



## MEETING REPORT

WHO INFORMAL CONSULTATION

# Anticipating Emerging Infectious Disease Epidemics

1-2 December 2015 | Geneva, Switzerland



World Health  
Organization

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## FOREWORD

One of the greatest threats to global health is the spread of uncontrolled epidemics due to highly pathogenic infectious diseases, especially those that easily cross borders and have the potential to wreak havoc on societies and their economies. The West Africa Ebola outbreak sounded an alarm to all of the actors involved in securing the health of populations by highlighting the critical need for forethought and pre-emptive action, even when dealing with well-known epidemic-prone diseases. Anticipation and preparedness are key to safeguarding global health security.

Today we have at our disposal, more than at any other time in history, technological advances and collaborative partnerships that can transcend the outdated tactic of reactive outbreak control. Epidemics are complex phenomena, the details of which must be better understood to rapidly and effectively detect their emergence, control their spread and mitigate their impact. The increasing convergence of a number of factors that drive and amplify outbreaks requires multi-disciplinary, multi-sectoral and multi-faceted approaches.

This consultation of experts was an open forum, conducted as the first in a series of steps the World Health Organization (WHO) is taking to further explore and address the complexity of epidemics. By understanding all the diverse elements involved in infectious disease epidemics – not just the pathogens and their hosts but also and in particular the biologic, socioeconomic, and physical environments in which they interact – we will gain a clearer picture of how and when we can best intervene to limit their spread. The discussions and deliberations in this consultation are aiding WHO as it adapts to the changing world of global health, with a clear vision based on solid evidence and a strong spirit of partnership to ensure countries and their health systems are resilient enough to withstand future epidemic threats.

A handwritten signature in black ink, consisting of a stylized 'B' followed by a horizontal line and a period.

**Dr R Bruce Aylward**

Executive Director a.i.

Outbreaks and Health Emergencies and

Special Representative of the Director-General for the Ebola Response



# EXECUTIVE SUMMARY

## Background

Having the ability to anticipate epidemic-prone emerging infectious diseases will give us the necessary edge to battle outbreaks which are becoming more frequent. This foresight, if reliable, is central to global health security and provides the tools and strategies to reduce avoidable loss of life, minimize illness and suffering, and reduce harm to national and global economies.

With the rapid evolution of technology, know-how, and an increasing appreciation of the interconnectedness of everyone on the planet, on 1 and 2 December 2015, the World Health Organization convened some of the world's most eminent scientists, experts and practitioners to identify a path forward to better, more accurately and systematically predict epidemics and thereby meaningfully strengthen global and national readiness to address these emerging infectious disease threats.

The informal consultation on anticipating epidemics was the first step in an intensified initiative to better predict and be ready to respond to epidemics. It aimed to **(1)** create a forum for discussion by bringing together multi-disciplinary experts in a forward-thinking exercise on how to better anticipate and prepare for epidemics; **(2)** engage with a wide range of expertise and experience in order to shape international collaboration to tackle future infectious risks; and **(3)** identify approaches to improve detection, early analysis and interpretation of factors that drive emergence and amplification of infectious disease epidemics.

## Summary of discussion

The experts agreed that ***the frame has changed fundamentally*** for preventing, detecting, responding to and managing global epidemics in the recent years. Some of these key shifts include:

- From managing known outbreaks we have to manage uncertainties and unknowns
- From relying on official government reports to anyone potentially alerting on unusual events
- A proliferation of information and technology in the hands of many, almost everyone, rather than a few
- Health-centred approach (mostly MOH, WHO) to multisectoral approach (all UN, whole of society, One Health)
- Explosion of initiatives and players that require coordination (e.g. GHSA, PEF, NGOs, defence agencies, etc.)
- Rather than be centrist, there is a need to engage and empower local communities in all aspects of preparedness and response
- Human activity and behaviour are the main drivers of emergence and amplification of new pathogens (globalization, food, trade, population expansion, urbanization, tourism, migration etc)





Based on this, many traditional concepts and interventions, such as restrictions at points of entry, quarantine measures, are out-of-date and increasingly difficult to implement. They need to be reviewed as international borders become increasingly porous and movement of people and goods follow ever-increasing and crowded paths. Therefore the overall approach to and strategy for preparedness, readiness and response needs to be overhauled. Deploying resources has to be re-thought. Strategies to build trust among an increasing number of players, in turn enabling coordination, need to be crafted and dynamically reviewed as the context evolves.

At-risk populations and the communities to which they belong are no longer homogeneous groups in a specific location. The concept of "community" is increasingly complex and they must each be identified for their beliefs, values, behaviours along with their role in combating epidemics. They need to be understood by their interests and often virtual and dispersed in large geographic areas. **Community engagement** should be strengthened, especially understanding the "resistance" of local frontline communities affected by epidemics to desired behaviours to manage the outbreak. The role of social scientists in preparedness and response and in two-way communication, especially reaching out to the most vulnerable (e.g. periurban populations defined by inequality and informality), is crucial early in an epidemic.

The fundamental and changing role of the health sector in controlling epidemics requires recognition of the key function of clinicians in the early identification of outbreaks. Engaging the **community of health care workers** who play a critical function in detecting and responding to outbreaks is essential. However, they are often criticized for not following public health principles of infection control measures and vaccination compliance. Acknowledgement of their potential to amplify epidemics as a result of their role within the health system is essential to ensuring appropriate prevention is in place.

The number of players interested and involved in preparedness and response to epidemics has increased significantly leading to a **coordination challenge** of the many disciplines and many sectors with different but important agendas, perspectives and approaches. Participants at the consultation called for an improved management of the "humanitarian circus" where coordination creates space for everyone to contribute constructively. Some of the elements that are needed include a good definition of roles and responsibilities; a good incident management system that allows inter-operability between players; and a willing leadership as well as followership.

New technologies allow for a rapid access to many more types of information and their sources than ever before. Given the multidimensional nature of infectious disease risks, integrating data elements from the micro level (genes) to the macro level (social, political, climate, global mobility patterns) would allow for better **information systems to anticipate, assess risks and prepare for epidemics**. New approaches such as **foresight** to identify blind spots, **popular epidemiology** and **local risk mapping** are to be considered to ensure the relevant analysis of complex events that could give us an added edge to curtailing their amplification. There are still a number of challenges for the use of data (quality, privacy, data sharing, ownership, ethics) and its interpretation (analysis, risk assessment) and eventually translation into actions (political, social, individual).

Public health strategies and interventions are based on the traditional biomedical paradigms for infectious disease but these are becoming obsolete. **New and emerging paradigms demand** that we re-visit the approach accordingly. Early detection can only happen if front line responders (health care workers, clinicians, farmers) are involved in the preparedness, surveillance and response. Endemic problems and known risks



should be utilized to strengthen multidisciplinary and multisectoral preparedness and readiness especially in low resources settings so that prevention is prioritized, for Rift Valley Fever outbreaks that occur regularly.

***Disease outbreaks may be inevitable but epidemics are preventable.*** There are known hot spots for emergence and amplification where targeted efforts for preparedness, surveillance, prevention and response should be focussed using the analogy of smoke detectors and fire fighters being in the same place. There is a need to identify those hot spots analysing biological, ecological and behavioural drivers and concentrating appropriate resources and efforts from different players in specific at-risk settings to ensure more sustainable and robust investments. Multidisciplinary outbreak investigation teams including social and political scientists as well as risk communication experts are needed to fully understand the risks and, barriers to response actions and identify the most effective options for containment within the early phase of the epidemic. Many new technologies (diagnostics, software applications) are now available to improve detection and control of epidemics that need to be better integrated into mainstream public health strategies and systems. Nevertheless, it is people who remain at the centre. Improved education and training is necessary for the epidemic prevention and control workforce of tomorrow to be in line with contemporary and future risks and interventions.

***Risk communication is perhaps the most essential element*** of the response to epidemics in the 21st Century. Communication can hamper or facilitate a good response. With ubiquity of the internet and communication technologies, modalities of risk communication have changed fundamentally. Principles of transparency, consistency and trust remain paramount in communicating with affected populations. New elements to consider and to be better understood for the future are the social-emotional patterns of fear and hope in communities and individuals and the social thermometer of risk perception. It is necessary to have multiple channels of communication including local and religious leaders not only during the an epidemic but also during inter-epidemic periods. Health care givers who are usually the most trusted information source for the population have to adapt to new technologies and use them appropriately to remain a solid pillar of the response.

