EBOLA

THE IMPACT FROM INTERNATIONAL AND LOCAL PERSPECTIVES

Lessons Learned

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OUTLINE

- Background
- Ebola Virus Disease Outbreak
- Ebola outbreak in Nigeria
- Health Sector Response
- Regional Response
- Establishment of a Regional Public Health Institute
- Global impact and Health Security Issues
- Research Issues prompted by Ebola outbreak
- Lessons learned
- Conclusions
- Recommendations

BACKGROUND

WHAT IS EBOLA?

- Ebola virus disease (EVD) is an acute viral hemorrhagic fever
- It is caused by infection with a virus of the genus Ebolavirus
- One of the most virulent viral diseases known to humankind
- It is a severe, often fatal disease in humans and nonhuman primates (such as monkeys, gorillas, and chimpanzees)
- Most fatal viral hemorrhagic fever
- Confined mostly to rural-jungle areas of East and Central Africa
- Usually a "One site. One time" outbreak



THE RESERVOIR IN NATURE

Ebola Virus Ecology

Enzootic Cycle

New evidence strongly implicates bats as the reservoir hosts for ebolaviruses, though the means of local enzootic maintainance and transmission of the virus within bat populations remain unknown.

Ebolaviruses:

Ebola virus (formerly Zaire virus) Sudan virus Taï Forest virus Bundibugyo virus Reston virus (non-human)

Epizootic Cycle

Epizootics caused by ebolaviruses appear sporadically, producing high mortality among non-human primates and duikers and may precede human outbreaks. Epidemics caused by ebolaviruses produce acute disease among humans, with the exception of Reston virus which does not produce detectable disease in humans. Little is known about how the virus first passes to humans, triggering waves of human-to-human transmission, and an epidemic.

Following initial human infection through contact with an infected bat or other wild animal, human-to-human transmission often occurs. Human-to-human transmission is a predominant feature of epidemics.

EBOLA TAXONOMY



Scientific Classification Order: *Mononegavirales* Family: *Filoviridae* Genus: *Ebola like viruses* Species: *Ebola*

How is Ebola Hemorrhagic Fever spread?

The manner in which the Ebola virus first appears in a human at the start of an outbreak has not been determined. However, Ebola HF could be spread through the following:

Direct contact with an infected animal or human;

- 1. Direct contact with the blood and or secretions of an infected person especially within families;
- 2. Contact with contaminated medical equipment such as needles;
- 3. Reuse of unsterilized needles in hospital;
- 4. Eating or handling the carcass of infected animals;
- 5. Inhalation of contaminated air in hospital environment,
- 6. Use of infected non human primate/bats as food source;
- 7. Non implementation of universal precautions.

Who is at risk?

People exposed to and handling wild animals;

- People depending on wild animals such as bats as a food source;
- Mortuary attendants;
- Health workers caring for Ebola HF patients;
- Health workers in hospital settings with poor hygiene and sanitation practices.

THE EVD OUTBREAK

THE HISTORY

- 1976 Ebola virus first broke out in Zaire and Sudan affecting more than 500 persons
 - Mortality rates were 88% in Zaire; 66% in Sudan
 - In one small village in Zaire, 274 out of 300 people infected in an outbreak died.
- 1995 Ebola resurfaced in Kikwit, Zaire (Democratic Republic of Congo) affecting medical professionals (Kikwit was immediately under quarantine)
 - International medical expertise required for effective containment due to poor health infrastructure
- Outbreaks of Ebola HF have been mainly restricted to Africa (Democratic Republic of the Congo, Gabon, Sudan, Ivory Coost, Uganda, Sierra Leone, Gambia and the Republic of Congo and now countries of West Africa).

