Global Health Security Agenda in Kenya and the region; what does it mean?

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1st International Conference on (Re) Emerging Infectious Diseases (ICREID)

African Union, Addis Ababa, Ethiopia

14th March, 2018
CDC disclaimer

This presentation expresses the opinions of its author and does not necessarily represent the views of the Centers for Disease Control and Prevention.
Global Health Security

“...the activities required, both proactive and reactive, to minimize vulnerability to acute public health events that endanger the collective health of populations living across geographical regions and international boundaries” (World Health Assembly Report, 2007)
Timeline of significant events in public health
Recent emerging and re-emerging infectious diseases (as of 2003)

Global Health Security Action Packages

**PREVENT**
- Antimicrobial Resistance
- Zoonotic Diseases
- Biosafety/Biosecurity
- Immunization

**DETECT**
- National Laboratory Systems
- Surveillance
- Reporting
- Workforce Development

**RESPOND**
- Emergency Operations Centers
- Linking Public Health with Law Enforcement and Multisectoral Rapid Response
- Medical Countermeasures and Personnel Deployment
History of CDC Kenya and Kenya Medical Research Institute (KEMRI) collaboration

1979 KEMRI Partnership Launched (Malaria then Schisto)

1997 Enterics work began

2003 - PEPFAR

2007 - First Influenza Assignee

2004 - Kenya FELTP and GDD Regional Center

2014 - Global Health Security Agenda

LIFE Initiative VCT, PMTCT, TB, Surveillance

Sensitive but Unclassified
GDD: Pre GHSA
Development of diagnostic capacity at KEMRI

With GHSA
- Trained county laboratories in diagnostics
- Biosafety and Biosecurity nationwide
- Laboratory mapping of referral patterns and specimen transport
- Next generation sequencing

Number of pathogens that can be detected by CDC supported KEMRI laboratories in Kenya, by year
Surveillance

**GDD: Pre GHSA**
Focus on influenza and population based incidence of endemic diseases

**With GHSA**
- Expanded to AMR, AFI
- IDSR training
- Detection and Response to Respiratory Events (DaRRE)

Distribution of sentinel sites for influenza, acute febrile illness and antimicrobial resistance and core CDC-supported labs in Kenya
Workforce Development

GDD: Pre GHSA

- Since 2004 to 2017, 91 FELTP (Field Epidemiology and Laboratory Training) graduates done or doing advanced epidemiology course
- Full pyramid model of FETP including Frontline and Intermediate courses: >160 graduates

With GHSA

- IMPACT – Improving Public Health Management for Action
- Continue FELTP, with transition to MoH
Emergency Operations Center

GDD: Pre GHSA
Ad hoc outbreak organization

With GHSA
- EOC built by DFID/WHO
- Operations supported by CDC
Ebola Virus Disease Outbreak — Nigeria
July–September 2014

- July 2014, traveler from Liberia dies of Ebola in Lagos
- Effective emergency response
- 894 contacts monitored
- Transmission limited to 3 generations

MMWR Weekly / Vol. 63 / No. 39 October 3, 2014
Middle East Respiratory Syndrome – Kenya

• 3 million camels in Kenya: up to 90% are seropositive for MERS-CoV antibodies by ELISA*†
• No human cases of MERS-CoV disease, no antibodies in 197 camel herders*
• Two human cases positive by neutralization assay
  • No history of travel nor exposure to camels

African Subsaharan African MERS-CoV strains are genetically different to Middle east viruses, and west African strains may be less infective$.

† Corman EIDJ 2014; Deem Plos One 2015
$ LilJander et al EIDJ 2016 $ Chu et al PNAS 2018
Middle East Respiratory Syndrome Camel study- Kenya

**Recruit young camels**
- Respiratory specimens tested every two weeks for virus by PCR
- Serum tested for monthly for antibodies by ELISA
- Follow for 2 years

**Enroll herders**
- Respiratory (swab and sputum) monthly for virus by PCR
- Baseline serum and end of study serum
  - ELISA screen and Plaque Reduction Neutralization Test (PRNT) confirmation
- Follow up clusters of illness in families
Zika Virus - Kenya

Table 1. ZIKV classification

<p>| Category 1: Area with new introduction or re-introduction with ongoing transmission |</p>
<table>
<thead>
<tr>
<th>Country / territory / subnational area</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>AFRO</td>
<td>Angola; Cabo Verde; Guinea-Bissau</td>
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<tr>
<td>AMRO/PAHO</td>
<td>Argentina; Brazil; Mexico; Peru; São Paulo</td>
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<td>SEARO</td>
<td>Bangladesh; Malaysia; Philippines; Vietnam</td>
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<td>WPRO</td>
<td>American Samoa; Fiji; Marshall Islands; Mickey's</td>
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<td>Micronesia (Federal States of)</td>
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http://apps.who.int/iris/bitstream/10665/254714/1/zikasitrep10Mar17-eng.pdf?ua=1