## Conclusion

Three major conclusions emerged from this consultation:

- (1) just response is not enough in dealing with epidemics. Preparedness for outbreaks requires increased readiness and building resilient health system.
- (2) technologically advanced tools are required to anticipate the emergence and, more so, the amplification of infectious disease outbreaks.
- (3) new risks in the context of big cities and intense mobility of a globalized world necessitate newer, better adapted public health interventions.

Effectively anticipating epidemics will contribute to reinforcing global health security mechanisms including assessment of infectious disease risks under the IHR 2005. It is expected that the outputs of this consultation will inform and guide preparedness efforts in the future.



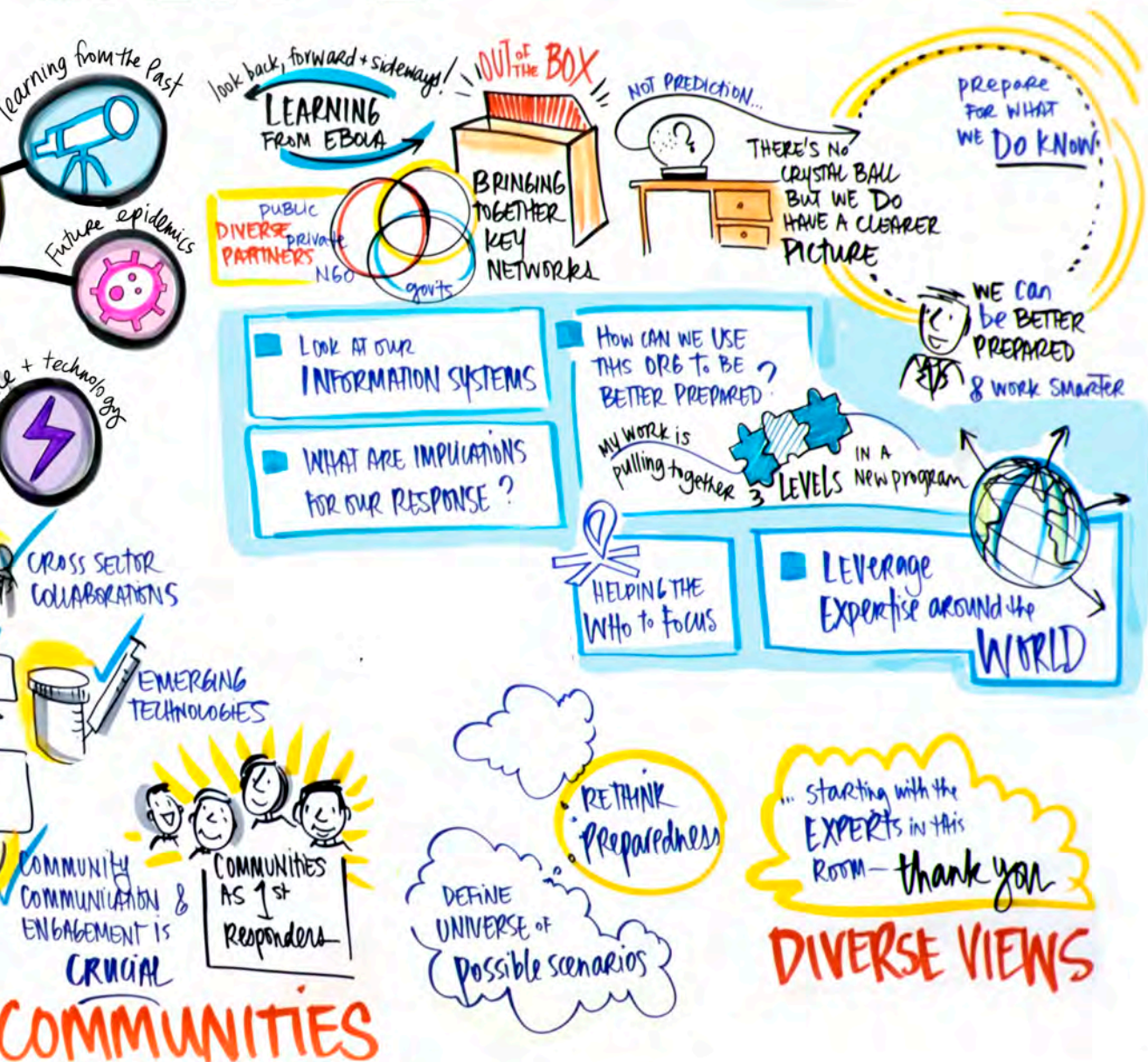


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# ING EMERGING DISEASE EPIDEMICS



# 01 INTRODUCTION

## Background and purpose

The world stands at a critical juncture in public health. Epidemics of infectious diseases are able to disrupt many spheres of human existence and the impact can be felt across the globe. To better prepare for and respond to those threats, it is imperative that we make fundamental changes to the way we understand them. Significant changes in the world today, mean that it is not enough to just implement traditional measures such as quarantine and isolation for epidemic control. We have to move beyond and find innovative approaches that are relevant for today's fast-paced, technologically-advanced world and, more importantly, that of the future.

Recent major public health crises such as the SARS, H1N1 2009 Pandemic and Ebola in West Africa have unequivocally demonstrated the importance of understanding the many non-biomedical factors that influence the emergence and spread of epidemics. There is no doubt that such epidemic and pandemic diseases will continue to threaten humanity. Following the re-emergence of H5N1 and the spread of SARS, WHO Member States adopted the revised International Health Regulations (IHR 2005). After Ebola in West Africa in 2014, the global community is similarly looking at the necessary mechanisms to better protect humankind from devastating epidemics. We have the benefit of hindsight and an unprecedented opportunity to revamp our collective approach to preventing and controlling epidemics so that we can mitigate their impact.

As a forward-thinking exercise, this meeting engaged a broad range of global experts from multi-disciplinary fields along with key stakeholders and partners to define the elements within which epidemics of the future will occur. The ideas and deliberations elucidated some of the drivers of emergence and amplification of infectious disease outbreaks. It is expected that the outputs of this consultation will guide and inform future preparedness; calibrate response, including research and development efforts; and reinforce global health security mechanisms.

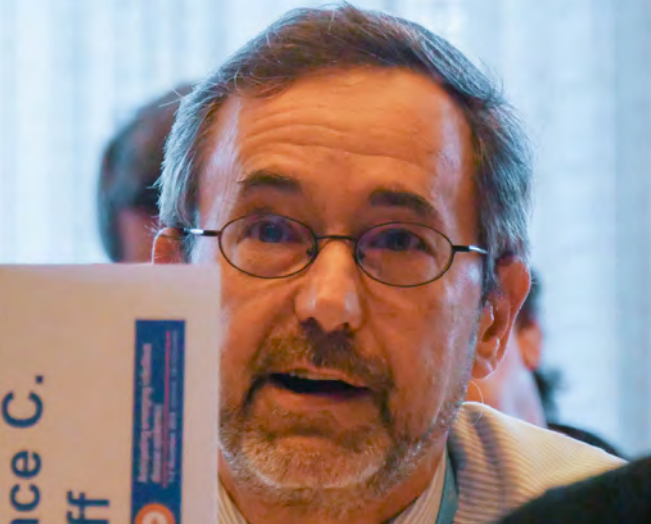
## Objectives

The **specific objectives** of this consultation were:

- To create a forum for discussion by bringing together multi-disciplinary experts in a forward-thinking exercise on how to better anticipate and prepare for epidemics;
- To engage with a wide range of expertise and experience in order to shape international collaboration to tackle future infectious risks;
- To identify approaches to improve detection, early analysis and interpretation of factors that drive emergence and amplification of emerging disease epidemics.







## Methodology

The consultation was designed to include a variety of disciplines and partners relevant to emerging infectious diseases from all over the world. The structure of the meeting entailed moderated panels for each of six sessions followed by extensive discussion with the audience. The panelists' remarks were restricted to five minutes each with the aim of engendering as much dialogue amongst the participants as possible in order to spark ideas and exchange. The meeting followed Chatham House rules whereby comments are not directly attributed to individuals in order to maintain their confidentiality and therefore allow them to speak candidly.

