ANTIMICROBIAL RESISTANCE (AMR) AS A BIOSECURITY THREAT

9th October 2024

Presented by:

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The Hon. Commissioner for Health, Lagos State

LAGOS STATE BIO-SHIELD

THE PUBLIC HEALTH WAVE, THE SECURITY WAVE, THE ECONOMC WAVE

Biological Agents of Concern

PATHOGENS OF HIGH CONSEQUENCE

Definition

The risk

Impact

Countermeasure

The long term startegy

A pathogen of high consequence

A group of pathogens that pose the highest risk to national security and public health because they can:

- be easily disseminated or transmitted from person to person usually with no specific treatment or vaccine
- Result in high mortality rates and have the potential for major public health impact overwhelming health systems
- Cause public panic, social disruption and insecurity
- Require special action and infrastructure for public health preparedness and drains existing resources
- May be acquired by non state actors for aggressive intention

TEN THREATS TO GLOBAL HEALTH, 2019

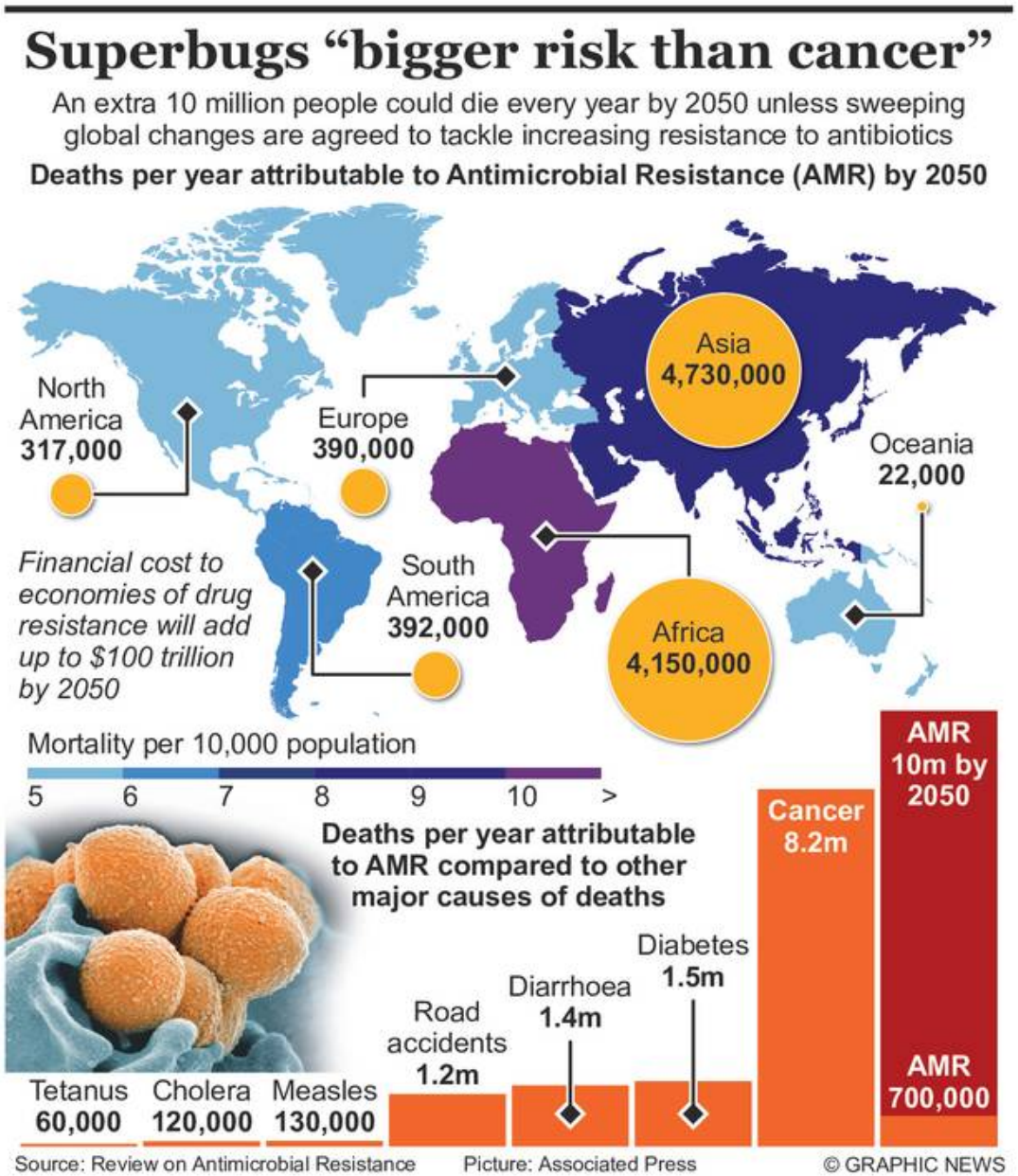
1. Air pollution and climate change
2. Non-communicable disease
3. Global influenza pandemic
4. Fragile and vulnerable settings
5. Antimicrobial resistance
6. Ebola and other high-threat pathogens
7. Weak primary health care
8. Vaccine hesitancy
9. Dengue
10. HIV

AMR IS A BIOSECURITY THREAT IN AFRICA

Antimicrobial resistance responsible for over 700 000 deaths annually and there could be an estimated 4.1 million deaths by 2050, as reported by the World Health Organization (WHO).

AMR is a significant global health threat, and Africa is disproportionately affected due to weak healthcare systems, unregulated access to antibiotics, and lack of comprehensive surveillance.

Anti Microbial Resistance



Tuberculosis (TB) and the fight against Antimicrobial Resistance (AMR)

Why pay attention to tuberculosis

WHO 2021 report, Nigeria is ranked 6th nation with the highest number of TB cases globally. The country contributed 4.4% to the total TB cases globally.

Yearly 245,000 Nigerians succumb to TB with nearly 590,000 new cases reported of these, about 140,000 of them are also HIV positive. TB is responsible for more than 10% of all deaths annually in Nigeria.

Lagos has 32,000 predicted cases a year

We identify about 60% annually and treat in 146 centers

300 are MDRTB

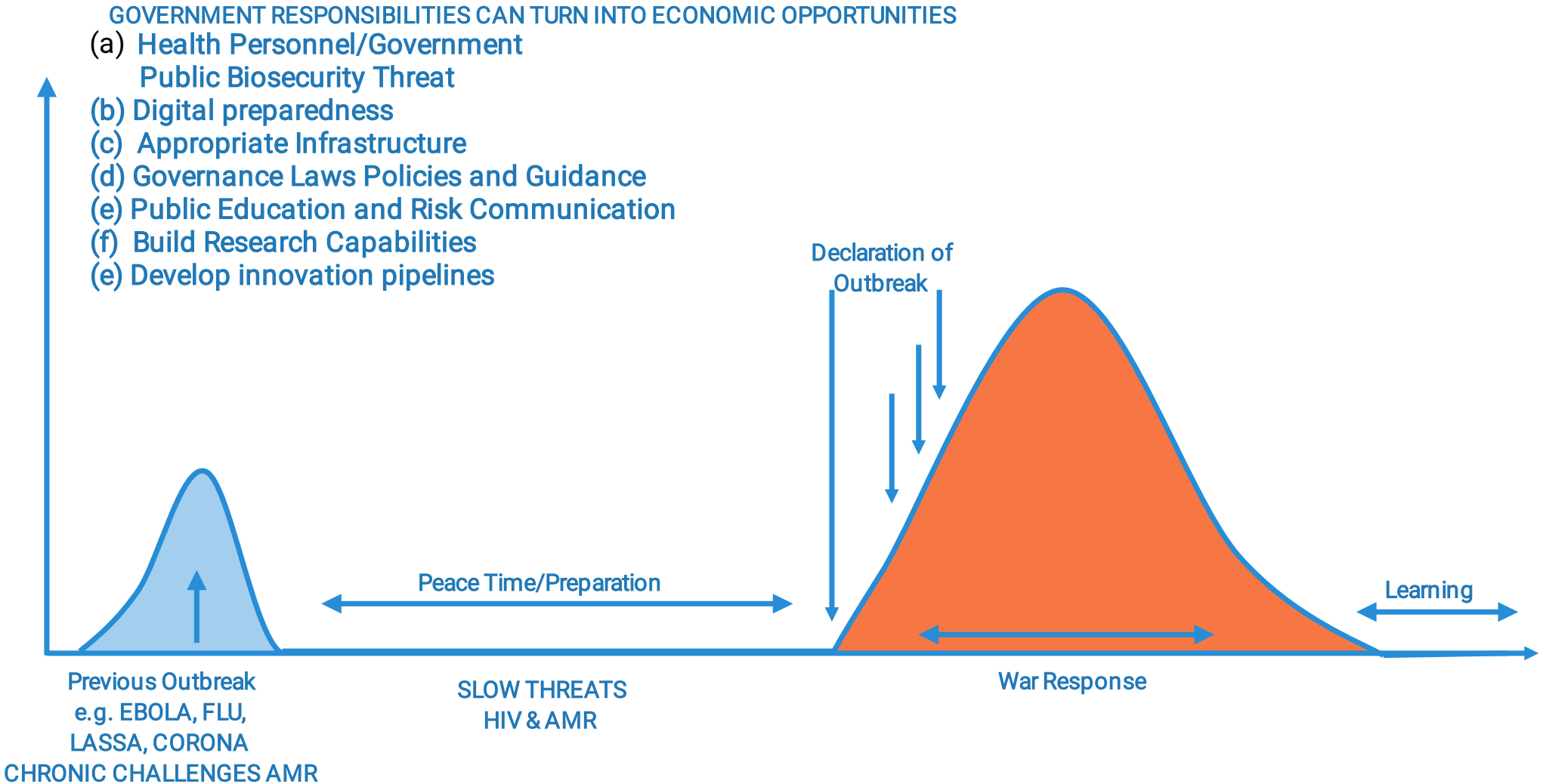
Global Health Implications

- **Global Health Threat:**

AMR poses a significant threat to global health, as resistant infections particularly MDR-TB and XDR-TB, can spread rapidly across borders due to international travel, migration, and trade, challenging global health security.

