commonwealth.

Political unrest and ethnic clashes ensued with a military rule that came to power in 1965. On May 30, 1967 one of the top military commanders from the east, General Ojukwu, attempted to secede three states of the eastern region forming the Republic of Biafra. This act started a civil war. Biafra collapsed in 1969, and formerly surrendered on January 15, 1970. A return date to civilian rule was postponed multiple times and military rule continued through multiple rulers. In 1979 a series of elections were held for local government counselors, state governors, and legislatures. After a brief period of democratic rule from 1979 to 1983, ensuing political crisis and the economic decline, the nation allowed the military the opportunity to seize power on December 31, 1983. A string of military rulers again followed. Gen Sani Abacha, one of the most brutal military rulers ever known, overtook the country in August, 1993. The Abacha regime resolved all governmental and social institutions, hindered due process of law, freedom

of the press, individual liberties, and openly violated human rights. The country's international image declined until Abachi's death in June 1998. His successor, Gen. Abubakar promised to return power to civilians. Presidential elections were held in February 1999, and a new constitution was promulgated.

C. Government and Legal System

Nigeria is a federal republic of 36 states. Much like the United States, the federal government has limited power and much of the governing power rests in its states. The states retain a certain amount of self-governance and the voters determine governmental officials. Heading the executive branch of government, the president is both the chief of state and head of government, followed by the vice president, and the Federal Executive Council (the president's cabinet). The president is elected to a four-year term by popular vote and is eligible to run for a second term. The legislative branch of government consists of a bicameral National Assembly consisting of the House of Representatives and the Senate, both of which are also elected by popular vote and serve four-year terms. Seven main political parties reside in the Senate, and nine in the House. The judicial branch of government is headed by the Supreme Court. It consists of 15 justices and a chief justice. Nigeria has a mixed legal system comprising of English common law, Islamic Law (in 12 northern states), and traditional law. Judges are appointed by the president, confirmed by the senate, and serve until age 65. There are many subordinate courts at the federal and state level. Some operate based on Islamic sharia law.

Table IV: Worldwide governance indicators (World Bank)

Indictor	Nigeria (2012 est.)	Percentile Rank
Individual voice & accountability	-0.7	27.5
Political stability & absence of violence	-2.2	3.3
Government effectiveness	-1.0	15.8
Regulatory quality	-0.7	25.4
Rule of law	-1.2	10.4
Control of corruption	-1.1	11.0

D. Economy and Employment

Over 95% percent of Nigeria's exports are of petroleum and petroleum products. Cocoa and rubber are the two other main exports. Since 2014, Nigeria's economy has been the largest in Africa and 26th in the world. Nigeria is listed among the "Next Eleven," a list of eleven countries identified by Goldman Sachs as having a high potential of becoming the world's largest economies in the 21st century. According to the World Bank, Nigeria has had a strong economic growth record averaging at 6.5% annually over the past decade.

As reported by the Nigerian National Bureau of Statistics, the unemployment rate of the country was 23.9%, with 17.1% of urban adults (age 15 and up) and 25.6% of rural adults being unemployed. Major economic sectors and thus sectors of employment include agriculture, petroleum, mining, and energy industries. Major imports include refined petroleum (14% of all imports), cars (6.5%), and rice and wheat (6.3%). Major exports include crude petroleum (72% of all exports), petroleum gas (14%), refined petroleum (5.3%), rubber (2.2%), and cocoa beans (1.4%).

E. Physical and Technological Infrastructure

The International Telecommunications Union (ITU) categorizes Nigeria as one of its least connected countries (LCCs) based on 2012 data estimates. With just under 70 out of every 100 inhabitants having mobile-cellular telephone subscriptions, and only 33% of individuals using the Internet due to a shortage of international Internet connectivity and a lack of broadband infrastructure. This has changed in recent years with the emergence of a vibrant telecommunications industry allowing even the poorest members of the population to afford cellular phone. An IUT estimate made in 2010 was that only 50.3% of the population had access to some electricity at the time. The majority of power comes from natural gas, hydropower, and oil. Load shedding (rolling blackouts) is a significant and persisting issue throughout the country.