The full proceedings of the meeting were recorded in real-time by a "live scribe" who graphically represented the topics and issues as they were being discussed. These graphic posters along with biographical sketches of each of the participants; abstracts of the panelists; video interviews; and the presentations from each of the sessions are available on the WHO meeting website ([http://www.who.int/csr/disease/anticipating\\_epidemics/events/informal-consultation/en/](http://www.who.int/csr/disease/anticipating_epidemics/events/informal-consultation/en/)). This report summarizes the proceedings. To capture additional ideas and thoughts, participants were encouraged to write these down and post them on an "idea wall" or put them in a box. These comments have been collated and can be found as an annex to this report (Annex 4). This report itself provides a brief summary of the interventions by moderators and panellists and a summary of the discussion with the audience.



# g emerging infectious demics

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World Health  
Organization



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ovative approaches that are relevant  
y's world and, more importantly,  
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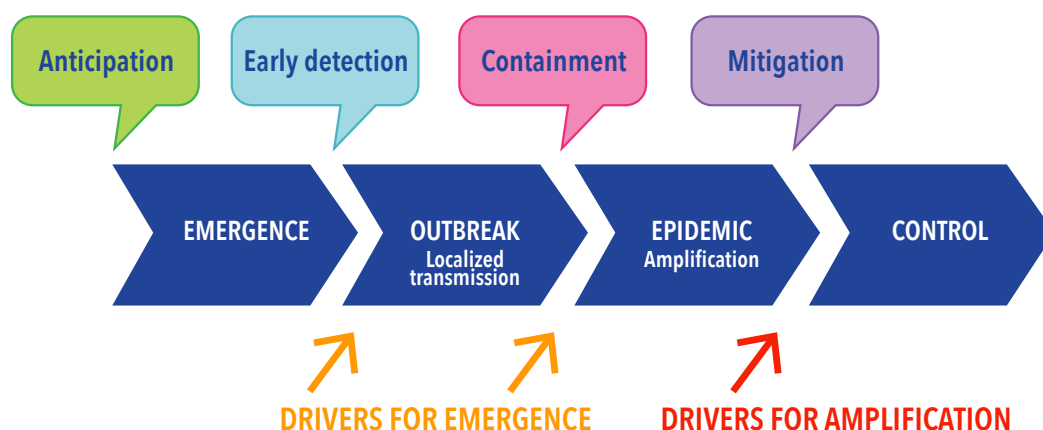


## 02 OPENING SESSION

Dr R Bruce Aylward, acting Executive Director of WHO's recently established WHO Health Emergencies Programme, said the new Programme has been one of several responses by the Organization in the face of the increasing frequency of epidemics in recent years, their increasing severity, and their destabilizing effects on nations, regions, and – in the case of Ebola virus disease – the world. It is clear that health systems have to be better at anticipating outbreaks so that responses can be more rapid and effective. The enormously complex challenge of doing so will be made more difficult by broad trends such as urbanization, deforestation, and climate change. Accordingly, those present at the meeting included not only health experts but experts in the environment and meteorology, the social sciences, information and communication technology, and other fields. It was important to remember that whatever high-level or technically complex steps are taken in coming years, they will depend for success on what communities do: non-experts have to be able to understand disease threats and often have to be persuaded to change traditional behaviours. "If we don't get that right," Dr Aylward said, "it will be very hard to combat epidemics."

Dr Sylvie Briand, Director of the WHO Department of Pandemic and Epidemic Diseases, said upcoming crises likely will be different from those recently faced. Steps can be taken to define possible scenarios, to guide preparedness, and to build in the flexibility necessary for responding to the unexpected. The goal is to have a global system that allows for anticipation, for early detection of emerging disease threats, for rapid containment, and for mitigation.

**Fig. 1: Drivers for emergence and amplification**





## 03 SESSION 1

### Back to the future: Learning from the past

This first session focussed on lessons learned from the recent epidemics of Ebola, H1N1 pandemic, SARS and the collective global response to similar emerging disease epidemics. The moderator highlighted that though we know that we must learn from our past experiences, we tend to have a forgetful memory. Anticipating new outbreaks and for epidemic risk assessment and risk management a better understanding of human factors is required in order to understand the impact of changing global trends including intensification of air travel and migration, political upheaval, climate change and deforestation, and new communications tools. We need to modernize and put at the forefront the social sciences for making decisions by focussing on trust, behaviours, and beliefs.

The session explored the following key questions:

- What are the critical lessons to be learned from major recent epidemics?
- What signals and information should we have anticipated that made “routine” events extraordinary?
- What are the drivers of emergence and amplification that can turn an outbreak into an epidemic?
- What important drivers need to be integrated into the risk assessment?
- How can we enhance our preparedness and response by “thinking outside the box”?

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**It is primarily the national governments' responsibility to ensure their populations are protected from epidemics.**

**This requires not only a strong health system but also government-led coordination with many non-health sectors.**

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#### **Ebola in West Africa: drivers and lessons learned**

Seven countries in Africa had Ebola outbreaks in 2014-15. In three countries, there were devastating events; but in the other four the spread was contained. Rapidly detecting the imported cases and establishing accurate laboratory diagnosis of the infection, they introduced classical infection prevention and control (IPC) measures to successfully contain Ebola virus disease (EVD) from spreading widely in their territories. These countries demonstrated that given basic facilities and infrastructures, combined with strong political leadership, effective coordination of an immediate and aggressive response, disease outbreaks can be controlled before they become major public health events. Securing the health of citizens of a nation, including protection from the ravages of disease outbreaks, is the primary responsibility of the government of the nations in which they occur.

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### **New perspectives on outbreak response after SARS in Canada**

SARS was the first major international event of this century which showed that any local crisis can become an international problem and that no country can consider itself isolated from the impacts. In many ways it is an example of what might be expected when the next global outbreak occurs. Secondary effects were felt beyond surveillance, morbidity and mortality in terms of travel and transportation, social services for quarantined persons, huge economic consequences for the city, media frenzies, political

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**Preparedness requires planning and exercising to be rigorous. But in the midst of uncertainties, the response must allow for nimble and flexible implementation of strategies to meet actual needs.**

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concerns, and more. The experience raised the spectre of a more easily transmissible agent that will produce even greater, far-reaching distress.

### A mild H1N1 pandemic: critics and anticipation

There are medical interventions such as vaccines and antivirals available for influenza but their use raised a number of criticisms and suspicions in many affected countries with parliamentary investigations after the 2009 H1N1 pandemic crisis. As the world had been preparing for the next pandemic for many years, response plans were deployed including the rapid development of pandemic-specific influenza vaccine and the use of antiviral stockpiles (in those countries where they were available). The overall impact of the pandemic was ultimately considered comparable to that of a moderately severe influenza season. Criticism of over-reaction was voiced and many lessons were learned that led to revision of the WHO global approach to pandemic influenza as well as to national response plans.

### Multidisciplinary response: strengths and challenges

Different partners exist, including non-health sector ones, and they each bring different points of view, perceptions of the risk, and how to address the problem. Emergency response brings actors from many UN agencies, national organizations, civil society (the NGO "community"), and the private, for-profit sector. This is sometimes referred to as "the humanitarian circus". Lack of a strong and effective ringleader results in a humanitarian response from the health sector that is usually relatively uncoordinated, unsupervised, and totally unregulated. The solution is to empower countries, with technical support of WHO and convening power of the UN system, to develop "whole of society" operational plans; exercise and regularly update them to ensure that local, national, regional and, if feasible, international authorities are able to implement technically sound and fully coordinated assessment and response activities.

### The role of NGOs and health sector partners

Many different institutional actors including NGOs, particularly those that are faith-based, are important providers of health care in poorer parts of the world. The West Africa Ebola experience highlights the speed and adaptability of non-governmental humanitarian actors, it underscores the importance of their role in responding, but it also reflects the need to partner with NGOs to increase their capacity to address non-traditional hazards, including infectious disease outbreaks. NGOs must be considered equal and vital partners in epidemic preparedness, response and recovery as the Africa Ebola outbreak shows including coordination, working alongside UN and local and foreign governmental agencies. Looking ahead we need to consider the opportunities to improve partnerships and enhance our collective response capacity to future outbreaks, building on our comparative advantages.