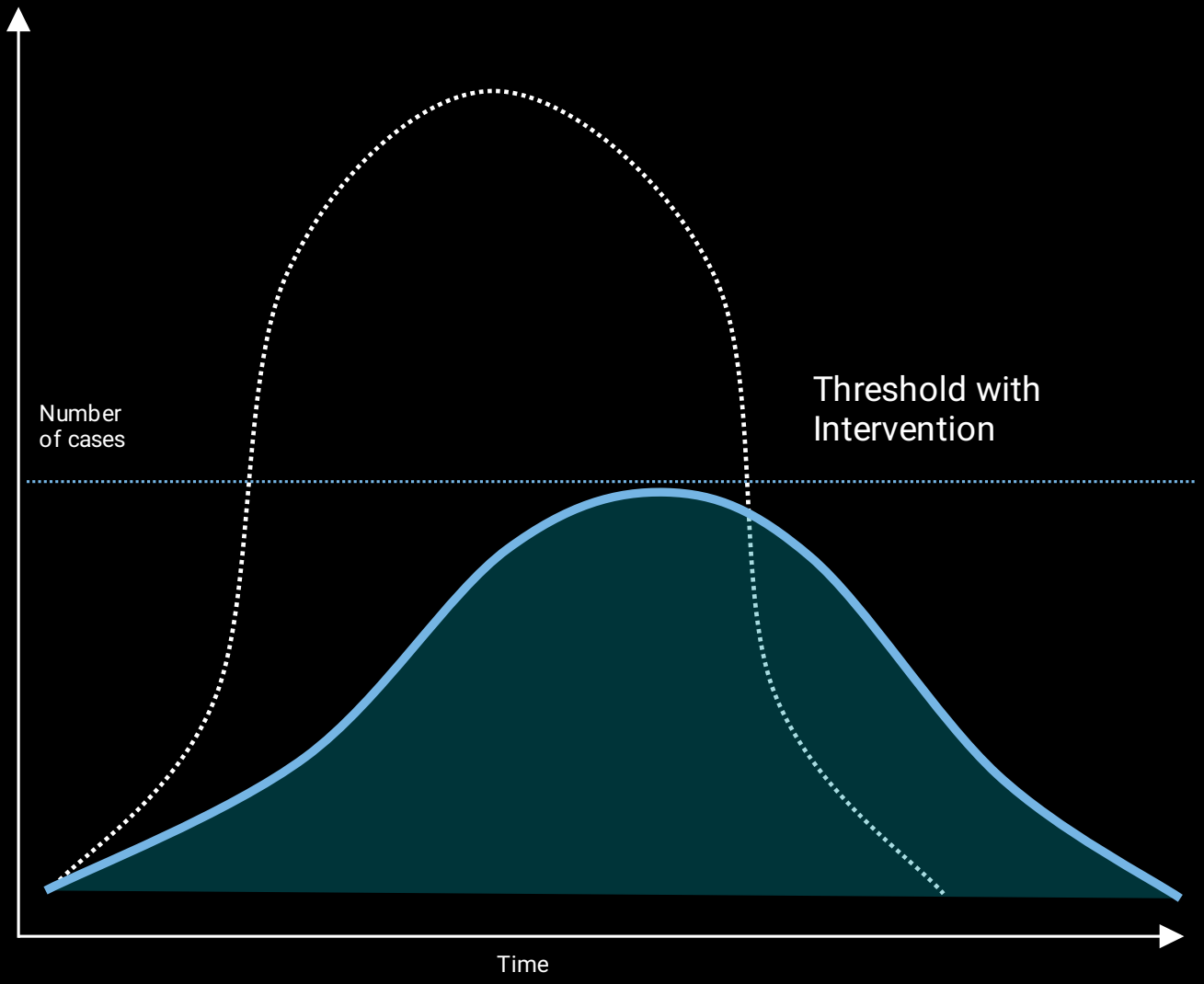
- **Economic Burden:**

The economic burden of AMR in Africa is significant, with increased healthcare costs due to prolonged hospital stays and more expensive treatments. It leads to reduced productivity through higher morbidity and mortality rates, impacting labor and household incomes. AMR also compromises medical procedures and reduces livestock productivity, further straining agricultural economies. Overall, AMR slows economic growth, increases poverty, and threatens food security
across the continent.


GOVERNMENT RESPONSIBILITIES CAN TURN INTO ECONOMIC OPPORTUNITIES
(a) Health Personnel/Government
Public Biosecurity Threat
(b) Digital preparedness
(c) Appropriate Infrastructure
(d) Governance Laws Policies and Guidance
(e) Public Education and Risk Communication
(f) Build Research Capabilities
(e) Develop innovation pipelines
Declaration of Outbreak
Peace Time/Preparation
Learning
Previous Outbreak
e.g. EBOLA, FLU,
LASSA, CORONA
CHRONIC CHALLENGES AMR
SLOW THREATS
HIV & AMR
War Response

Flatten the Curve

When institutes are able to generate intelligence on the nature of the pathogen and how it causes disease, ***interventions can be put in place and minimize the death rate and number of people that contract the disease.***

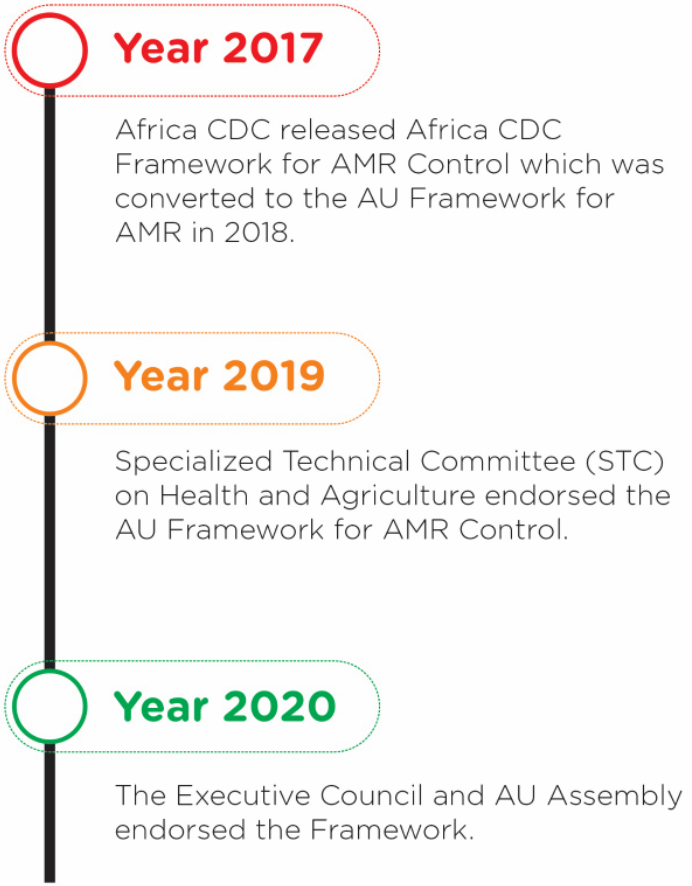


ANTIMICROBIAL RESISTANCE SURVEILLANCE AMR NETWORK AND MAAP.

African Union (AU) Activities on AMR

African Union AMR Framework:

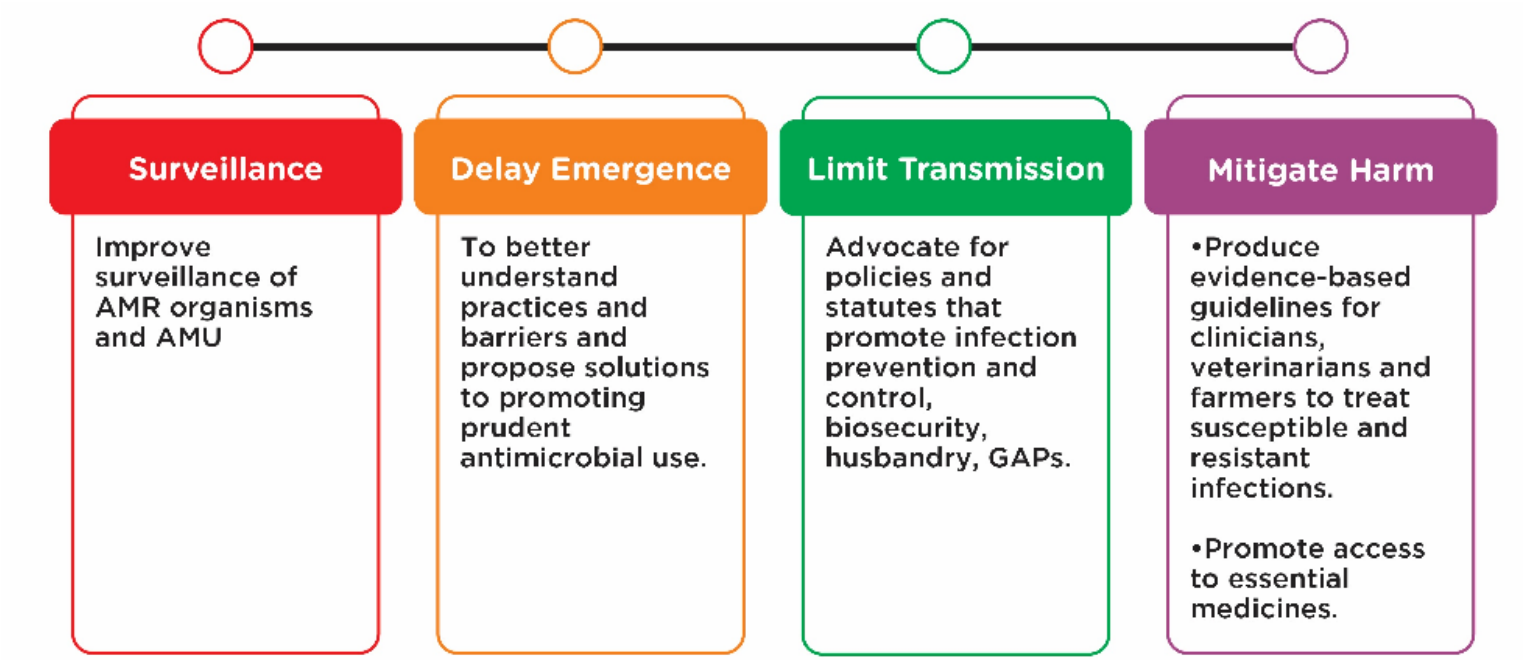
The AU has developed the "Framework for Antimicrobial Resistance Control in Africa," aiming to guide member states in developing and implementing national action plans.