DISTRIBUTION OF PREVIOUS EVD OUTBREAKS IN AFRICA

 Majority of outbreaks are due to Ebola virus

(species Zaire ebolavirus)

EBOLAVIRUS OUTBREAKS BY SPECIES AND SIZE, 1976 - 2014
Species
Vumber of Cases
Zaire ebolavirus
O 1-10

Sudan ebolavirusTai Forest ebolavirus



Bundibugyo ebolavirus





Country	Town	Cases	Deaths	Ebolavirus	Year	
Dem. Rep. of Congo	Yambuku	318	280	Ebola virus	1976	
South Sudan	Nzara	284	151	Sudan virus	1976	
Dem. Rep. of Congo	Tandala	1	1	Ebola virus	1977	
South Sudan	Nzara	34	22	Sudan virus	1979	
Gabon	Mekouka	52	31	Ebola virus	1994	
Ivory Coast	Tai Forest	1	0	Taï Forest virus	1994	
Dem. Rep. of Congo	Kikwit	315	250	Ebola virus	1995	
Gabon	Mayibout	37	21	Ebola virus	1996	
Gabon	Booue	60	45	Ebola virus	1996	
South Africa	Johannesburg	2	1	Ebola virus	1996	
Uganda	Gulu	425	224	Ebola virus	2000	
Gabon	Libreville	65	53	Ebola virus	2001	
Republic of Congo	Not specified	57	43	Ebola virus	2001	
Republic of Congo	Mbomo	143	128	Ebola virus	2002	
Republic of Congo	Mbomo	35	29	Ebola virus	2003	
South Sudan	Yambio	17	7	Ebola virus	2004	
Dem. Rep. of Congo	Luebo	264	187	Ebola virus	2007	
Uganda	Bundibugyo	149	37	Bundibugyo virus	2007	
Dem. Rep. of Congo	Luebo	32	15	Ebola virus	2008	
Uganda	Luwero District	1	1	Sudan virus	2011	
Uganda	Kibaale District	11*	4*	Sudan virus	2012	
Dem. Rep. of Congo	Isiro Health Zone	36*	13*	Bundibugyo virus	2012	1 4
Uganda	Luwero District	6*	3*	Sudan virus	2012	*Reflects
Guinea, Sierra Leone, Liberia	Multiple	745*	Ś	Ebola virus	2014	cases only

THE WEST AFRICAN OUTBREAK

- The Ebola outbreak in West Africa constituted an 'extraordinary event' and a public health risk to other States
- Guinea officially declared that it was hit by the Ebola Virus Disease (Ebola) on 23 March 2014.
- Within four months Ebola had affected four countries.
- Liberia declared it was affected on 31 March 2014,
- Sierra Leone, with the first death reported on 27 May 2014.
- Isolated and quickly contained cases occurred in Nigeria (25 July)
- Senegal (29 August) and Mali (23 October).
- However, by 20 March 2015 Ebola had infected a reported 24,753 people in Guinea, Liberia and Sierra Leone, killing 10,236.

HOW IT STARTED

- The West African Ebola epidemic stems from the infection of a 2-year-old-boy from Guinea. The child died on 6th December, 2013, just a few days after falling ill. Some of his family members contracted Ebola, and then mourners at his funeral carried the virus to a nearby village.
- The boy's pregnant mother was infected, and in turn infected a midwife, who treated her while she miscarried. By the time the outbreak was confirmed as Ebola in March 2014 49 people had contracted the virus, and 29 people had died. Four health workers were among the dead.
- By the end of March 2014, Ebola had spread to Liberia and Sierra Leone. In July, a visibly ill air traveler brought Ebola from Liberia to Nigeria. Ebola spread to Senegal in August, when an Ebola patient who escaped the surveillance system in Guinea traveled to Dakar, Senegal by road.

BROKEN HEALTH SYSTEMS

Being treated, or working, in a hospital in affected states is extremely hazardous. Hospitals have become amplification points, fueling EVD transmission. Health professionals are most susceptible, working in hazardous conditions. They care for infected patients without personal protective equipment and infection controls; they lack training in diagnosis of and treatment for EVD; there are few safe and sterile isolation units; and they are underpaid. As a result, the disease is decimating the West African workforce, which was fragile ever before the crisis emerged—nearly 400 health workers have contracted Ebola and more than 200 have died.