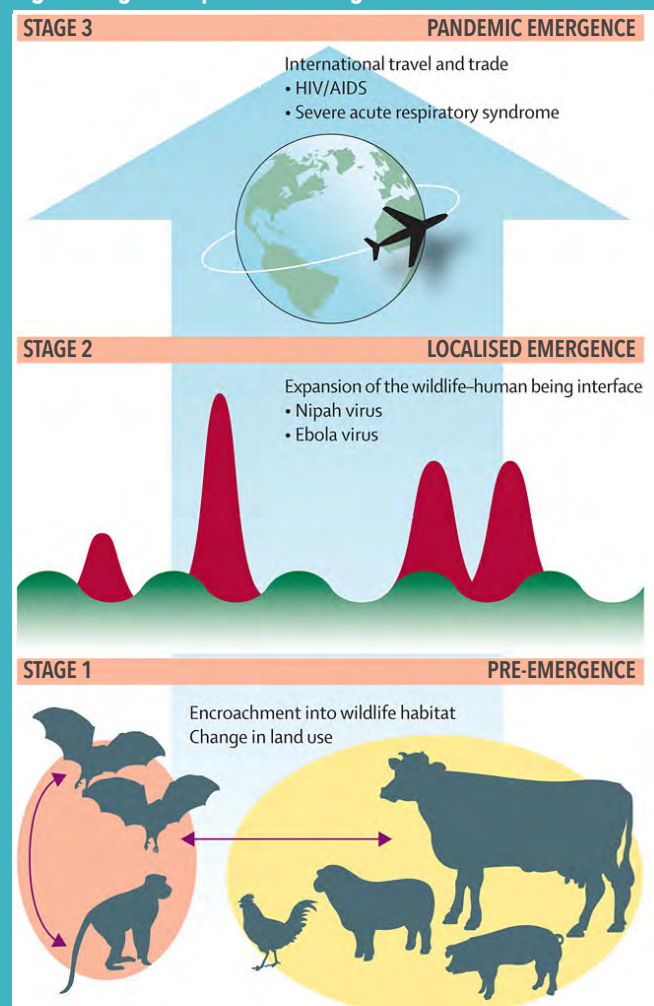
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All humanitarian actors must be recognized and their complementary strengths enhanced for infectious diseases. Coordination during a response should bring them together for collective action but with countries in the lead.

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Fig. 2: Stages of epidemic emergence



Emergence of pandemic zoonotic disease (ref: Morse SS et al Lancet 2012; 380: 1956-65)



# BACK TO THE FUTURE



## EBOLA W. AFRICA OYEWAKE TOMORI

EBOLA TOOK AWAY HOPE...

...BUT IN 4 COUNTRIES WAS

there's NOT MORE to say about the FACTS



VIGILANCE: KEY  
LOCAL: AGGRESSIVE RESPONSE WORKED  
EMERGENCY DECLARED ON TIME  
LABS AVAILABLE

NETWORK OF INTERCONNECTED PLAYERS REQUIRED

Context of inequality  
COUNTRIES must take RESPONSIBILITY

## DISCUSSION



eg. expired food because of delays

COMMUNITY ENGAGEMENT WAS A HARD LESSON  
Can't just send in our men with space suits

WHO REGIONAL OFFICES KEY

addressing community resistance  
Prepandemic partnership building understanding trust

FUNDING DURING pandemics is EASIER - we need it between pandemics



We need the ONGOING surveillance info

## MULTIDISCIPLINARY RESPONSE

RON WALDMAN

INTERPANDEMIC PERIODS



STARTING NOW!

KEY TIME FOR GLOBAL PLAYERS TO COLLABORATE

PREPAREDNESS MUST BE HOLISTIC

COMMUNITY LEADERS: CAN SHAPE BEHAVIOUR

FOR PROFIT: technical skills CAN BE SELF-INTERESTED

NGOs: CAN REACH COMMUNITIES - UNREGULATED

MINISTRIES OF AGRICULTURE

MINISTRIES FOR COMMUNICATION FINANCE, TRANSPORT...

SKILLS IN DIFFERENT SECTORS VARY

NEEDS DISCIPLINE + PLANNING

COORDINATION • LEADERSHIP • FOLLOWERSHIP

## NEW PERSPECTIVE OUTBREAK RESP

SARS IN TORONTO



251 CASES 41 DEATHS

we learn

TRAN Lacked

REST asian re

INI PO invited li

SOCIAL 78,000+ with no

Medic no coord

Econom

Health no formal + public

RELIG



# LEARNING FROM THE PAST

preparedness...

RON ST. JOHN

S: UNISE

ed:

PORTATION

coordination

MURANTS

survivors empty

tics

ison officers from US

SERVICES

people in quarantine

up projects

nted messages

ic impact

link: hospital/clinical

health; hospitals closed

**A MILD PANDEMIC** JOHN WATSON

ANTIVIRAL STOCKPILES USED

Overall impact: moderately seasonal INFLUENZA

OVER-REACTION?!

PROCESS OF

CONTAINMENT	TREATMENT	COMMUNICATION
<ul style="list-style-type: none"> <li>Within the UK, nationally agreed steps;</li> <li>LOCAL FLEXIBILITY NEEDED</li> </ul>	<ul style="list-style-type: none"> <li>criticized for giving treatment to ALL at cost of VULNERABLE</li> </ul>	<p>SOCIAL MEDIA context changes behaviour</p> <ul style="list-style-type: none"> <li>✓ consistency</li> <li>✓ trust</li> <li>✓ look to social scientists</li> </ul>

Illustration of people in a meeting.

**NGOs & HEALTH SECTOR PARTNERS** SEAN CASEY

CLUSTER RESPONSE

to work operationally not just into 'shadow'

interaction with community  
trained themselves + peers  
built + managed 19 ETCs/ETUs  
speed, adaptability, diverse skills

**NGOs + EBOLA**

- Had never responded, felt unprepared
- Lacking technical capacity (but with 2 weeks we trained others?)
- NGO boards reluctant/risk averse

UN GOVT'S NGOs

- ✓ NEED to COLLABORATE
- ✓ NGOs AS EQUAL PARTNERS
- ✓ NGOs AS OPERATIONAL ROLE

Illustration of hands shaking.

Let's make ASTUTE CLINICIANS even more astute!

Send anthropologists... before Virologists... So they can work together

acknowledge Community + local Context who's been on the ground 1st

WE COULD HAVE PREDICTED SOME OF THESE RESPONSES

SOCIAL SCIENTISTS AT THE TABLE FOR PREPAREDNESS

we need SUPER-COORDINATION!

ERADICATE PANDEMIC of bad management

NATIONAL RESPONSES

INTERNAL RESPONSES

START EARLY

when they call, make sure someone's listening

drawn live  
graphic recording

Drawing  
Change









## 04 SESSION 2

### Future epidemics: moving and blurry targets

The session moderator highlighted the progressive stages of emergence of epidemics from wildlife and livestock pathogens crossing over to humans, resulting in a zoonotic outbreak and sometimes becoming human-to-human transmissible (e.g. SARS and MERS-CoV). This last stage is too late to contain novel pathogens and so the question remains: can we anticipate microbes in the animal sphere and assess their risk as potential pathogens for humans? H1N1 was not a failure of the signal but a failure in our understanding of the virus. Can we identify common patterns for emergence and control at source? This requires a better understanding of what is circulating in animals but this is a huge list so how to prioritize? How do we assess risk given the diversity of potential microbes? To understand whether zoonotic events precede transmissibility from human to human some knowledge gaps exist, for instance:

- Influenza – there has been an attempt to structure risk assessment using IRAT (CDC) and ECDC's risk assessment tool. Should we do the same for other diseases?
- Routes of transmission, host factors, genetic diversity of viruses among human populations. Can we identify common pathways by which they emerge? For influenza: interventions that we know will trigger emergence.

Finally, the issue of emergence of epidemics coming from animals requires an integrated approach of One Health (human, animal and environment).