AFRICA CDC'S FRAMEWORK FOR AMR CONTROL

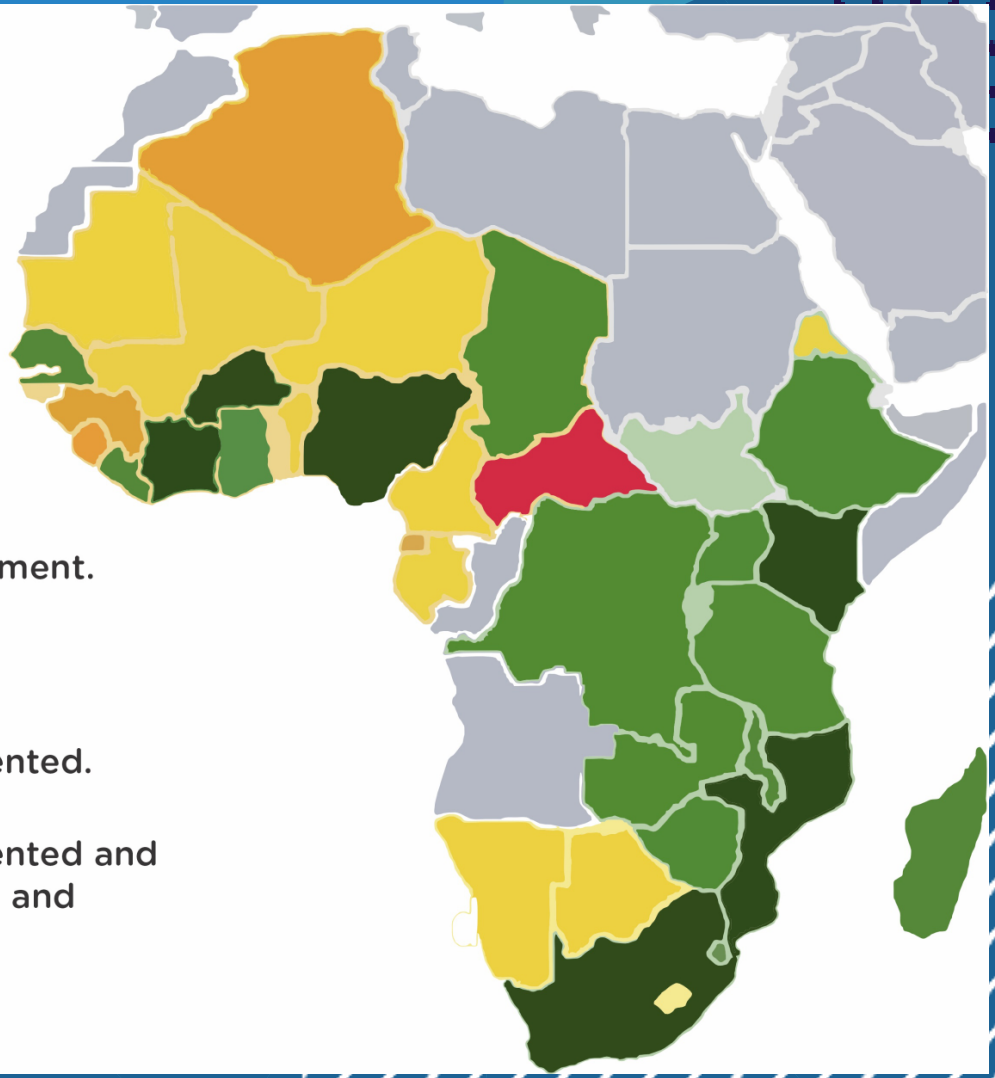
The African Union Framework for AMR Control 2020 – 2025

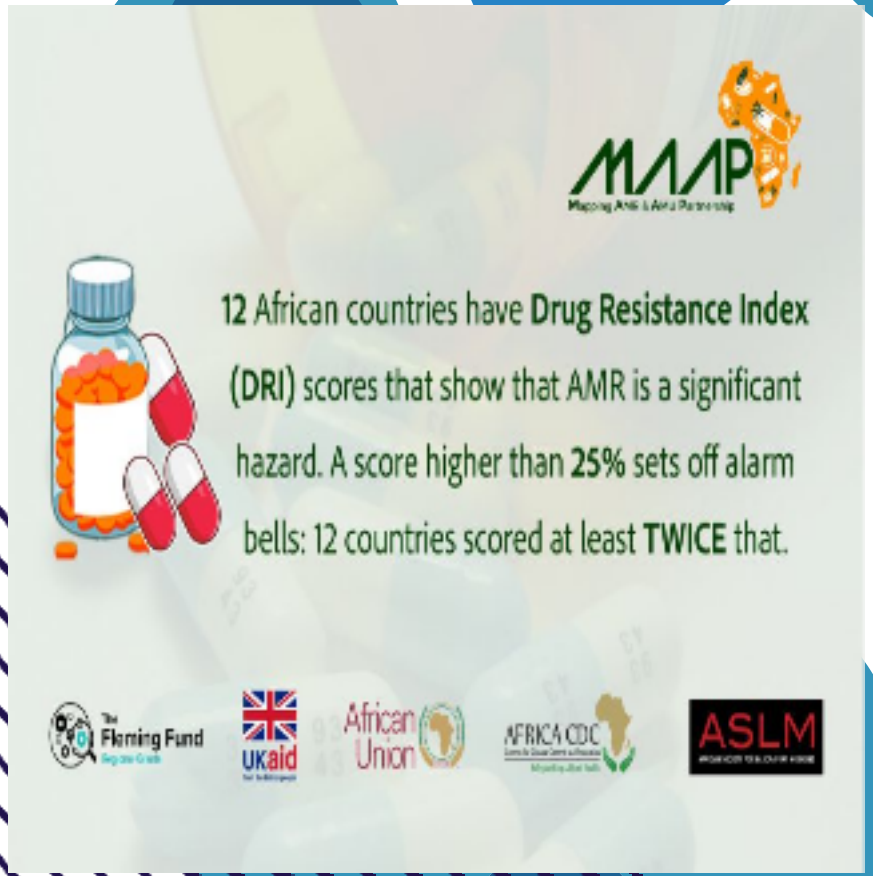
Primary Goals

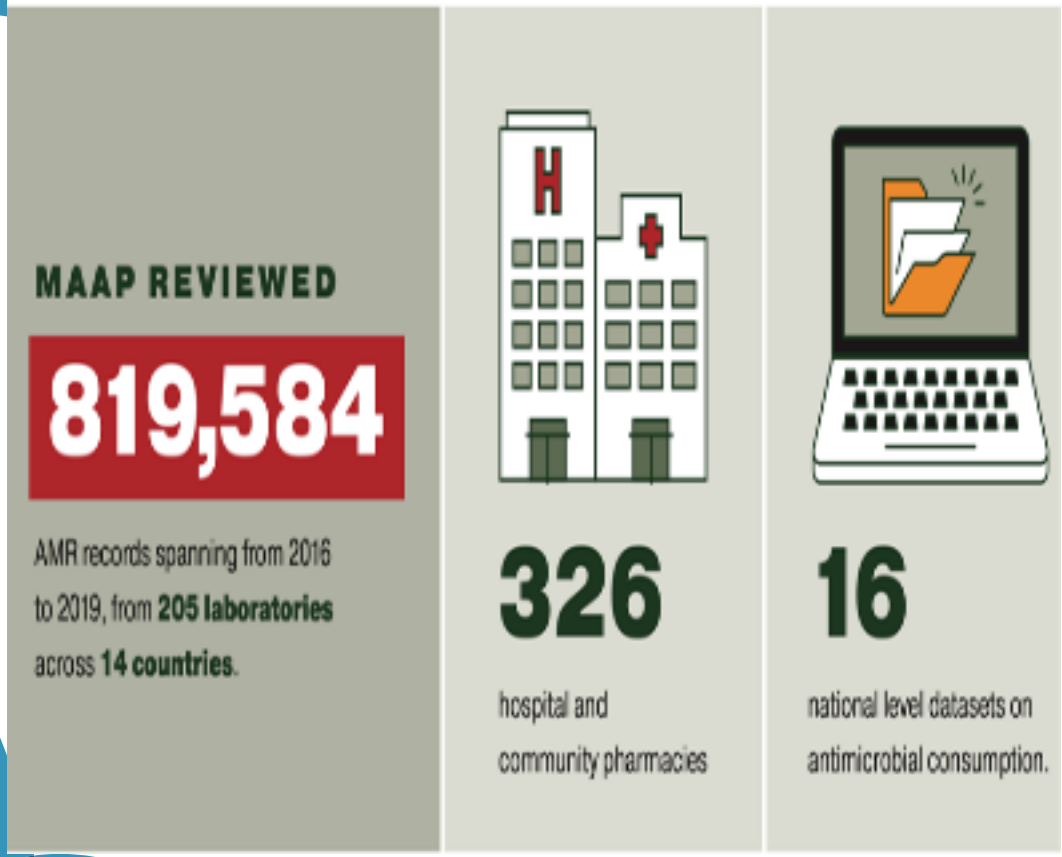


Country progress with development of a national action plan on AMR

- No national AMR action plan.
- National AMR action plan under development.
- National AMR action plan developed.
- National AMR action plan being implemented.
- National AMR action plan being implemented and actively monitored through a monitoring and evaluation framework.




MAAP
12 African countries have Drug Resistance Index (DRI) scores that show that AMR is a significant hazard. A score higher than 25% sets off alarm bells: 12 countries scored at least TWICE that.
The Fleming Fund
UKaid
African Union
AFRICA CDC
ASLM


MAAP REVIEWED
819,584
AMR records spanning from 2016 to 2019, from 205 laboratories across 14 countries.
326
hospital and community pharmacies
16
national level datasets on antimicrobial consumption.

Key Findings from the MAAP Project

The data reveals that only 5 of 15 global antibiotic-resistant priority pathogens, selected by the WHO from 14 sub-Saharan countries, are being consistently tested.

All 5 demonstrate high resistance, indicating an underestimated level of AMR that is directly impacting patient treatment and agriculture.

Although the Africa CDC identified AMR as an urgent public health threat, African surveillance systems is limited and as such, little is known about the scale of the problem.

This has restricted national governments' ability to instigate policies that effectively tackle the ever-growing AMR rates.