Bogoch et al Lancet ID 2016
Zika Virus Studies in Kenya

- 2 maternal cohorts
  - Siaya and Mombasa. >3000 women enrolled
  - Tested for IgM and IgG for Zika with ELISA and Plaque Reduction Neutralization Test (PRNT) confirmation

- Testing AFI from surveillance by PCR

- Serology for Zika by ELISA during 2013 dengue outbreaks

- Primate sera from Rwanda and Kenya for IgG antibodies against Zika

Location of maternal cohorts
Monitoring Disease and Interventions
Population-Based Infectious Disease Surveillance

• Lwak
  • Rural western Kenya
  • HIV ~17%
  • Malaria holoendemic

• Kibera
  • Largest slum in Africa
  • Densely populated
  • Poor sanitation and limited access to clean water
Monitoring Disease and Interventions

- Antimicrobial resistance
- Burden and Risk factors for infection and disease
- Strain diversity e.g. rotavirus, influenza, pneumococcus
- Effectiveness of interventions
  - HIV, malaria, TB, rotavirus, influenza etc.
- Pathology
  - PRESS and CHAMPS

Figure 1: Invasive NTS disease adjusted incidence among children <5 years in Lwak and Kibera, January 2009 through December 2014
Diagnostic pathology

- Many outbreaks / new pathogens such as SARS, hantavirus in US, lymphocytic choriomeningitis virus detected by histopathology
- Minimally invasive tissue sampling
Outbreak Response & Training Support

2006 – 2016
348 Outbreaks:
- 252 in Kenya
- 96 in the Region

14,972 participants trained
- 12,526 in the Kenya
- 2,446 in the Region

>30 KEMRI and CDC staff to West Africa for Ebola response

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<tr>
<th>Outbreak Response Supported (n=3)</th>
<th>Training Supported (n=16)</th>
<th>Training and Outbreak Supported (n=9)</th>
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Lessons learnt in Kenya

1. Global health security efforts increase and institutionalize Kenya capacity to prevent, detect and respond

2. Public health studies key to health security
   a) help identify and understand threats early
   b) maintain rigorous scientific country capacity

3. Common threats kill far more than uncommon threats and can become global security threats
   a) these common threats need monitoring
   b) surveillance for these maintains capacity
   c) engage country in present problems

4. Potential for strong regional role and contribution to generalizable health security data
Challenges

• Coordination of expertise
  – NPHI
• Ministry bandwidth
• National versus county capacity - devolution
• Outbreaks not fully investigated
  – Limited financial, personnel resources
  – Political pressures
  – EOC culture not established
• Regional communication not routine
• Lack of countermeasures
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PREVENT

DETECT

RESPOND

Early reality – Liberia
“Disease X”

R&D Blueprint

List of Blueprint priority diseases

2018 annual review of the Blueprint list of priority diseases

The second annual review occurred 6-7 February, 2018. Experts consider that given their potential to cause a public health emergency and the absence of efficacious drugs and/or vaccines, there is an urgent need for accelerated research and development for:

- Crimean-Congo haemorrhagic fever (CCHF)
- Ebola virus disease and Marburg virus disease
- Lassa fever
- Middle East respiratory syndrome coronavirus (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS)
- Nipah and henipaviral diseases
- Rift Valley fever (RVF)
- Zika
- Disease X
**STRIVE timeline**

Abbreviations: Ebola = Ebola virus disease; FDA = Food and Drug Administration; IND = investigational new drug; SL = Sierra Leone; STRIVE = Sierra Leone Trial to Introduce a Vaccine against Ebola.

*Active study sites: 1) Connaught Hospital (Western Urban); 2) College of Medicine and Allied Health Sciences Library (Western Rural); 3) Port Loko Government Hospital (Port Loko); 4) Holy Spirit Hospital (Bombali); 5) Magburaka Government Hospital (Tonkolili); 6) St. John of God Hospital, Lunsar (Port Loko); 7) St. John of God Health Center, Kaffu Bullom (Port Loko).
Smallpox Vaccine Revolt, Rio de Janeiro, 1904
“We seem to think, with health problems as with other things, that science and technology will always save us, even though in the realm of human endeavor, it always comes to people and our relationships.”

James W. Curran
Dean, Rollins School of Public Health

Thank you

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