Distribution of EVD cases in West Africa

HEALTH CARE WORKERS AT RISK

- Several factors help explain the high proportion of infected medical staff.
- These factors include:
 - shortages of personal protective equipment (PPEs) or its improper use,
 - Too few medical staff for such a large outbreak,
 - Rejection of posting and escape to safe grounds by medical staff to lengthy work time in isolation wards (far beyond the number of hours recommended as safe)

EBOLA OUTBREAK IN NIGERIA

EBOLA OUTBREAK IN NIGERIA

Imported case in July 2014

- 20 cases with 8 deaths ; rapid response
- 899 contacts ; > 99% contact tracing daily rate
- Controlled within 8 weeks (20th July-8th of September (20th October – WHO, 42 days post onset of last case).

NATIONAL PUBLIC HEALTH INSTITUTES ROLE IN EBOLA RESPONSE

- Nigeria Centre for Disease Control (NCDC) Nigeria Field Epidemiological and Laboratory Training Programme (NFELTP)
- >100 graduates and residents involved Timeliness
 - Outbreak investigation competencies
 - Interpersonal communication skills
 - All Epidemiology background
 - Case identification and investigation
 - Contact identification and monitoring using real time (RT), GIS enabled system, Open Data Kit (ODK)
 - All contact identified and followed up
 - Over 18 000 contact visits and interview in 3 states with > 97% coverage rates
- Operational research to identify specific response gaps evidence based decisions
- Deployment to other countries

CASE MANAGEMENT/INFECTION PREVENTION AND CONTROL

- 40-bed capacity isolation facility at the Infectious Disease Hospital, Yaba for Ebola case management with separate sections for suspected and confirmed cases
- Another 10-bed facility completed by LSMOH also within IDH Yaba
- 3 patients currently on admission in isolation ward
- The isolation facility was initially managed by WHO experts and later supported by MSF
- A team of Nigerian health workers including 9 doctors, 13 nurses and 16 ancillary staff now trained on Ebola case management and infection control and currently providing 24-hour care



Old isolation ward



Confirmed patient ward

Similar ward with more spacing Between beds for suspects

Photo courtesy- CDC

Wash station in ward



Average duration of Stay in ETC	11.6 days (Range 10-15 Days
Average age of patient	35.9 yrs (Range 26-58yrs)
Time interval btw Onset of symptoms-admission into ETC	5.8 days (Average 3- 7days)
Currently on admission	2

NATIONAL RESPONSE

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NATIONAL LEADERSHIP

- President declared Ebola National Emergency
- Established Presidential Steering Committee
 - N1.9Bn (11.5M USD) earmarked by the government of Nigeria
 - EOC established in Lagos, another one set up in Port Harcourt

"EBOLA EOC" COORDINATES ALL RESPONSE ACTIVITIES LED BY FMOH/NCDC

- Partners: FMOH/NCDC, Lagos State MOH, Rivers State MOH, N-FELTP, WHO, US CDC, UNICEF, Red Cross,; Dangote Foundation;
- NCDC PD: National Coordinator Prof A. Nasidi
- Incident Manager: Dr. Faisal Shuaib
- Strategic Group : Core Strategic planning & decision-making team comprising IM, Team Leads of WHO, UNICEF, US CDC, MSF, SMOH. Met twice daily
- Organized into 6 teams responsible for:
 - 1) Epidemiology/Surveillance
 - 2) Case management/ Infection prevention & control
 - 3) Laboratory
 - 4) Points of Entry (PoE)
 - 5) Social mobilization
 - **6)** Management and coordination