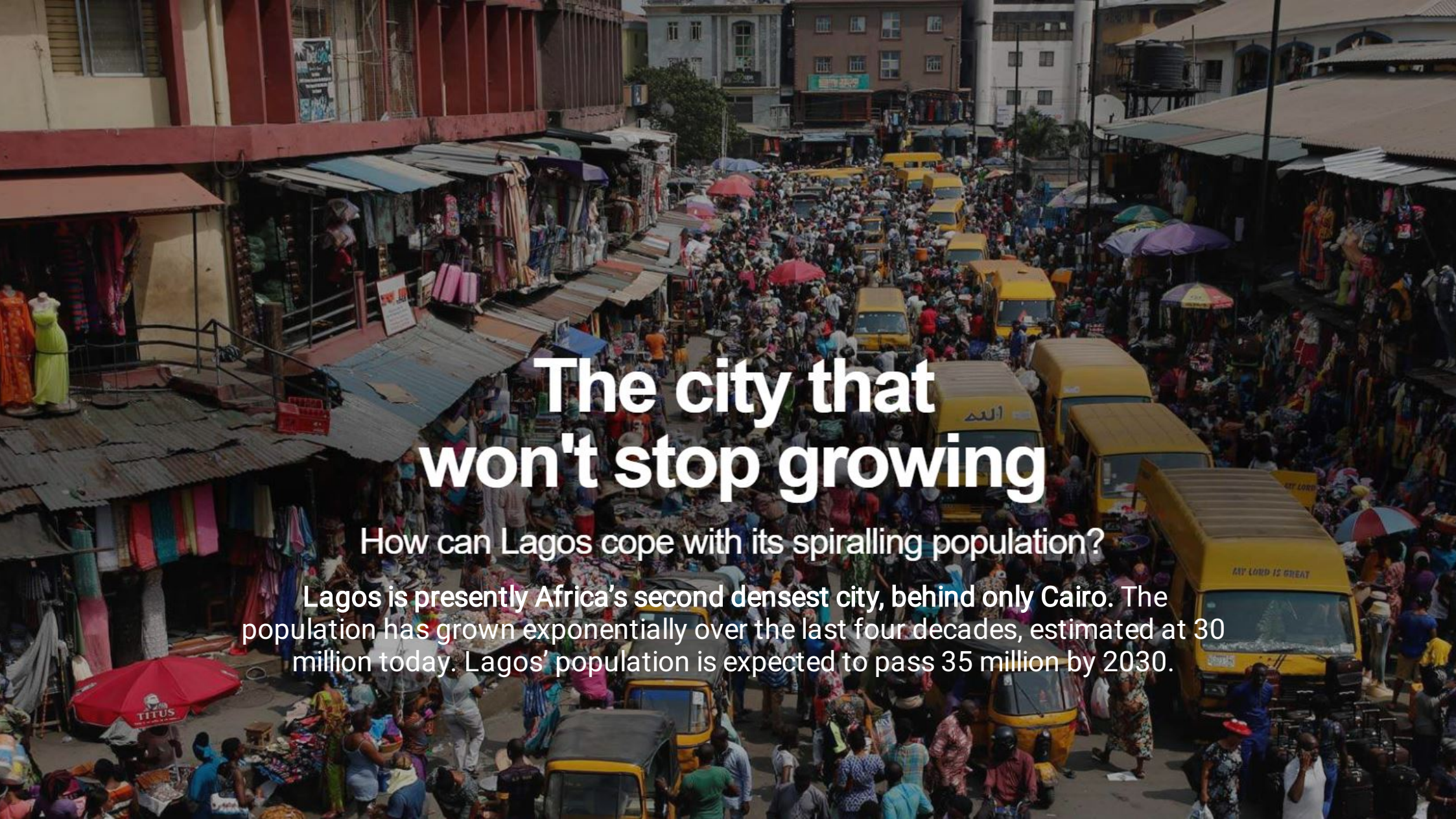
Based on MAAP report, only 1% of the 50,000 medical facilities in the laboratory networks of 14 African countries are equipped for bacteriology testing and AMR analysis.

The study revealed only four drugs made up 67% of all antibiotics used in healthcare, with limited access to more effective antibiotics for treating highly resistant infections like severe pneumonia, sepsis, and abdominal infections.

National Action Plan (NAP) on AMR

Nigeria developed a National Action Plan (2017-2022) aligned with the Global Action Plan on AMR.

Focused on improving awareness, strengthening knowledge through surveillance and research, reducing the incidence of infection, optimizing the use of antimicrobial agents, and developing the economic case for sustainable investment.



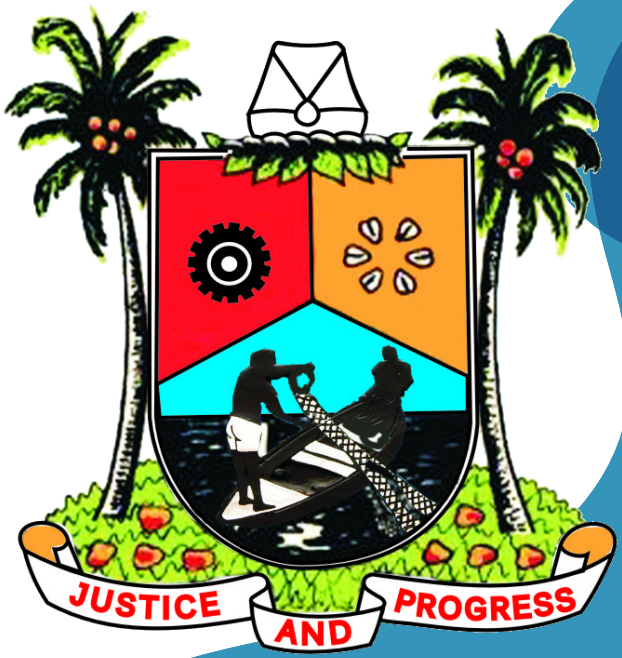
The city that won't stop growing

How can Lagos cope with its spiralling population?

Lagos is presently Africa's second densest city, behind only Cairo. The population has grown exponentially over the last four decades, estimated at 30 million today. Lagos' population is expected to pass 35 million by 2030.

LAGOS STATE'S HOLISTIC AMR PLAN

1. POLICY
2. INFRASRTUCTURE
3. SURVEILANCE
4. HRH
5. DIGITAL
6. RESEARCH
7. INNOVATION
8. DRUG MANAGEMENT



The Responsibility of Government

- Each country has the moral responsibility to protect its people within the social contract from biological crises and threats and protect the integrity of its ecosystem we depend on.
- Government agencies must be able to do the following:

Pre-empt and prevent biosecurity threats

Predict

Mitigate and adapt to insidious unavoidable environmental changes

Find and clearly identify a threat when it emerges

Respond

Restore calm and civil disruption & build resilience

Requires operational systems, policies and regulations and Legislation to deter threats and enable a rapid scale up should an emergency occur despite preventative measures

Trained workforce, Role of Tertiary Academic Institutions, labs, environmental and public health monitoring and surveillance systems, and emergency response inclusive of law enforcement.