II: Focused review on national health care

A. National Health Profile:

The National Population Commission (NPC) of Nigeria found that in 2008 on average 73.7% of adult women (ages 15 to 49) report at least one problem with accessing healthcare, with 56.4% having difficulty getting money for treatment, 41.3% not seeking treatment because of concerns that drugs will not be available, 36.2% not wanting to travel the distance to the health facility, 34.0% having difficulty accessing transportation, 33.4% concerned no provider will be available, 20.5% concerned no female provider will be available, and 17.2% not wanting to go alone.

Table V: Public and private health expenditures

Year:	1995	2000	2005	2008	2009
Total expenditure on health (the), billions of USD	1.1	2.1	7.4	11.1	10.7
Private expenditure on health as % of total	74.4	66.5	70.8	63.3	63.7
Public expenditure on health as % of total	25.6	33.5	29.2	36.7	36.3
Total expenditure on health, USD per capita	9.7	17.0	52.6	73.4	69.3

Summary: As of 2009, Nigeria spends 10.7 billion USD on total health expenditure, with the majority (63.7%) of that coming form the private sector. The public sector's health expenditure has been growing over the years, but not consistently.

Table VI: Utilization of health care services

Service:	% Of Population	Year
Contraceptive prevalence	15	2008
Antenatal care coverage (at least four visits)	45	2008
Births attended by skilled health personnel	34	2008
Smear-positive tuberculosis treatment success rate	83	2009
Measles (mcv) immunization coverage among 1-year-olds	71	2010

Summary: As of 2008, 15% of the population uses contraceptives, 45% had at least four visits for antenatal care, and 34% of births were attended by skilled health personnel. As of 2009, 83% of smear-positive TB treatments were successful. As of 2010, 71% of one-year-olds were immunized against measles.

Table VII: Main causes of morbidity and mortality

Main causes of morbidity	(Value %)
1. Malaria	70.5
2. Diarrhea	14.2
3. Dysentery	5.50
4. Pneumonia	4.76
5. Sexually trans dis.	1.96
6. Tuberculosis	0.60
7. Measles	0.37
8. Aids	0.37
9. Cholera	0.36
10. Pertussis	0.30
Source: Department of Public Health, Epidemiological Division, Federal Ministry of Health, Nigeria, 2006.	

Main causes of mortality	(Value %)
1. Malaria	20
2. Lower Respiratory Infections	19
3. HIV	9
4. Diarrheal Diseases	5
5. Road Injuries	5
6. Protein-Energy Malnutrition	4
7. Cancer	3
8. Meningitis	3
9. Stroke	3
10. Tuberculosis	2
Source: Centers for Disease Control and Prevention, United States, 2010.	

Summary: As of 2006, the main causes of morbidity in Nigeria are malaria (70.5%), diarrhea (14.2%), and dysentery (5.5%). As of 2010, the main causes of mortality are malaria (20%), lower respiratory infections (19%), and HIV (9%).

B. National Health Care Structure

All three tiers of government; Federal, State and Local government share responsibilities for providing health services and program. However, health service is ultimately regulated by the federal government. The federal government is largely responsible for providing policy guidance, planning and technical assistance, coordinating state-level implementation of the national health policy, and establishing health management information systems. In addition, the federal

government is responsible for disease surveillance, drug regulation, vaccine management and training health professionals. The federal government is also responsible for the management of teaching hospitals and running some medical centers. The States operate secondary health facilities (general hospitals) and in some cases tertiary hospitals, as well as some primary health care facilities, though ultimately the majority of these are concentrated in urban areas, with rural areas having very few medical centers long distances apart. State authorities are responsible for training health technicians, midwives, and nurses. The local governments oversee the operations of primary health care facilities within their geographic areas. This includes the provision of basic health services, community health hygiene and sanitation. The inadequacy of the public health system has given increasing prominence to the private health sector – profit and non-profit – as well as to traditional and spiritual healers.

Both public and private health insurance are available. The Nigerian government is in the process of expanding health insurance in an effort to achieve universal healthcare coverage through the National Health Insurance Schema (NHIS). This socialization of health insurance will offer programs to cover the formally employed, urban self-employed, tertiary students, armed forces, pregnant women, children under five, disabled persons, and prison inmates. An investigation conducted by USAID in 2013 found that, based on the number of identification cards issued, NHIS covers about 5 million individuals, or about 3% of the total population.