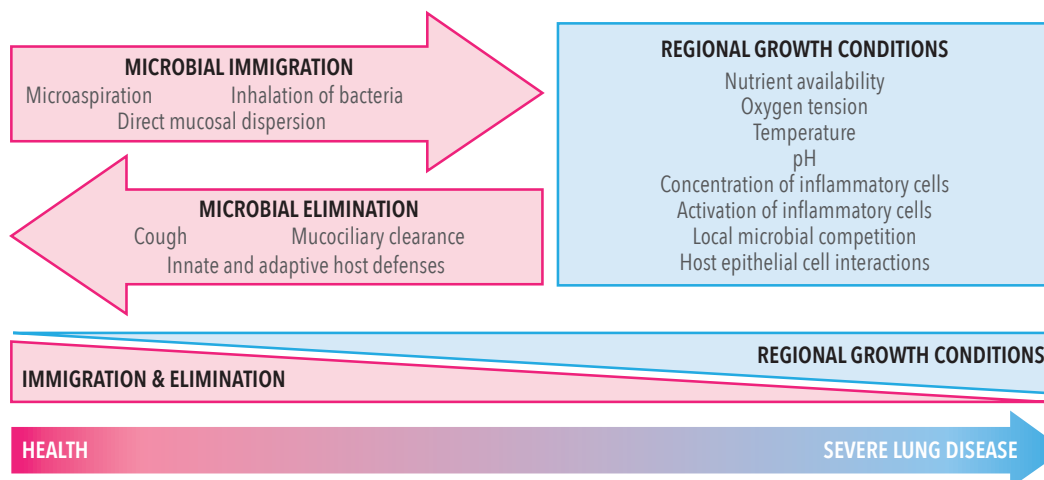
The session explored the following key questions:

- How can we better use our knowledge of the human-animal interface to anticipate and respond to emerging infectious diseases?
- What could be the impact of the new infectious disease paradigm (microbiota) on the understanding and control of outbreaks?
- How can we holistically and systematically apply our knowledge on the human-animal interface and the microbiome to mitigate epidemics?
- What concrete steps can be implemented to anticipate emergence and prevent amplification?

#### Knowledge on microbiome and research

In the past centuries, the classic Pasteurian paradigm, in which the pathogen comes from outside the host, has shaped the strategies and methods for control of infection and epidemics. Cutting-edge research on the human microbiota has revealed that a new paradigm of pathogen-host interaction is required. Gut microbiota have co-evolved symbiotically with the host with functions ranging from absorption of nutrients and contribution to the development of the immune response. The concept of invasion of the host by a pathogen is therefore complicated by the theories of the imbalance within the host's own bacterial ecology, i.e. the microbiome, rather than simply invasion of the host by a pathogen from an external source. The development of therapeutic and preventive interventions and diagnostic methods being explored in addressing gut microbiome disorders range from nutrition complements to stimulate immunity to fecal transplantation to treat gut infections.

**Fig. 3: Ecological determinants of the respiratory microbiome**



Dickson RP, Huffnagle GB. *PLoS Pathog* 2015, 11(7): e1004923

It is imperative that we continuously understand and apply the newest scientific tools and knowledge to respond to emerging diseases. New opportunities from the field of the microbiome must be exploited for health.



### From science to action: microbiome and respiratory diseases

Modern, culture-independent techniques have revealed that healthy lungs are not sterile as once believed but harbour diverse communities of micro-organisms. Many questions remain unanswered regarding their role including respiratory dysbiosis in pathogenesis and treatment; whether they can be manipulated for therapeutic effect; and how viruses affect the ecology of respiratory tract. Research is ongoing to address important insights into the pathogenesis of acute lower respiratory tract infections, the role of epidemic viruses in causing or triggering severe respiratory disease, and identification of novel therapeutic or prophylactic interventions.

### Managing the risks of emergence at the animal level

We are all inter-connected. From the animals that populate our human environment on which we rely for food, draught power, savings, security and companionship, to the wildlife inhabiting sky, land and sea. Early warning of disease events is critical. Livestock health is the weakest link in our global health chain, and disease drivers in livestock as well as wildlife have increasing impacts on humans. To respond effectively the following are necessary: (1) evidence to understand problems and opportunities for change; (2) enabling inter-sectoral dialogue and information exchange; (3) raising awareness, promoting health-conscious innovation, improving the way we produce, buy, sell and consume animal products; and (4) enhancing how we jointly investigate and respond to health threats.

Our inter-connectedness with our environment requires close cooperation with joint actions between animal and human health. The two networks must be systematically linked and engaged for preparedness as well as response.







# FUTURE

moving AND blue

## HUMAN-ANIMAL INTERFACE



**RISK:**

HOW DO WE DECIDE WHAT TO SURVEIL? WHAT ARE KNOWLEDGE GAPS?  
WILL A ZOOLOGICAL EVENT ALWAYS PRECEDE HUMAN EVENT?  
CAN WE ID COMMON PATHWAYS?

1 IDENTIFY 1<sup>st</sup> CASES

2 EARLY DETECTION NEEDS PATHWAY KNOWLEDGE

• CONNECT WITH PEOPLE IN CONTACT WITH ANIMALS

3 DATA: MORE SCIENCE

✓ PREDICTIVE EPIDEMIOLOGY  
✓ FIELD WORK  
✓ GOOD DATA  
✓ INVEST IN HUMAN RESOURCES

COOPERATION

## MANAGING RISKS AT ANIMAL LEVEL



WE'RE ALL CONNECTED

Growing demand for animal protein

WHAT are DISEASE DRIVERS?

HOW DO WE RAISE LIVESTOCK?

Better Communication: Institutionally + cross sector

Early warning system

## MICROBIOM RESEARCH

GUT MICROBIOT

MODULATING VACCINE EFFICACY:  
DISRUPTED BY ANTIBIOTICS  
PROTECTS AGAINST PATHOGENS



PROBIOTICS  
INSECT MICROBIOTA

## ECOSYSTEM SURVEILLANCE

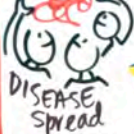
THE ANSWERS WILL BE LOCAL



Prevention:

outbreaks INEVITABLE, EPIDEMICS ARE NOT!

OUR BEHAVIOURS create



RISK is NOT EQUALLY DISTRIBUTED

- Hotspots He Strategic  
- WHAT'S EMERGING FROM AN CHAINS?



# EPIDEMICS:

every TARGETS

discussion

## MICROBIOMES + RESPIRATORY DISEASE

✗ We Used to think LUNGS were STERILE...

✓ it's a DIVERSE MICROBIAL COMMUNITY

① EMERGING AREA    ② LOOKING AT LUNG DISEASES

MICROBIOMES IN → bacteria  
MICROBIOMES OUT ←  
WITHIN NUTRIENT RICH AREA

INES

IBIONICS

ST

APeptic

ilities:

+ metabolic

sordens

merging

areas

fecal transplants

RELATED

p us be

ERING

VALUE

NOTE: ALSO spread of disease by MOSQUITOS

HOW CAN we sustain FUNDING for SURVEILLANCE?

HUMAN-ANIMAL INTERFACE

How do we EDUCATE & reimagining the WORKFORCE?

VETERINARIANS... AGRICULTURE... RURAL AREAS

is it Really this BAD? Spread of stories on social media

VERTICAL + HORIZONTAL COOPERATION

can we match hot Spot to New Hs, Ns?

lower the viral load

Challenges 1 pathogen, 1 disease

get AHEAD OF THE CURVE Means: SHARING info

get clear on MESSAGING

Is it influenza? Is it bird flu? Where are surveillance gaps?

Use large gatherings to identify

RRRRRRRR

animal value chains are crucial

PAY ATTENTION TO VETERINARY SECTOR

known about microbiomes in Treatment for a long time

drawn live graphic recording

Drawing Change



## 05 SESSION 3

# Science and technology: opportunities and challenges

The session moderator emphasized that new and different solutions were needed to strengthen national and subnational capacities to make sure they are at the optimum. This would be complemented by “planetary security” – global security at its broadest with supra-national institutions, e.g. the UN system, NGOs, partners should work together as equal partners. The weakest link argument is more relevant rather than the old cliché: “diseases respect no borders”. Health and health care industries have to look at the aviation industry, new development banks, insurance and financial sectors and to R&D. The R&D solutions mean innovations and technological solutions. How should we direct the R&D and incentivise manufacturers to make the needed investments and ensure their products come to market? By putting patients and communities back at the centre.

The session explored the following questions:

- How can new scientific advances and technologies influence the surveillance, detection and control of emerging pathogens?
- What is the impact of increased accessibility, availability and visibility of technologies on risk perception and how should communication strategies be adapted to make them successful?
- How can we best use new technologies to rapidly detect, communicate and respond to epidemics?
- What tools can help to better engage the communities and other actors in outbreak response?