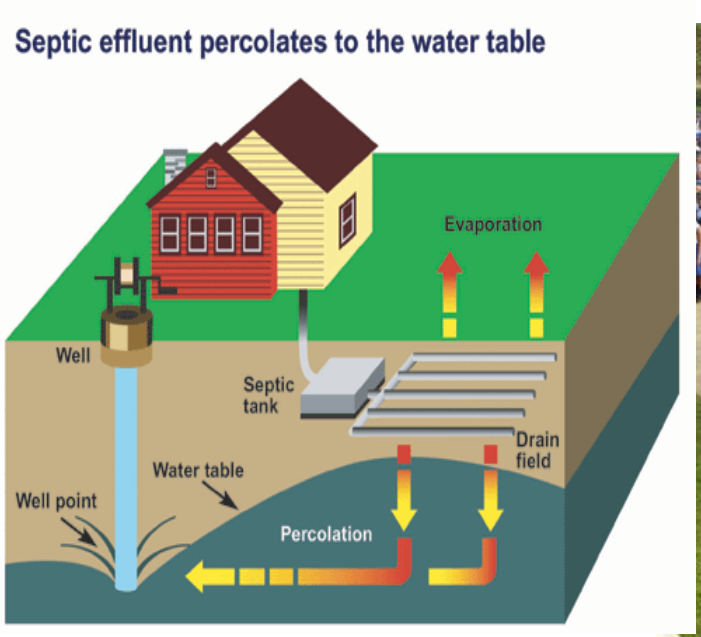
A well-informed populace

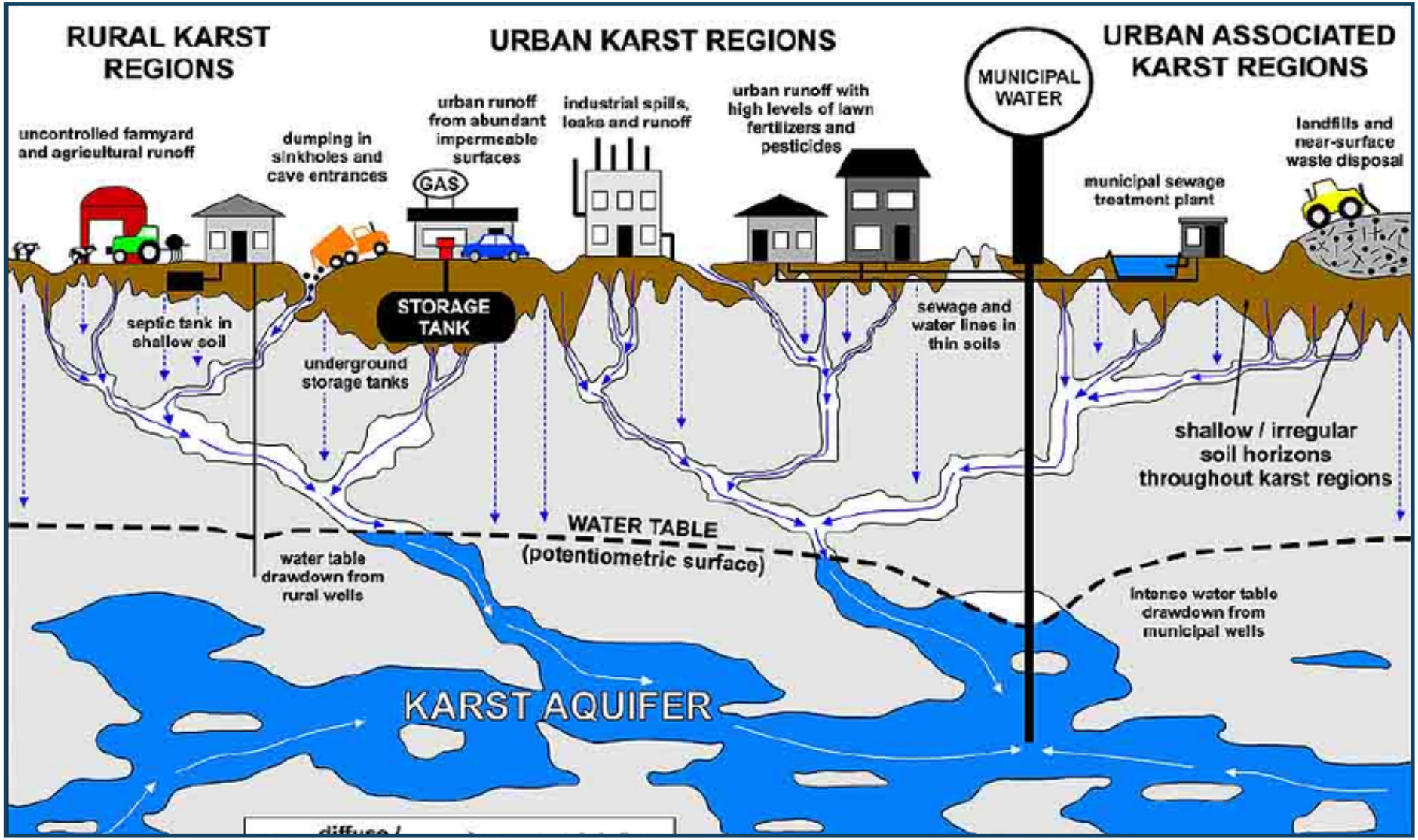
LIST OF BIOLOGICAL OUTBREAKS IN LAGOS STATE

S/N	BIOLOGICAL OUTBREAKS	DATES	NO OF CONFIRMED CASES
1	AVIAN INFLUENZA	JANUARY 2007	1 confirmed case
2	CHOLERA	MARCH 2013	15 confirmed cases
4	LASSA FEVER	AUGUST 2013	1 confirmed case
5	EBOLA VIRUS DISEASE	JULY-OCTOBER 2014	16 confirmed cases
6	AVIAN INFLUENZA	JAN-FEB 2015	2 confirmed cases (bird not human)
7	CHOLERA	JULY-OCTOBER 2016	12 confirmed cases
8	MEASLES	FEB-MARCH 2016	4 lab confirmed cases
9	LASSA FEVER	JAN 2016	4 lab confirmed cases
10	MDRO ENTERIC PATHOGENS IN A SECONDARY SCHOOL	FEBRUARY 2017	Seven blood samples for culture, serology and genetic studies isolated Campylobacter jejuni, Enterotoxigenic E. coli, Salmonella sp.
11	LASSA FEVER	AUGUST 2017	9 confirmed cases
12	MONKEY POX	OCTOBER 2017	3 confirmed cases
13	LASSA FEVER DIPHTHERIA	2018	4 CASES OF DIPHTHERIA (75% CFR)
14	cVDPV, MONKEY POX	2019	8 MONKEY POX CONFIRMED
	SARSCOV-2	2019 till date	with over 70,000 infected
	. Monkey pox	2021	with 1 confirmed

•The water tank; Queen's College

Photos: Facebook;file

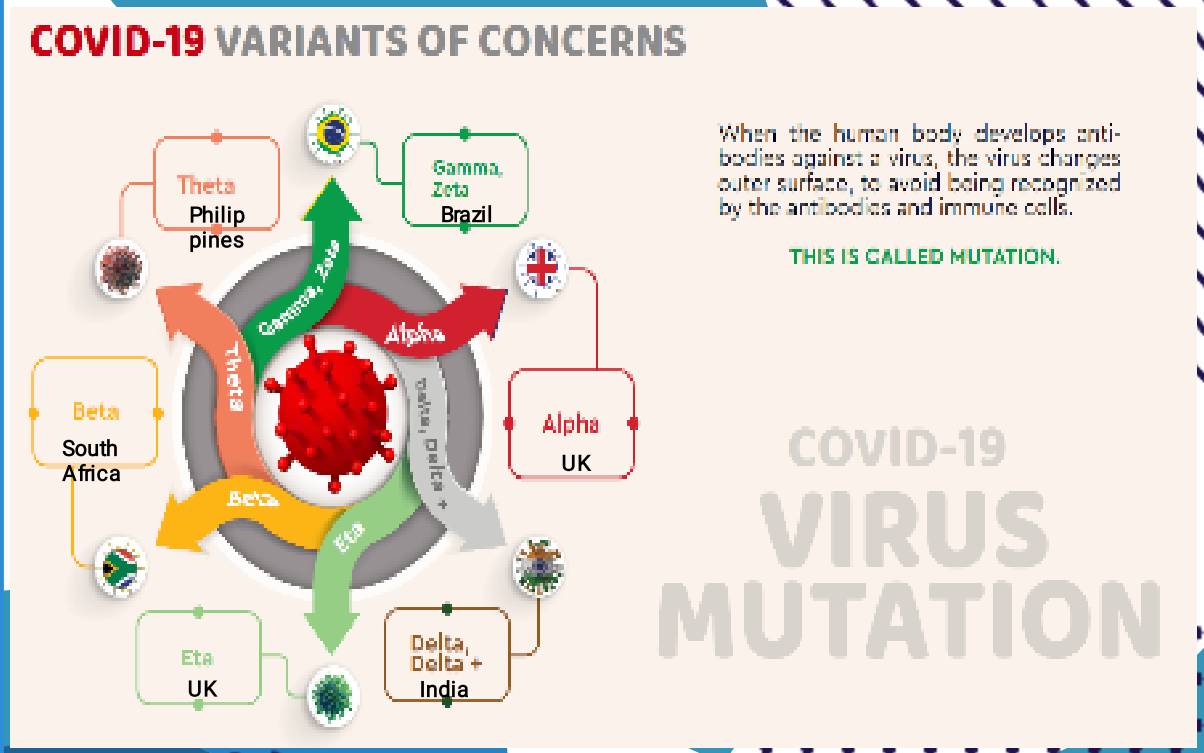


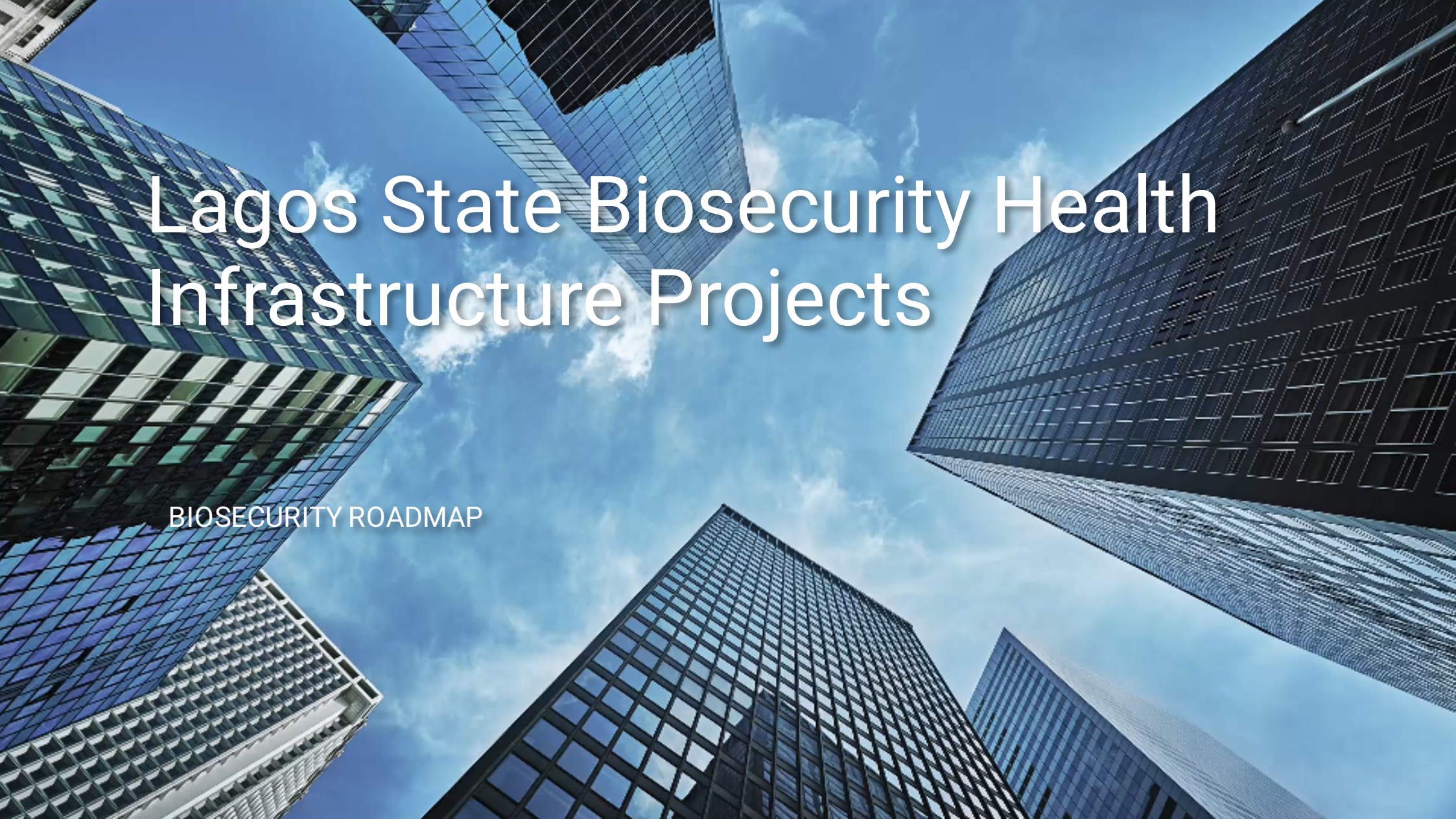


Basically everything we do affects water table

LAGOS BIOSHIELD AND GENOMIC DEFENCE

Lagos state has developed a very robust Biosecurity Framework. Experience during COVID demonstrates that more infrastructure and human capital are required to absorb sudden catastrophic pandemic





Lagos State Biosecurity Health Infrastructure Projects

BIOSECURITY ROADMAP

LAGOS
INFECTIOUS
DISEASE
RESEARCH
CENTRE,
YABA

The MOH of Lagos State is rapidly developing the Mainland Hospital Campus into a hub for cutting edge Infectious Disease treatment & research.

- *Biobank*
- *Research Institute*
- *Isolation Centre*

Current Strategies in Lagos to Combat AMR

Leveraging Advanced Infrastructure to Combat AMR: The Lagos State Biocontainment Facility

- **BSL2 and BSL3 Laboratories: These labs enable the safe handling of infectious agents and high-risk pathogens, crucial for research on drug-resistant microbes.**


RONCO
RONCO

Isolation Center 300 Bed

LAGOS STATE MINISTRY OF HEALTH

Lagos Infectious Diseases Research Institute

PHLEXCOM

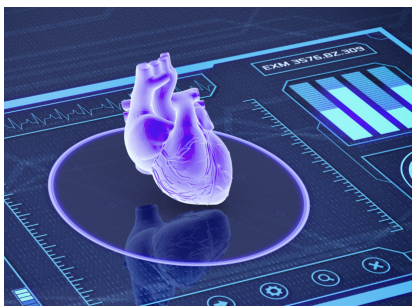
MASS DESIGN GROUP | LTS HEALTH


Lagos Infectious Diseases Research Institute
Parking with Solar PV Shading
Laboratories
Vehicular Security Check
Solar PV Panels
Shaded Courtyard
Ventilation Chimneys
Campus pedestrian access
Collaboration Spaces
PHLEXCOM
MASS DESIGN GROUP | LTS HEALTH

A global data management system to aggregate all health system data in Lagos State

SMART HEALTH INFORMATION PLATFORM (SHIP)

Lagos State's Smart Health Information Platform (SHIP)



Leveraging on technology to improve supply and demand side efficiencies and speed of our healthcare delivery.