Daily coordination meetings to share information and provide feedback

EMERGENCY OPERATIONS CENTRE (EOC) ORGANOGRAM



EEOC in Session



Active participants at EEOC



EPIDEMIOLOGY/SURVEILLANCE

- Contact tracing
 - 18 Contact tracing teams in Lagos; 15 in Port Harcourt
 - Contacts visited daily by trained personnel
 - e-Reporting on contacts seen using android phones
 - Contacts that develop symptoms automatically trigger messages and alerts to the team for immediate action;
 - Special team to track and resolve noncompliant contacts with the support of community leaders, local government and law enforcement agencies



EBOLA OUTBREAK IN NIGERIA 2014: TRANSMISSION CHAIN



Flow Diagram of cases and contacts – EEOC Nigeria



Summary of contacts data, 29 September 2014

Contacts	Lagos	Port Harcourt
Cumulative contacts listed	362	530
Contacts that became EVD cases (Suspect, Probable, and confirmed)	16	2
Contacts currently under follow-up	0	0
Contacts who completed 21- day follow-up	362	530
Contacts lost to follow-up	1	0

Total followed = 892

PARTNERSHIPS

- All of these efforts were possible through partnerships with WHO, UNICEF, US CDC, MSF, Private sector, Bill and Melinda Gates
 Foundation, Dangote Foundation, NGOs, Community and Religious Leaders and volunteers
- In the end, Nigeria confirmed a total of 19 cases and probable case, of whom 8 died and 12 survived, giving the country an enviable case fatality rate of 40% – much lower than the 70% and higher seen elsewhere.

TRUE SEQUENCE OF EVENTS IN THE EBOLA OUTBREAK IN NIGERIA FROM 20 JULY 2014




SUCCESS FACTORS IN NIGERIA

- Why it was successful
 - Government leadership through EOC
 - Multi-sectoral involvement private/public partnership
 - Preparedness plan and rapid response
 - Availability of trained personnel (NFELTP)
 - Use of highly skilled HEALTH CARE workforce for
 - Rapid response
 - Contact tracing
 - Operational research
 - Innovation real time monitoring for contacts
 - (Open Data Kit and Hub technology)

SUCCESS FACTORS IN NIGERIA CONT'D

GETTING TO "0"

According to WHO

- Nigeria demonstrated world class epidemiological detective work
- Nigeria Ebola free on 20th October 2014

GLOBAL HEALTH SECTOR RESPONSE

WORLD HEALTH ORGANIZATION (WHO) COMMITTEE ON EBOLA AS A PHEIC

WHO advised that:

- The possible consequences of further international spread are particularly serious:
 - in view of the virulence of the virus,
 - the intensive community and health facility transmission patterns,
 - and the weak health systems in the currently affected and most at-risk countries.
- Based on this advice, the Director-General accepted the Committee's assessment and on 8 August 2014 declared the Ebola outbreak in West Africa a Public Health Emergency of International Concern (PHEIC).
- Therefore a coordinated international response was deemed essential to stop and reverse the international spread of Ebola.

REGIONAL RESPONSE

REGIONAL RESPONSE

- The African Union urged its members to recruit more health care workers. The ECOWAS Commission has also directed
- A three (3) month moratorium placed on all meetings
- Deployed ASEOWA Response Team

AFRICAN UNION SUPPORT TO EBOLA IN WEST AFRICA (ASEOWA) : ARRIVAL IN MONROVIA – 05-12-14



BRIEFING LIBERIAN GOVERNMENT AT CROSS BORDER MEETING OF AFFECTED COUNTRIES



DELAYED TIME OF RESPONSE BY AU AND ECOWAS: EVIDENCE OF POOR CAPACITIES IN PREPAREDNESS AND RESPONSE IN AFRICA



THE ESTABLISHMENT A REGIONAL PUBLIC HEALTH INSTITUTE

THE ECOWAS REGIONAL CENTRE FOR DISEASE CONTROL AND PREVENTION (ECOWAS RCDC)

The ECOWAS Regional Centre for Disease Control by decision of the Conference of Heads of State and Government was established