There are 72 public and private hospitals and medical centers in the city of Lagos, Lagos State, and 27 public and private hospitals and medical centers in the city of Port Harcourt, Rivers State. There has also been a reported specialty maldistribution, with the most frequently chosen clinical specialties being internal medicine, surgery, pediatrics, and obstetrics and gynecology, leaving other medical and surgical specialties short-staffed, particularly those in community medicine and public health (Bojuwoye, Araoye, & Katibi; 1998). Residency programs are available in a wide range of specialties, including anesthesiology, dental surgery, family medicine, general dental practice, internal medicine (includes cardiology, clinical hematology, clinical pharmacology, dermatology, endocrinology, gastroenterology, general medicine, nephrology, neurology, pulmonology), obstetrics and gynecology, ophthalmology, otorhinolaryngology, pathology (includes anatomical pathology, chemical pathology, hematology, medical microbiology, histopathology), pediatrics, psychiatry, public health, radiology, and surgery.

III: Radiology in Nigeria

A. Radiology Profile

Early in our project, the University of Maryland RAD-AID Chapter (Baltimore, MD) established a relationship with the Radiology Department at the Lagos University Teaching Hospital (LUTH) in Lagos, Nigeria. The city has one of the most respected Radiology departments in West Africa. One of the RAD-AID members from the University of Maryland RAD-AID team visited LUTH in January of 2015 and the Nigerian survey was primarily based at LUTH. In addition, our RAD-AID chapter member visited numerous prominent private hospitals in the

region and also explored the emergence of entrepreneurial private diagnostic centers emerging throughout Nigeria. The findings of the survey will be stated in the sections below.

B. Training and Professional Representation

Radiology residency training is managed by The National Postgraduate Medical College of Nigeria (NPMCN) and the West African College of Surgeons (WACS). These two principal bodies oversee the activities, certification and management of Radiologists in the country. 14 teaching hospitals in Nigeria and 2 teaching hospitals in Ghana offer Radiology training in the region. Radiology training program does not exist in the other 14 countries in West Africa. The latest estimate of the number of Radiologists currently in Nigeria is between 250 and 300; this equals approximately one Radiologist for every 566 thousand people.

With regards to the training program at LUTH, there are significant shortcomings secondary to the medical system and the country infrastructure as a whole. These problems are the result of systemic issues from the governmental level to the adequate utilization of Radiology support staff. Most of the university hospitals encounter similar systemic shortcomings.

The fundamental backbone of any radiology training program is reviewing volumes of cases, however at most of these public institutions, the essential tools required to operate are not available. The most glaring of these problems is the availability of constant electricity to keep the equipment running. The power supply in the country has been a problem for as long as Nigeria has been in existence. No institution is immune from regular interruptions in power supply, including critical structures such as hospitals or even the international airport. The residents at LUTH spend most of their nights on call without power, which means no radiologic studies will be performed. Strikes by the medical staff also present a significant challenge. During the site visit the professional and support staff including the radiologic technologists, nurses, and maintenance staff had been on a 3-month strike. This shortage of cases forces the residents to cling dearly to what little hard copy radiologic texts they have for learning.

These systemic issues have led to mistrust in the adequacy of locally trained Nigerian radiologists, which has resulted in the importation of expatriates from countries like India to manage entrepreneurial radiology centers.

C. Equipment and Operation

Diagnostic radiology equipment is not evenly distributed across the country. A majority of these resources are situated in the southwestern region of the country, with a substantial proportion in Lagos and the surrounding areas. There are about 50 computed tomography (CT) units in the country, with approximately half of these in the Lagos metropolis. The majority of CT scanners available are 2 slices, while a few are 64 slices and 1 is 128 slices. GE and JNCI are the foremost suppliers of diagnostic equipment across the country. Equipment used in Public hospitals is funded principally by government at the federal and state levels. Other sources of funding include grants, individual and corporate donations. Equipment currently available at LUTH includes a 128 slice CT scanner, 0.2 Tesla permanent magnet MR, 1 mammography unit, 1

non-digital radiographic unit and 4 Ultrasound units – only two of which are functional. There are currently no fluoroscopy or nuclear medicine capabilities at LUTH. All fluoroscopic procedures are currently done using plain radiography. Investigation suggests there are only two gamma cameras in the entire country, neither of which are in Lagos.