---

Health security requires application of a dynamic shift to find new solutions to old problems using the best science and technology has to offer. But application of new tools and approaches means opening our traditional health perspectives to views from other disciplines.

---

### What's new for surveillance and detection?

Targeted single isolate detection has been a valuable tool, however, the dramatic increase in emerging and mixed microbial infections, and rising association of food-associated and intestinal microbial community in human and animal health and wellness has led to a need to identify the entire microbial community to understand the dynamics of infections. The ability of next generation sequencing to generate large amounts of DNA sequence data has considerably facilitated metagenomics studies, including of food-associated and intestinal microbes. Specific applications of metagenomics in food safety include, among others, (i) identification, from clinical specimens, of novel and non-culturable agents that cause foodborne disease; (ii) characterization of microbial communities (including pathogens and indicator organisms) in foods and food associated environments (e.g., processing plants); and (iii) characterization of animal and human intestinal microbiomes to allow for identification of microbiota that may protect against infection with foodborne pathogens.





Professor Gabriele  
Leung







### What's new in diagnostics?

Many of the tools first deployed in life sciences research have now been turned into clinical *in vitro* diagnostic devices with fit-for-purpose features that make them attractive for use in many developing world settings. Ease of access is a key element, i.e. local staff near patient settings without special training and an ability to transmit resultant data in real-time. There are a number of opportunities provided by these advances in technology. Now a new generation of immunoassays is in development that offer multiplexing, quantitation, automation, and electronic reporting and molecular testing systems have been developed for clinical use that automate specimen processing, amplification, detection, and wireless reporting. However, there are some persistent obstacles to their broad impact in public health. Investment for diagnostics development is necessary in the inter-epidemic period along with a global architecture by harnessing partnerships to deploy earliest in an epidemic.

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To systematically build preparedness and response capacities investment in innovations and new technologies must be harnessed during inter-epidemic periods.

---

### Advances in biology and their applications

Nature is still better at producing human threats than we are. For detection and analysis, biosensors from synthetic biology (DNA sequencing and engineering) may enhance our capabilities in differentiating closely related strains. For instance, metagenomic sequencing to analyse patterns that drive diseases. For known emerging infectious diseases, synthetic biology may help by developing support methods for existing technologies such as combinations of biotechnology and nanotechnologies. Analytic and database tools are being put together. Response in the form of treatment or prophylaxis is the area where synthetic biology can greatly enhance our capabilities as well as accelerate vaccine development. But getting the product to the people and making it viable is the basic principle for responsible research in science and technology.

### Risk perception and community engagement

Risk perception is the core to how an individual and community understand, interpret and react to risk and it influences decisions about the acceptability of risk and behaviour before, during and after the risk has passed. Ability to translate information from global

---

Information technology is ubiquitously owned by everyone which brings with it risk perception challenges. Community engagement and risk communication tools are critical components of any epidemic response.

---

level into language that is understood by communities is vital so that complex information on risk is understood within societal and cultural influences and is aligned with actual risk to communities, as accurately as possible. The revolution of social media and dire need of better and faster risk communication has driven the use of more technologies including mass SMS, radio, internet (Facebook, social media), but interpersonal communication is still the way we make a difference when psychosocial support is required. Challenges remain as to how to use the networks of Red Cross volunteers (17 million) to pass messages at scale and use them in an alert system.

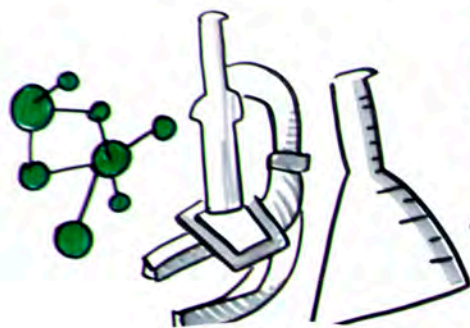
### Communicating in the 21st Century

Central importance of communities and community ownership highlights the central importance of people taking actions. Five key principles in community engagement are: (1) trust - source of information needs to be trusted by building trust in the health system and through intermediaries; (2) listening is as important as messaging - build on communities' reference and understand the cultural context (3) professionalism - communication cannot



be improvised so it is imperative to build national capacities; (4) ensuring coherence in complex fields - interagency cluster system; and (5) communities compare information from multiple channels so there is a key role for innovations. Investment for the long-term is needed because we cannot just start at the beginning of the outbreak, rather resources are needed for preparedness.

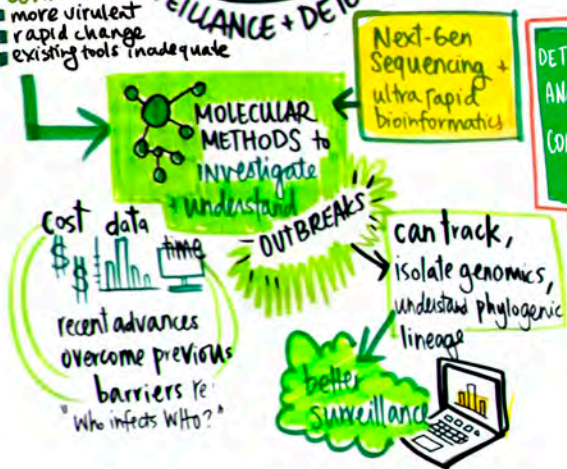




# SCIENCE & OPPORTUNITIES

## WHAT'S NEW? SURVEILLANCE + DETECTION

Current context:  
 ■ more virulent  
 ■ rapid change  
 ■ existing tools inadequate



NUR HASSAN

## SYNTHETIC BIOLOGY

JIM AJIOKA



## WHAT'S NEW? DIAGNOSTICS



## DISCUSSION:

ENSURE WE ENGAGE LOCAL EXPERTS

RE-VCOR OPEN TESTING - SOME COMMERCIAL TOOLS STILL RECY

WHAT ABOUT DATA SHARING (at global level)



# TECHNOLOGY

## 8 CHALLENGES



AMANDA McCLELLAND

Risk is ALSO about  
PSYCHO-  
SOCIAL  
SUPPORT



BARBARA BENTEN

MARK PERKINS



SOME  
SUCCESS  
STORIES:

Knowledge can  
be HIGH - but  
perception can  
change



17 million  
Volunteers:  
How do we  
work at  
SCALE?

RISK PERCEPTION changes  
as epidemic moves

2 WAY  
COMMUNICATION



SMS  
polling



Radio  
2way  
communication

PHONE  
CREDITS  
TO CALL IN



Drove  
radio  
transmitters  
around



Collect  
inactivate  
test

IPS + Coordination  
Needed



Tests  
ebola tests



CAN WE  
PREDICT BUGS  
IN LOW-RESOURCED  
SETTINGS?

Look at  
"COMMUNITIES  
BROADLY"  
all in NY, market in  
Liberia

COMMUNITY  
ENGAGEMENT:  
\$ FOR PARTICIPATION  
WORKS WELL

Look to AIDS,  
not just Ebola  
existing epidemics  
can teach us

RELEVANCE OF  
BIG DATA WITHOUT  
GOOD ANALYSIS = 0

TECHNOLOGICAL  
GAPS BETWEEN  
AFRICA + REST OF  
THE WORLD

IF PEOPLE  
TRUST  
SOCIAL  
MEDIA, HOW  
DO WE  
ENGAGE?

- Can we train journalists locally?
- Religious leaders became trusted source, not at start

- dismantle rumours by acting in an ongoing way

- Knowledge sharing isn't always correct - Red cross had social med managers

OPEN  
DATA  
HAS PROS + CONS...

- stay jargon-free!

drawn live  
graphic recording

Drawing  
Change







## 06 SESSION 4

# Making the most of Big Brother

The session moderator described the UK's experience with the Olympic Games in London. As much good information as possible was collected through laboratory and syndromic surveillance in which 30 million people were registered and trends observed. Some of the more challenging questions that were dealt with were: what is the baseline? When does it change? When is it significant change? They are now using social media, the added value of which remains to be seen.

The session explored the following questions:

- How can real-time information be better used for timely and relevant responses?
- Forecasting: what can public health learn from other sectors?
- How can big data approaches be applied to enable epidemic anticipation?
- How do we capture, collect and optimally analyse data on the drivers and amplifiers of epidemics?
- What can the health sector learn from other sectors that are further ahead in using newer technologies to anticipate risks?