- To operate within the concept of West Africa Health Organization (WAHO)
- Encourage member countries to report outbreaks
 - Manage/mitigate trade and travel restrictions
 - Support the WHO to timely treat Ebola as a Public Health Emergency of International Concern (PHEIC)

ECOWAS RCDC CONT'D

- Establish a functional Laboratory network through National Coordinating Institutes (NCIs)
- Develop an event-based surveillance system (EBSS) at country and regional levels
 - could easily be transformed into real-time monitoring system during outbreaks
- Timely sharing of data during outbreaks will enhance timely evaluation and feedback towards effective control
- Innovation and equitable access to drugs, vaccines, diagnostics and other technologies
 - Regional centers of excellence with varied capacities



ECOWAS RCDC CONT'D

- Based on this structure, an ERRRT) otherwise also known as the "ECOWAS White Helmets" is formed launched at the KAIPTC 19th to 22rd of September 2016.
 - Formation of ERRRT adopted "One Health Approach" combining experts from human, animal and environmental health sectors for well-rounded preparedness and response to epidemics.

ECOWAS REGIONAL RAPID RESPONSE TEAM (ERRRT ESTABLISHED)

GLOBAL IMPACT AND HEALTH SECURITY ISSUES

EBOLA - A THREAT TO INTERNATIONAL PEACE AND SECURITY -

- The West African Ebola epidemic is an international public health crisis, representing a threat to international peace and security, said on September 18th,
- "The gravity and scale of the situation now requires a level of international action unprecedented for an emergency." As the international community begins to accelerate its response commensurate with the magnitude of the immense human suffering, additional actions – in both the immediate and longer term – are necessary. In the immediate term, the UN should exercise decisive leadership, and move the international response from a "catch-up" exercise to a wellplanned, properly resourced, and diligently executed strategy.

►UN Secretary-General Ban Ki-moon, Sept 2014

AFRICA – 2ND LARGEST CONTINENT

The land mass of Africa is daunting! It swallows most of the well populated countries of the world.

Africa has approximately 30% of the earth's remaining mineral resources – yet we are referred to as "Resource limited nations"



The continent has the largest reserves of precious metals with over 40% of the gold reserves, over 60% of the cobalt, and 90% of the platinum reserves.

WEST AFRICA POPULATION

- Population 366,254,975 by November 15, 2016
- Western Africa population is 4.81% of the <u>total world</u> population.
- The population density in Western Africa is 60 per Km² (155 people per mi²).
- ► The total land area is 6,067,010 Km2 (2,342,485 sq. miles)
- ▶ 44.6 % of the population is urban (164,351,190 people in 2016)
- ► The median age in Western Africa is 18 years.

WORLD INTERCONNECTED

- Our highly mobile, interconnected world ripe for rapid spread of global threats
- Infectious diseases emerging and spreading geographically faster than any time in history
 - an outbreak anywhere only few hours away somewhere else
- Nearly 40 new diseases discovered
 - unknown a generation ago
 - Globally, WHO verified >1100 epidemics in the last 5 years

Need for effective surveillance and response has never been as urgent

THE GLOBAL THREAT OF INFECTIOUS DISEASES



Emerging diseases
 Re-emerging diseases

Adapted from Morens, Folkers, Fauci 2004 Nature 430; 242-9

ABOUT 100 ACUTE PUBLIC HEALTH EVENTS ANNUALLY











Marburg and Ebola risk mapping



Countries with reported index cases

Countries at risk without reported index cases



Lassa and Crimean Congo risk mapping



Reported cases

Presence of the Mastomys natalensis



Yellow fever and Zika risk mapping





LASSA FEVER – AN EXAMPLE OF A PENDING DISASTER

- Lassa fever has a very high case fatality rate of between 54% and 98%, but with prompt reporting could be as low as between 1-25% (Bulletin of Epidemiology, 2009).
- The disease cuts across all age groups though more predominant among the adolescents and reproductive age group, hence constitutes a lot of public health and economic hazard.