- Improve efficiency
- Inventory Management – Reduce wastage of scarce resources
- Improve income generation
- Prepare to enter the digital age of precision medicine
- Drive the bioeconomy
- Accelerate human resource development
- Create global virtual health hub

Actualizing the Digital Health Strategy Through a Health Information Exchange

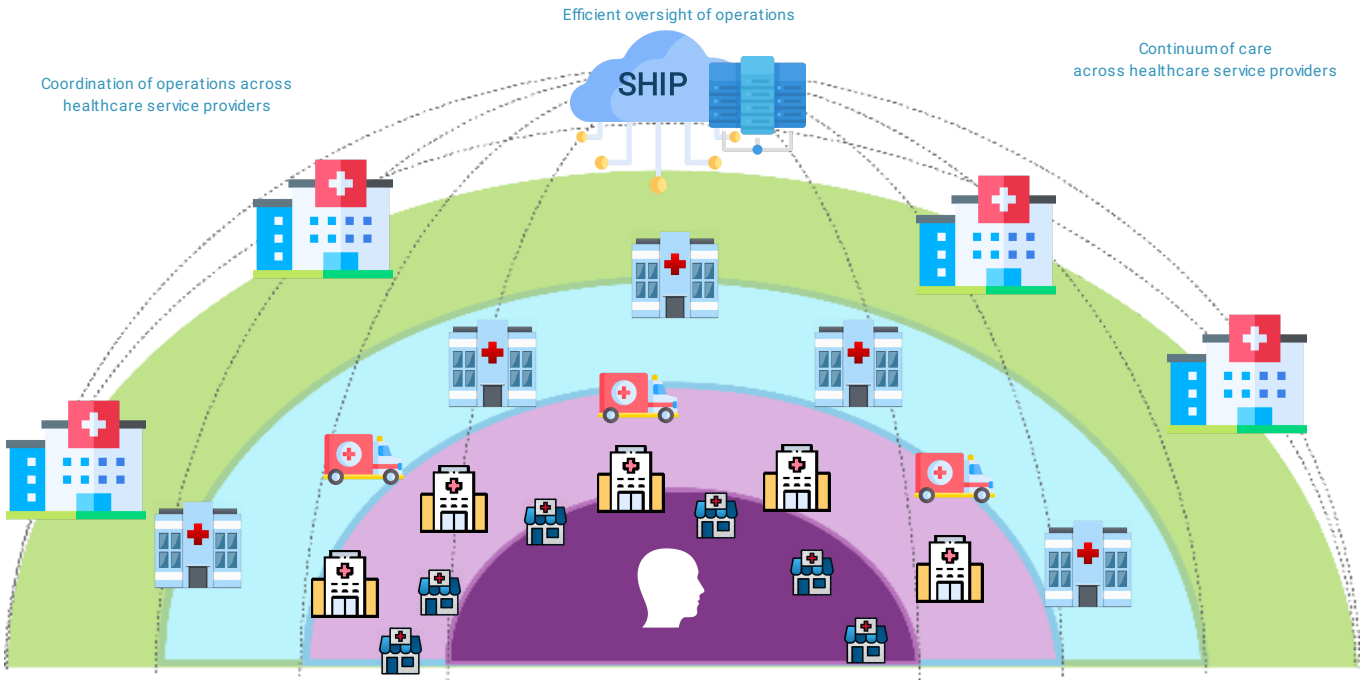
LSMoH

To Actualize its digital Health strategy, Lagos State Ministry of Health will Deploy a Robust Health Information Exchange called the 'SMART HEALTH INFORMATION PLATFORM (SHIP)'

LAGOS STATE SMART HEALTH INFORMATIO N PLATFORM

One data platform that will aggregate, collate, analyze, interpret and present health system data to manage patient as well as drive policy decision-making in Lagos State

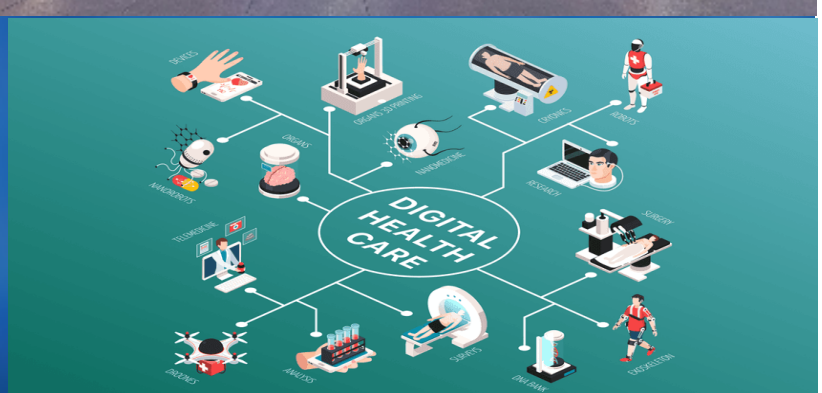
SHIP connects Lagos State healthcare service providers for exchange of information, secured patient data storage, processing & management, and digital enablement of clinical services.



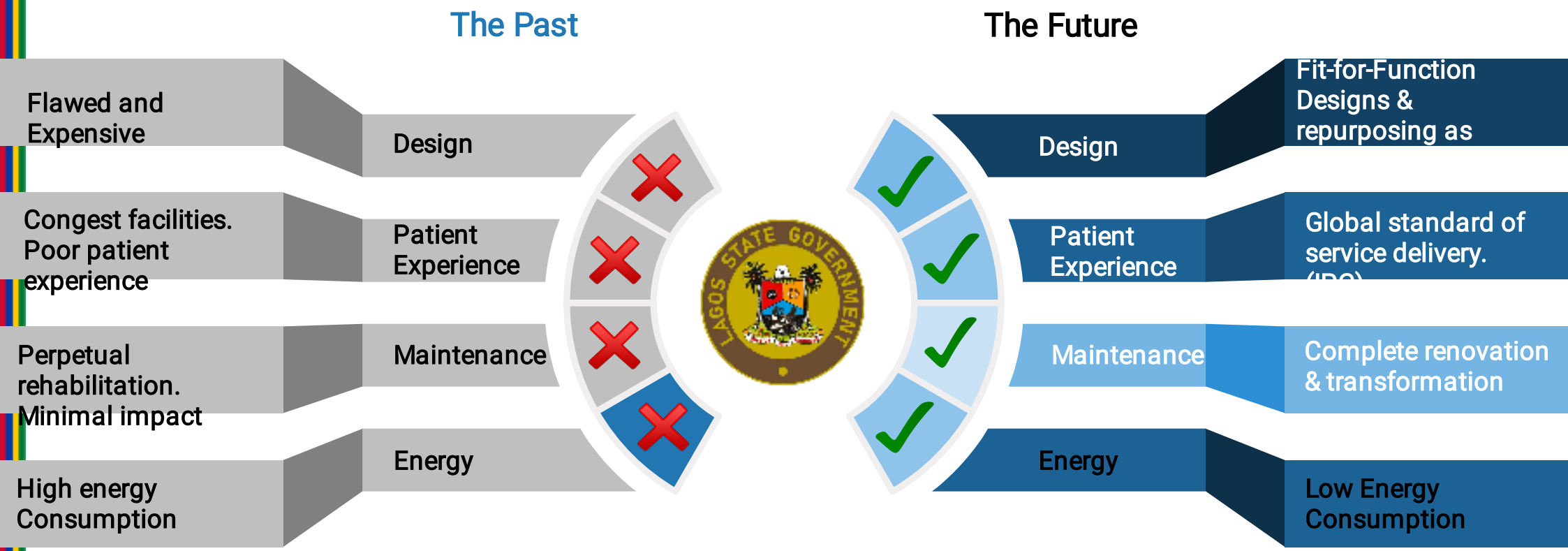
Mr. Governor's

BLUEPRINT

FOR MEDICAL AND DIGITAL INFRASTRUCTURE TRANSFORMATION



Transition to the Blueprint Agenda for Healthcare Infrastructure in Lagos State



Characteristics of the Prototype Healthcare Facilities

When designing any facility, there are key elements to be considered to improve the quality of service delivery across the State, as well as the end-user experience of doctors and patients alike.

01 **Natural Light/Ventilation**
Minimize heat gain, cross ventilation & air movement/orientation, large windows for sunlight

02 **Look & Feel, Cultural**
Identifiable, standout visual indigenous features and characteristics

03 **Sustainable Energy**
Renewable energy sources, natural cooling systems

04 **Patient Flow**
Easy circulation, user experience & furniture/machinery layout

Future Expansion 05
Scalability and modular design for upward expansion

Rapid Pandemic or Emergency Repurposing 06
During shocks and crises

Infection Prevention 07
Flow & Isolation of infectious patients

Maintenance friendly 08
Input from maintenance engineers at design stage

Blueprint Prototypes – Primary & Secondary Health Centres

Comprehensive Primary Health Centre

The New Massey Children's Hospital

Green Design Prototype the comprehensive health center

Prototype Design can run off grid on bright days.

Comprehensive Health Centre

Low Carbon footprint, alternative energy, solar panels, naturally ventilated built designs.

Lagos State Green Design General Hospital Sustainability Prototype

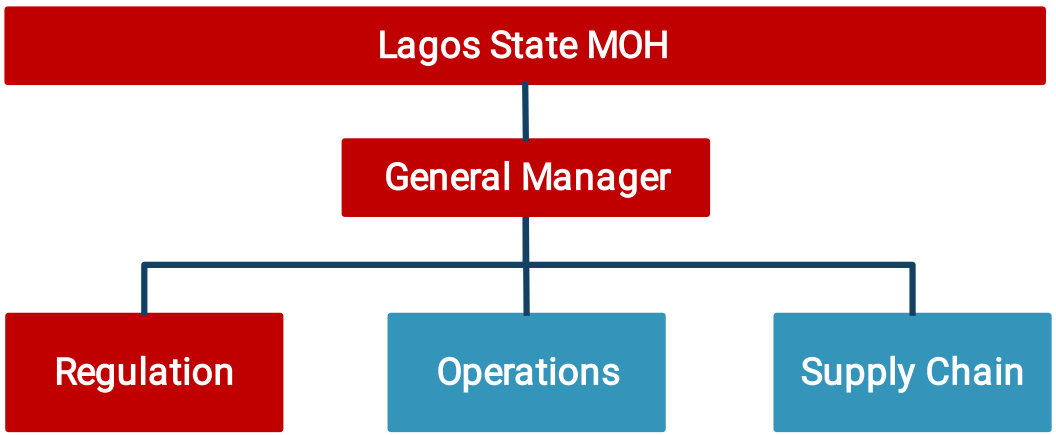
First Prototype (New Massey)

2nd Prototype: Shomolu General Hospital

LAGOS STATE ESSENTIAL MEDICINES MANAGEMENT AGENCY

A Conversion of the central medical store into an agency to drive access to quality drugs in Lagos State.