### Modelling outbreaks: pros and cons

Modelling goes hand in hand with analysis and is not a theoretical exercise. The cycle involves preparedness, real time analysis, and retrospective analysis with on-going monitoring during an event. Modelling can help with "what if" scenarios. It can be a retrospective "what if" (impact of strategies implemented earlier) and it can be a simulation for preparedness, considering a possible set of scenarios. Challenges include access to (timely) data for analysis, who will see the result and if widely available how will they make sense out of it, how to separate the noise from the signals, and how to coordinate a modelling group(s) to get the best value out of them?

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**A number of newer, more extensive, real-time data sources and analytic methodologies have become available that will allow us to better anticipate outbreaks and their evolution. It is time to apply these at a global scale.**

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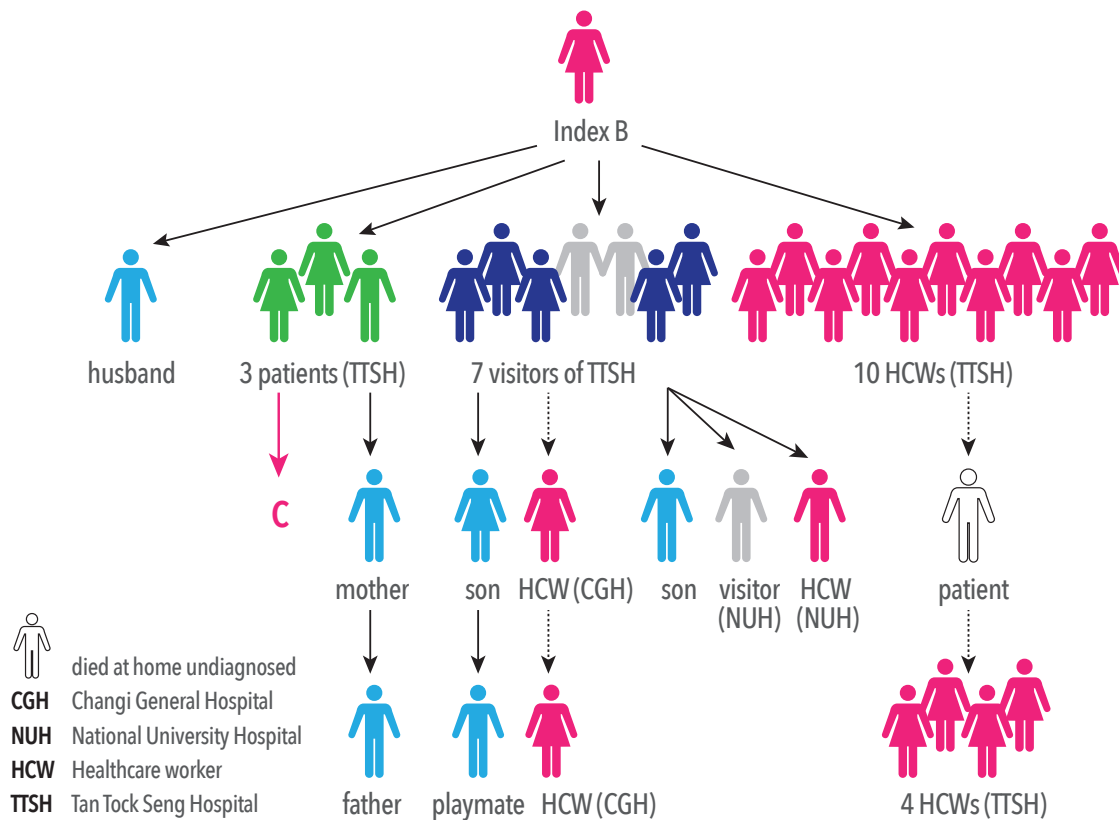


### Use of big data to anticipate epidemics and their evolution

Understanding migration and human mobility is critical in infectious diseases providing important insights into risk. Of the almost 6 trillion kilometres travelled 1/6th comes from just the US and a quarter from just three countries: US, UK and China. Hotspots for risk are linked to unequal distribution of movement. In the last 10 years there has been a 60% increase in mobility which is accelerating quicker and faster than our ability to prevent and control infectious diseases; we are getting better at amplifying threats by our global movement. There are better opportunities to get data: internet (GPHIN / ProMed), meteorological (satellite), smartphones with computing power, and social, behavioural, cultural aspects of epidemics. We are working on many kinds of data (open data, from industry, personal health information) but we have to overcome the following challenges: managing a growing volume of data; security/privacy issue; mechanisms to share data; who is going to have access to this data (who is Big Brother?). We need some entity to have a panoramic view – an incident manager – whom we can all trust.

We can learn from other sectors that have analyzed large, dynamic datasets for prediction, such as meteorology and insurance, and adapt their concepts, techniques and strategies for epidemic anticipation.

Fig. 5: SARS, chain of human-to-human transmission, Singapore 2003



(Source: Tan Tock Seng Hospital, Singapore)



### Learning from successes in meteorology

Evolution of technology since World War II has been a success for weather forecasting which is based on collection and sharing of large amounts of data, thanks to satellites, resulting in real-time sharing to the point where data is gathered every six hours from satellites airplanes and ships, down to a resolution of 15 kilometres. Availability of data is not the only element (only 20% of satellite data is used). The big question is how we translate these data using mathematical models and simulations. What matters most is "initial conditions" after which, using additional new information you correct your initial guess. Weather forecasting has moved from a deterministic to a probabilistic approach. By providing probabilities you share the responsibility whereby interpretation of the probability is left to the user. Key questions remain on how far we can go (i.e. seasonal forecast) and what kind of details we can provide (i.e. 500 or 100 metres)?

### Learning from the insurance expertise

Health surveillance is often a rather reactive process, with no real integration of early signals and wild cards. As a consequence it is difficult to detect radical changes having a strong impact on public health in the medium or long term. To embed this proactive dimension and increase proactivity, foresight is a key approach to use and many such methods exist among which the scenario approach will be explored. In describing possible future scenarios, as well as the elements in favour of one scenario rather than another, health surveillance can help decision makers to influence the context in order to guide towards one or more favourable futures.

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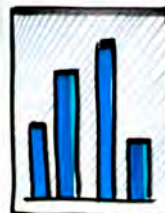
A key issue is the use of different kinds of data to make decisions BY whom, FOR whom? Data ownership, privacy, confidentiality, quality etc are considerable challenges that must be address for the use of big data.

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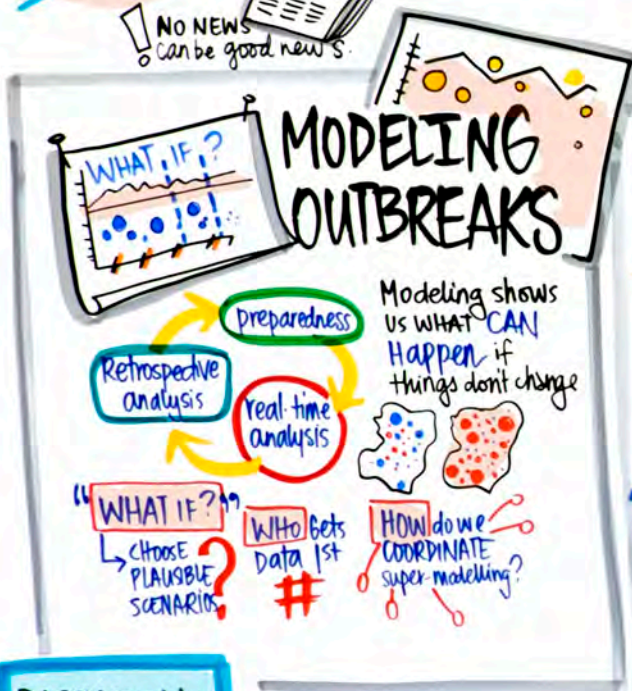
making the  
**MOST** of:



Good information  
= **EMERGING TRENDS**

WHAT'S THE BASELINE?

NO NEWS  
Can be good news.



### BIG DATA

MOBILITY

4 COUNTRIES

WHY is Relevant?