LASSA FEVER ENDEMIC AFRICAN COUNTRIES



The LF has been known to be geographically located across the West
Africa sub-region of the World and endemic in
Nigeria, Sierra Leone and Liberia.

 First cases occurred in Mali – 2009, Ghana – 2011 and Cote D'Ivoir -2013

WHAT DID THESE EPIDEMIC INFECTIOUS DISEASES HAVE IN COMMON?

- ► All were caused by zoonotic pathogens
- All spread across boards by modern transportation
- Most had Asian or African origin
- Laboratory and clinical diagnoses were problematic
- ► Poor communication among countries
- ► Major economic impact
- Government denial and delayed response

ECONOMIC IMPART OF SELECTED INFECTIOUS DISEASES



WHY HAVE WE SEEN SUCH A DRAMATIC INCREASE IN EPIDEMIC INFECTIOUS DISEASES?

Complacency, Lack of Political Will

- ► Policy Changes
- Changes in Public Health
- Changing Life Styles/Behavior
- Microbial Adaptation
- ► Technology
- ► Intent to Harm
- Climate Change

RESEARCH EFFORTS PROMPTED BY EBOLA OUTBREAK

EBOLA PROMPTING WHO R&D BLUEPRINT

- The rapid development of rVSV-EBOV contributed to the development of WHO's R&D Blueprint, a global strategy to fast-track the development of effective tests, vaccines and medicines during epidemics.
- The WHO R&D Blueprint developed as a direct consequence of Ebola outbreak has defined a priority list of <u>diseases</u> likely to cause epidemics in the future. For each of these, WHO is preparing R&D roadmaps and developing the profile for the kinds of vaccines, medicines and diagnostics we would need to address them.
- So far, four target product profiles have been developed for vaccines and diagnostics to address Zika, Nipah virus and Lassa fever. These 'standards' will guide the research of our partners and will ensure that everyone works according to the same parameters for quality, safety and efficacy.

EBOLA APPROVALS

On August 11th, WHO approved the compassionate use of experimental drugs and, on September 5th, a WHO expert committee considered a list of promising candidates, such as antibody treatments and blood transfusions from Ebola survivors. Several vaccine candidates are currently being studied. Johnson & Johnson, GlaxoSmithKline (GSK) and NewLink Genetics are among the many companies currently testing potential compounds, but none have yet proven safe and effective in humans (preliminary results from GSK's human trials are expected in November). An experimental drug, ZMapp, has shown considerable promise in primate trials. However, it has neither been proven effective nor tested

WHO BLUEPRINT: A GLOBAL STRATEGY

The rapid development of rVSV-EBOV contributed to the development of WHO's R&D Blueprint, a global strategy to fast-track the development of effective tests, vaccines and medicines during epidemics.



CHARACTERISING THE EV BY VIROLOGY UNIT, CRL (NCDC)



Glovebox is decontaminated by spraying with 0.5% hypoclorite and overnight incubation. Double bagged waste from previous day is sprayed and autoclaved



Materials needed for sample inactivation are placed inside the glovebox

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Isolation and characterization of Ebola Virus by local scientists



RESULTS



hylogenetic Analysis



Molecular Phylogenetic analysis of the L-Gene Segment of EBOV/Hsap/NGA/2014/LIB-NIG/ 01072014in comparison with selected filovirus sequences by Maximum Likelihood method. Sequences are labelled using the ICTV consensus nomenclature for variants of Filoviridae Family and their corresponding Genebank Accession numbers in parenthesis

From EchiTAb to EbolaTAb



DEVELOPMENT OF POLYCLONAL ANTIBODIES FOR THE TREATMENT OF EBOLA VIRUS DISEASE

PROGRESS TO DATE

- Recombinant glycoprotein expressed in mammalian cells in sufficient quantities to immunise a pilot flock of sheep and develop assessment assays to monitor antibody production
- Recombinant glycoproteins have been "probed" with human convalescent serum and shown to be recognised
- Sheep have demonstrated a good antibody response to the immunogen
- Small quantity of purified ovine IgG antibodies have been prepared for in vitro assessment
- Guinea pig and non-human primate experiments are promising
SOME OTHER NEW TECHNOLOGIES ON SAFETY

Body Apparels
PPEs
Vestex®
Creams, sprays, etc.