Resourcing and Management Structure



The agency will be led by a General Manager to be appointed by Lagos State. The core functions of the agency will be:

- **Regulation:** This function will be carried out by the agency in partnership with the PCN and NAFDAC
- **Purchase and Storage of Drugs:** Manufacturer will supply the agency directly. The agency will fund the purchase and storage of all drugs. This function will be outsourced to the private sector
- **Distribution of Drugs:** to public and private health facilities. This function will out sourced to a private operator

The private sector partner and the government will share proceed of the operations of the agency

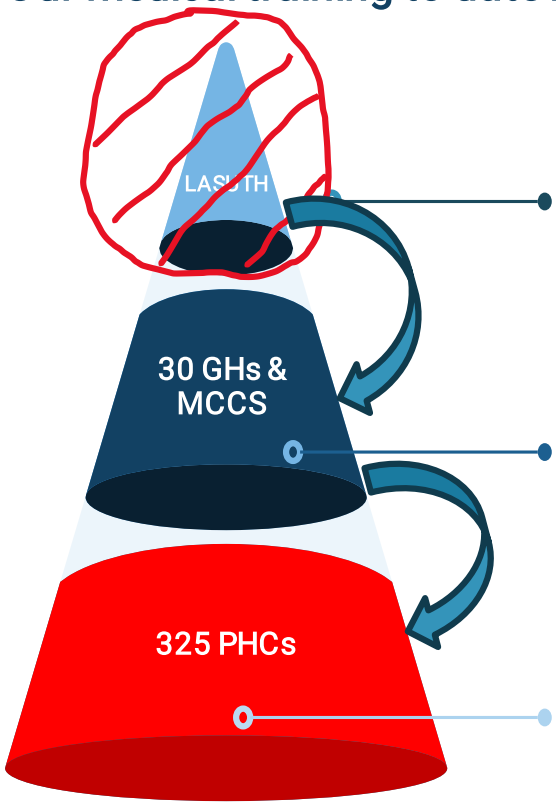
Public Sector

Private Sector

UNIVERSITY OF MEDICINE AND HEALTH SCIENCES LAGOS (UMH)

An initiative geared towards increasing the production of medical professionals in Lagos State to counter the effect of brain drain.

Our medical training to date has been confined to the apex hospital



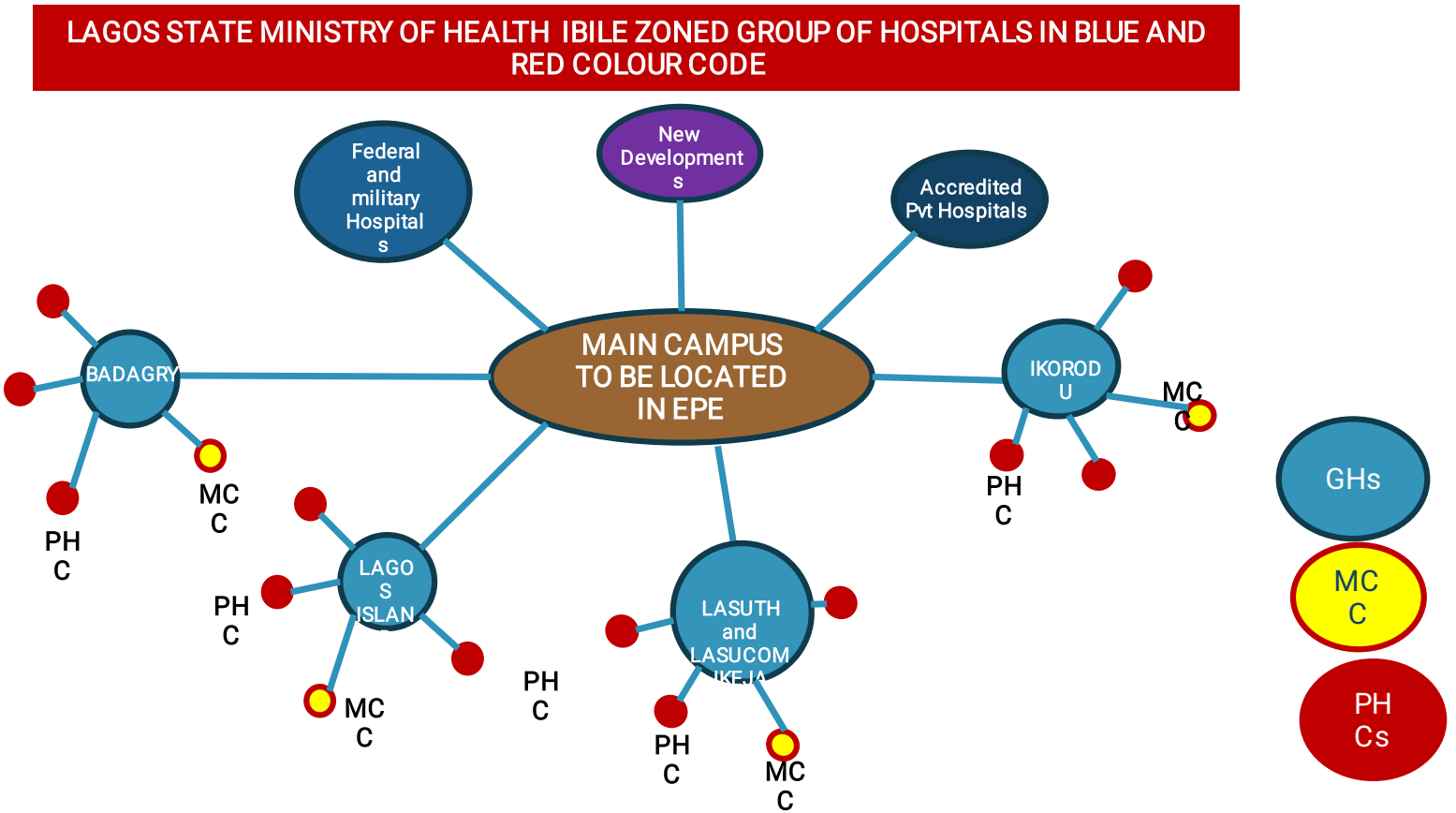
750 beds (multidisciplinary)

SECONDARY HEALTH collectively have 3,000 beds (multidisciplinary)

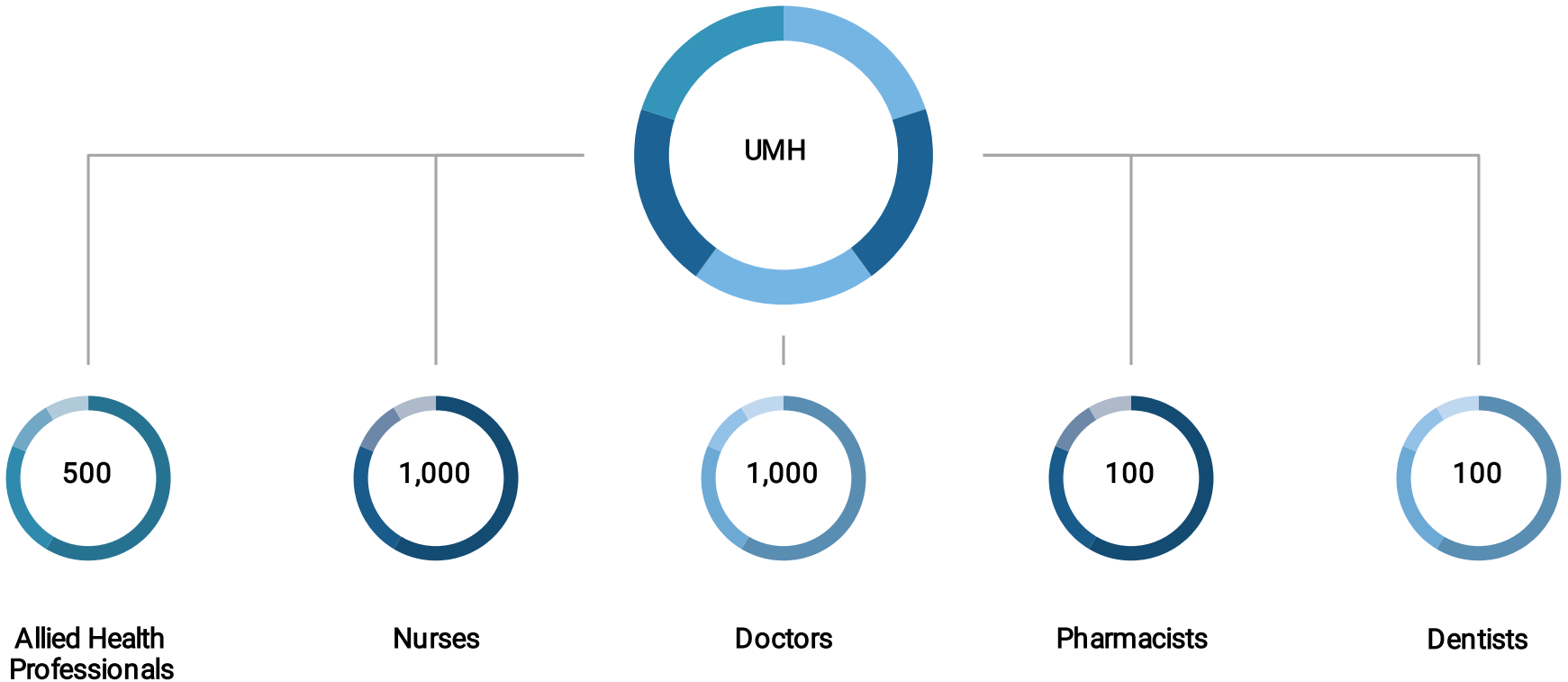
PRIMARY HEALTH can add an additional Family Medicine 1,000 beds

To expand our training of health professionals we will be utilizing the assets and human resources of some of our 30 GH and 60 Flag Ships as a group of training facilities under the apex unit LASUTH