Most studies at LUTH are read by film with the exception of CT, for which there is a single cable transmission from the scanner to a computer equipped reading room. Reports are written by hand while the patient waits to be taken back to the ordering physician. Although the system designed to have a photocopy of the report scanned for storage in the department, this is very rarely done. There is no PACS system for image storage, and all images are stored locally on the scanner. There is no expertise in protocol development either. Most of the CT scans are done as routine regardless of the indication. Maintenance of equipment in developing countries is a well-known problem and this is not any different at LUTH. After installation of equipment it can be troublesome to find adequate support. There have been great strides regarding this problem with most centers now entering service contracts or part-ownerships with manufacturers to maintain equipment. When there is a problem however, it can take days before an engineer can be dispatched, and oftentimes this is from a foreign country.

In the private sector, there two major avenues through which radiology is delivered: hospital-based practices and diagnostic radiology centers. Equipment at these hospital-based practices – even the most lucrative ones – are similar to or worse than what is available at public hospitals. These hospital-based practices mainly cater to their inpatients, as outpatients from other hospitals are rarely referred due to fear of competition. Diagnostic centers are mainly privately owned small radiology with radiography, ultrasound and fluoroscopy capabilities. In the last few years, there has been the emergence of exclusively entrepreneurial diagnostic centers in Nigeria. The most prominent of these centers is Mecure Diagnostics, owned by an Indian businessman. Mecure opened its doors in the Nigerian market with plain radiography, ultrasound, 4 slice CT scanner and a 0.3 Tesla MR magnet. In addition to radiology, Mecure offers diagnostics in both laboratory and ophthalmologic arenas. The emergence of these centers significantly reduced the prices of exams in the country, virtually eliminating competition from the small radiologist-owned centers. Rebates offered to referring physicians also plays a major role in their market dominance.

There has been emergence of new competitors like Clinix, a state of the art healthcare center with services including diagnostic radiology, dialysis, endoscopy, cardiac workups, ophthalmology and dentistry. Clinix is owned by an entrepreneurial pharmacist and most of the radiologists are Indian. Mecure and Clinix now boast the three 1.5 Tesla MR systems in the Lagos metropolis. The emergence of these centers is very fast becoming the norm, with increasing inability of standalone centers owned by radiologists to compete.

D. Regulation, Policy and Radiation protection

Policy and regulation is monitored by Nigerian Nuclear Regulatory Authority (NNRA) established under the nuclear safety and radiation protection act of 1995. NNRA is responsible for nuclear safety and radiological protection regulation in the country. At our primary survey center (LUTH), discussions with the staff revealed the majority of the personnel are not

adequately monitored. Although there was a designated Radiation safety officer, at the time of the visit badges had not been read for the past four months. There are no mechanisms in place for estimating or monitoring doses administered to patients during exams, and most of the staff were not familiar with dose modulation techniques. There is an absolute reliance on standard manufacturer settings with minimal education and training on radiation protection.

IV: Conclusion

Similar to the Nigerian economy, radiology in Nigeria has experienced incredible growth in the past several years. Despite this growth, there remains a serious paucity of locally trained and trusted radiology expertise in the country. Our visit to LUTH exposed a myriad of systemic issues –lack of national training and professional representation, inadequate clinical experience, inadequate training tools, a dearth of subspecialty expertise, and lack of consistent electrical power—which has led to this disparity.

The University of Maryland RAD-AID chapter has formed a partnership with the LUTH radiology training program. Current efforts by our chapter to assist trainees at LUTH include:

- **Education:** Recently, over fifty late addition major radiology reference texts were shipped to LUTH to help them establish a hard copy teaching library. We also hope to make available our University of Maryland lecture series in electronic audio and video format. Donation of a modern high definition projector is also a short term goal, as this would be a major boon to the teaching program and the department as a whole. Our chapter has extended invitations to members of the LUTH residency program to attend electives in our department.
- **Protocol Development:** Our chapter will work with the LUTH radiology department to help them expand their current limited CT protocols such that they soon have a more robust indication-specific protocol set that not only minimizes radiation, but also more effectively addresses the clinical question.
- **Expert Consults:** Difficult case interpretation is confounded by a limited number of available subspecialists and a lack of a PACS to facilitate sharing of images. We have extended an invitation to the LUTH program to share difficult cases with our subspecialty groups here at the University of Maryland.

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