LESSONS LEARNED

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LESSONS LEARNED CRITICALLY NEEDED FOR EFFECTIVE CONTROL

- Swift response
- Available laboratory capacity and continued support with timely results
- Strong Government leadership and commitment- EOC
- Country ownership of response programme
- One Outbreak, One response
- Effective community awareness and engagement
- Preparedness plan developed using lessons learned from the response
- Strong coordination of partners and harmonization of resources
- Unprecedented support from the private sector and professional bodies
- Extensive use of mobile technology and social media
- Outbreak response multi-sectoral
- Appropriate allocation and use of resources (transparency)
- Most of All empowering the national public health institute as the lead coordinating centre (in Nigeria's case – the NCDC working under the office and supervision of the Minister of Health), while WHO was the coordinator of partner support)

LESSONS LEARNED CONT'D. CRITICALLY NEEDED FOR EFFECTIVE CONTROL

- Health Policies to guide your direction in Health preparedness and response
- People (the right people) to implement your policies
- Programme ownership (country ownership)
- Leadership Political and Technical
- Establish a well defined mechanism (structure), e.g. EOC/ IMC for effective coordination and management of response
 - The establishment of the Nigeria Centre for Disease Control (NCDC) and its Nigeria Field Epidemiological and Laboratory Training Programme (NFELTP) has provided Nigeria with such a mechanism.

WHY REGIONAL COLLABORATION?

- The West African outbreak of Ebola virus disease had 3 major lessons:
 - Injury to one is injury to all
 - Protecting Health Care worker is cardinal to disease prevention and control
 - Member countries are not at the same level of when it comes to preparedness and response
- Need for ensuring national core capacities has never been more urgent
- Need to improve to technical and financial resources of member countries to develop and maintain their capacities

SUCCESS FACTORS

- Strong Government leadership and commitment-EOC
- Availability of SOPs and materials from WHO that were quickly adapted for use in Nigeria
- Adequate human resources numbers and technical competence; including national and international staff
 - Enough teams to follow up the contacts
- Availability of required logistics cars, phones, forms, airtime, thermometers
- Use of mobile phone technology enabled real-time follow up contacts and prompt detection of those with symptoms

SUCCESS FACTORS CON'T.

- Available laboratory capacity and continued support with timely results
- Data management initiated from the beginning of outbreak initially using Excel and later both Excel and Epi Info
- Active rumor/alert investigation system
- Use of data to monitor response
- Motivated and facilitated team
- Good teamwork and leadership

FROM ENDEMIC TO GLOBAL

- Ebola Epidemic has transitioned from local endemic to global public health problem
- Even after containment it can return
- Ebola has impacted severely on nations' economies and has become a serious global health security risk factor
- Ebola needs a committed health workforce and effective biodefence tools such as vaccines, biologicals and drugs to contain it

CONCLUSIONS

- It is possible to control and prevent Ebola using local capacities
- Capacity building and on-the-job training key to success
- National Public Health Institutions key to effective response
- National Leadership and Ownership most important
- International partnerships Nigeria's Ebola response would not have been as successful without the coordinated efforts of national and partner organizations

RECOMMENDATIONS

RECOMMENDATIONS

- Strengthen national health system
- Enhance Health Sector Work Force
- Enhance health sector funding
- Strengthen international collaboration and partnerships
- Strengthen health promotion and information and date sharing among nations

STAND UP FOR SAFETY

Thank you All!