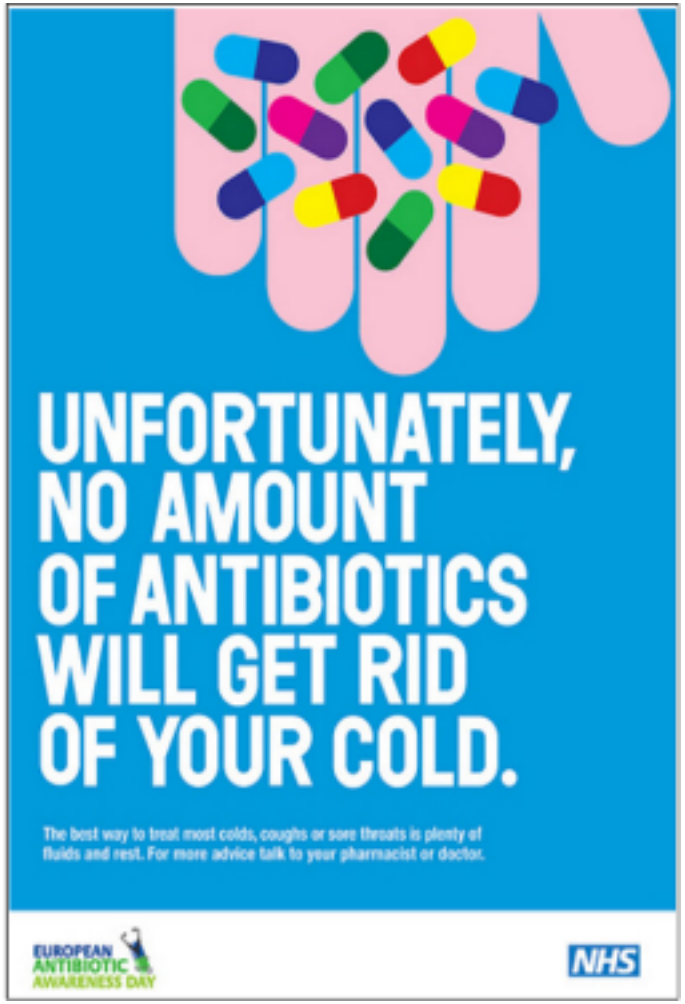
Structure of Lagos State Group of teaching HOSPITALS affiliated to the University of Medicine and Health Sciences (UMH): Selected General Hospitals and Comprehensive Primary Healthcare centers, zoned off into 5 IBILE campuses.



Expected Student Intake



In the short term, UMH will produce about 2,500 healthcare workers (HCWs) annually in Lagos State. Other cadres will include, laboratory scientists, etc.



The fight against Antimicrobial Resistance (AMR)

Why focus on AMR?

AMR develops from unnecessary antibiotic use, such as treating Viral infections and Malaria with antibiotics and excessive unregulated use of antimicrobials in agriculture. The world is running out of effective antibiotics, and without urgent action, decades of medical progress are at risk.

Research: IMPACT COMPONENT 1 MOH/WHO/ NMEP/PCN/MAISHA

DEFINING A PATHWAY FOR MANAGING FEVERS IN LAGOS IN PUBLIC AND PVT

1. DISEASE BYURDEN
2. HISTORY AND EXAMINATION
3. CORRECT TESTING ALGORITHM
4. MALARIA POSITIVE
5. MALARIA NEGATIVE
6. MONOTHERAPY
7. ORAL VS PARENTERAL

POLICY

- BIOECONOMY GOVERNING COUNCIL
- BIOSECURITY POLICY AND DRAFT BILL
- EOC
- ICS

DEVELOPED BY
LAGOS STATE
MINISTRY OF
HEALTH &
INNOVATION
PARTNERS

LASMIIZO

Medical, Industry & Innovation

PROPOSAL FOR LAGOS STATE MEDICAL, INDUSTRIAL & INNOVATION ZONE (LASMIIZO) PPP PROJECT

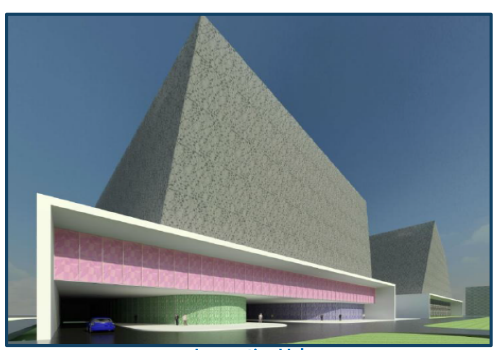
Bio Bank

Pediatric General Hospital

Bio-Science Research

Solar & Green Energy

Manufacturing



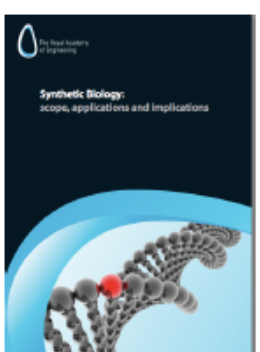
Innovation Hub

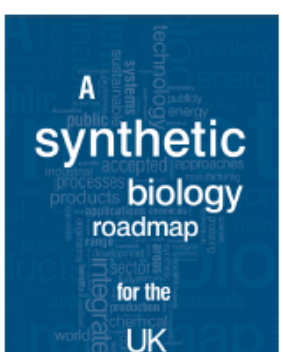
WHAT DO WE NEED TO BE WEARY OF IN THE FUTURE

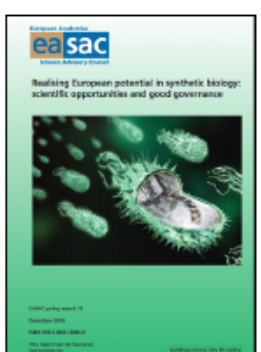

SYNTHETIC BIOLOGY HUB
encompassing:
→ CSynBI
→ The Flowers Consortium
→ SynbiCITE
→ The Foundry
→ Frontiers Engineering

So why is synthetic biology causing such a fuss?

"Synthetic biology aims to design and engineer biologically based parts, novel devices and systems as well as redesigning existing, natural biological systems"

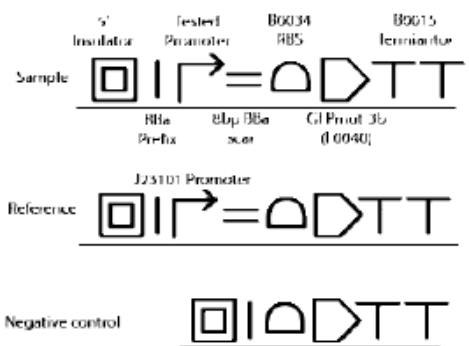


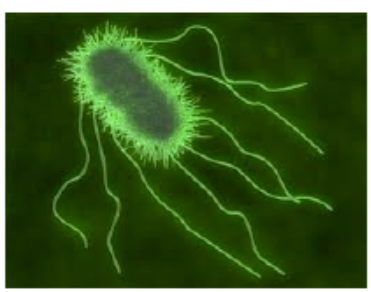




Synthetic Biology has a powerful vision for merging engineering design practice into the construction of biology systems and cells at the genetic level

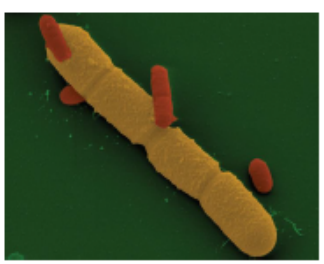
How do we standardise the construction of living matter?





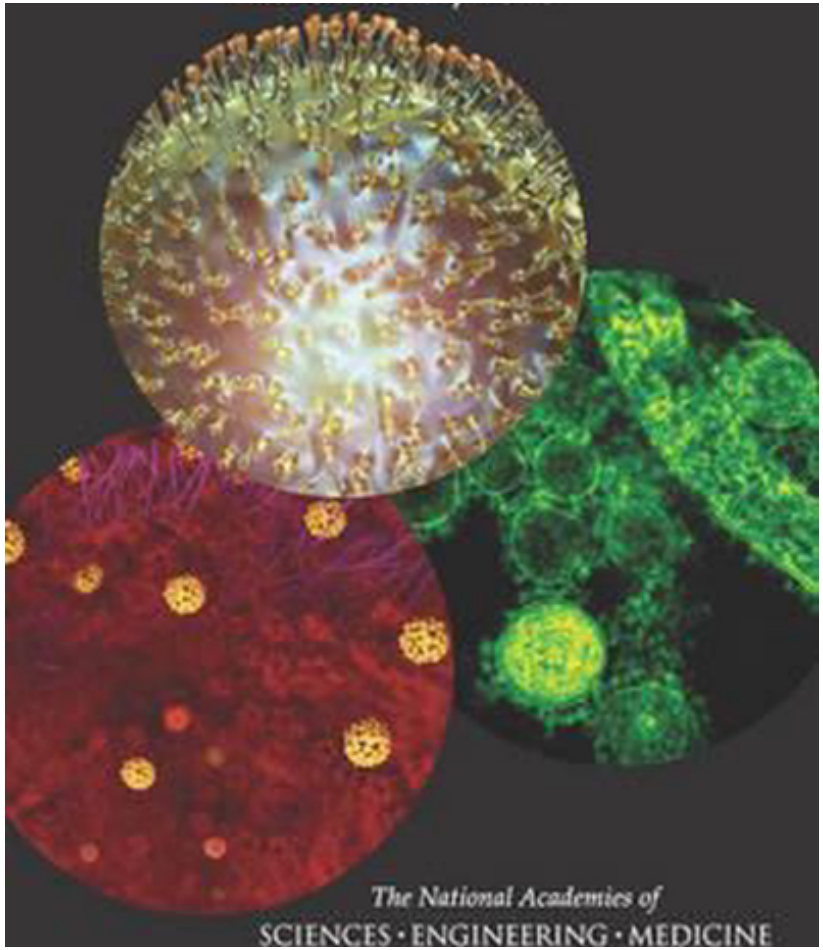
E. coli

B. subtilis



Bacillus megaterium

Gain of Function Research of Concern (GOFROC)



- Gain-of-function research is medical research that genetically alters an organism in a way that may enhance the biological functions of gene products
- Gain of Function research that could generate a pathogen that is:
  - Highly transmissible and likely capable of wide and uncontrollable spread in human populations
  - Highly virulent and resistant and likely to cause significant morbidity and/or mortality in human beings

Synthetic Biology Market

CAGR [2023-2028]

23.89%

MARKET SIZE [In 2028]

USD
44.17 bn

MARKET DRIVER

The growing use of synthetic biology in biofuels, therapeutics, personalized medicine, and synthetic drugs is driving demand.

DOMINANT SEGMENT

- Tool Type- **Oligonucleotides & Synthetic DNA**
- Technology Type - **Genome Engineering**
- End-Use Industry Type - **Medical**

REGIONAL ANALYSIS

Conclusion

AMR poses a significant threat to public health and development in Africa, but comprehensive, coordinated, and sustained efforts can mitigate its impact.

The AU, Nigeria, and Lagos State are taking important steps, but further action is needed to build resilient healthcare systems, promote appropriate antimicrobial use, and safeguard the health of populations.

Lagos is acutely aware of the threats. Repetitive and Continuous Communication is Key