- We could this 15 y
- human connects disc

How down

**DISCUSSION:**

ETHICAL QUESTIONS ON STORING GENETIC DATA

RISK CHOICE

WE INSURE FOR **RISK** IN **INSURANCE** other sectors - eg legislation

CAN People ADAPT BEHAVIOUR re: Risk & coverage

Local expertise

"Little brother" data

DATA at COMMUNITY LEVEL?

DEMOCRATIZE DATA

WHAT'S IMPACT FOR AFRICA?

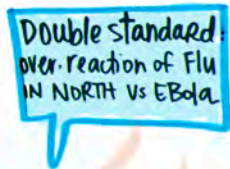
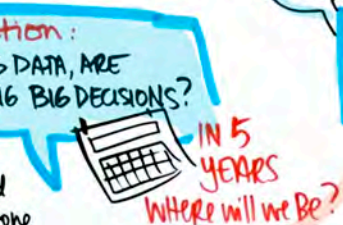
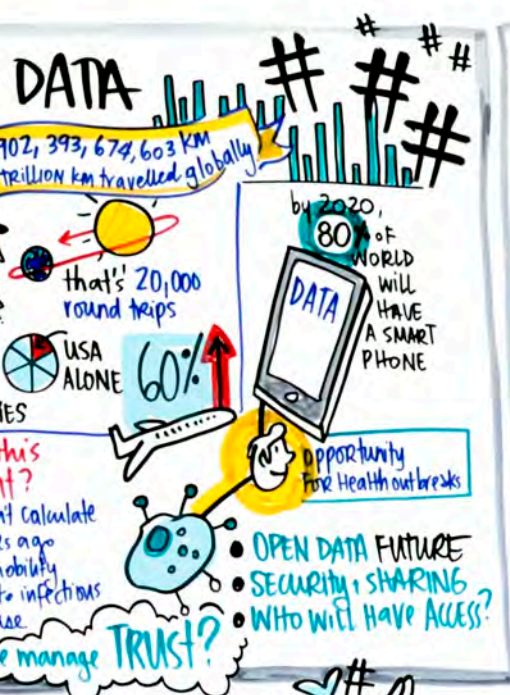
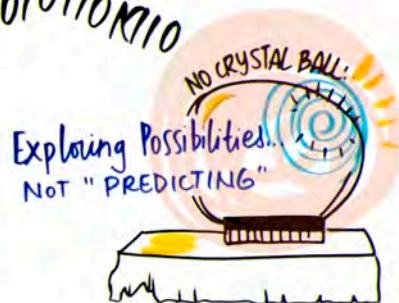
leapfrog org's

Big data

Teenage Sex

no one's good at it, even thinks even ELSE is doing





drawn live  
graphic recording

Drawing  
Change





## 07 SESSION 5

### Curing and not harming: that is the question

The session moderator highlighted the impact on healthcare workers during Ebola and SARS as an example of the critical importance of the health system in handling all kinds of emergencies. But these healthcare workers require the best support possible in terms of training and tools to ensure they serve as a positive influence in managing epidemic emergencies rather than have a negative impact due to poor practices.

The session explored the following key questions:

- How can the health systems of the future minimize the risk of amplifying epidemics and what elements must be in place to mitigate impact of epidemics?
- What kinds of innovations in medical technologies and patient care will improve epidemic detection and control?
- What kind of research is needed for the 21st Century to better address the challenge of emerging pathogens?
- How can we change routine clinical practices including adaptation to cultural beliefs and practices to better prevent and manage infections?

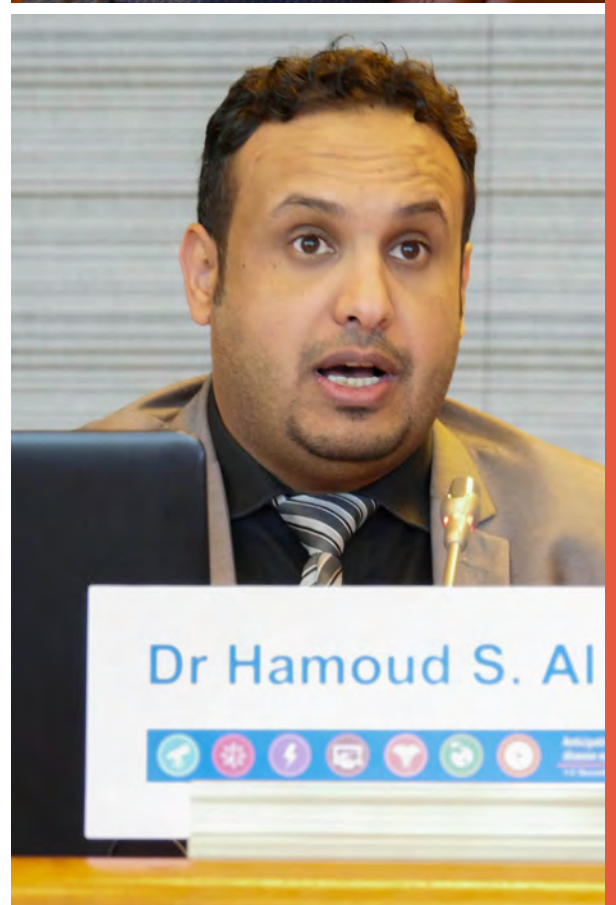
#### Clinical practices and emerging diseases

Key lessons learned from the MERS-CoV outbreak in Saudi Arabia include: never underestimate a novel virus; get prepared (planning, training, evaluation and auditing); ensure safe hospitals with security check points; "outbreak quad" (overcrowding, absence of triage, low index of suspicion, non-adherence to IPC measures); sick patients are efficient in getting and efficient in transmitting MERS-CoV; transmission happens because of what we do and not because of what the hospital looks like; administration involvement is critical; line of communication with communities is necessary for mobilizing them; disease does not respect national borders; build a national surge plan.

---

**It is vital to recognize that the health care system can propagate outbreaks just as it can contain them. This requires proper management of the entire system, not only one aspect such as infection prevention or one element such as the health worker.**

---







### Systemic view of infections in health care facilities

From Ebola we learned that adherence to simple and basic measure such as hand hygiene is more important than building high-tech facilities. At the same time we also learned that high-tech facilities can help contain the infection, providing an argument for building well-equipped health care institutions in the developing world as well. Health care institutions of the future should amalgamate modern strategies to improve human behaviour and at the same time build and design health care facilities to provide a safe environment with the least risk of creation of dangerous pathogens and amplification of the spread of infection.

### Patient-doctor relationship at the age of the Internet

By offering free, unlimited, easily and anonymously accessible health information, the web and social networks incite patients to take more control over their own health. As a result the patient-provider relationship is evolving such that patients often expect to discuss and sometimes challenge their doctors' recommendations. Health professionals' role needs to evolve, and in this regard, one size does not fit all. Healthcare providers need to take into consideration the health behaviour profile of their patients in order to build and maintain a trusting relationship.

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**Health care facilities are defined by the physical infrastructure but the human factors and people who staff them are the most important and must be addressed explicitly to ensure appropriate containment of outbreaks.**

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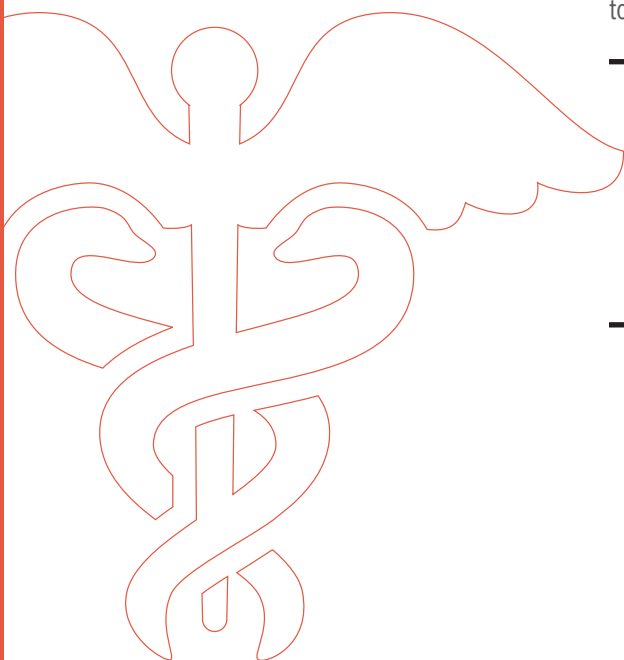
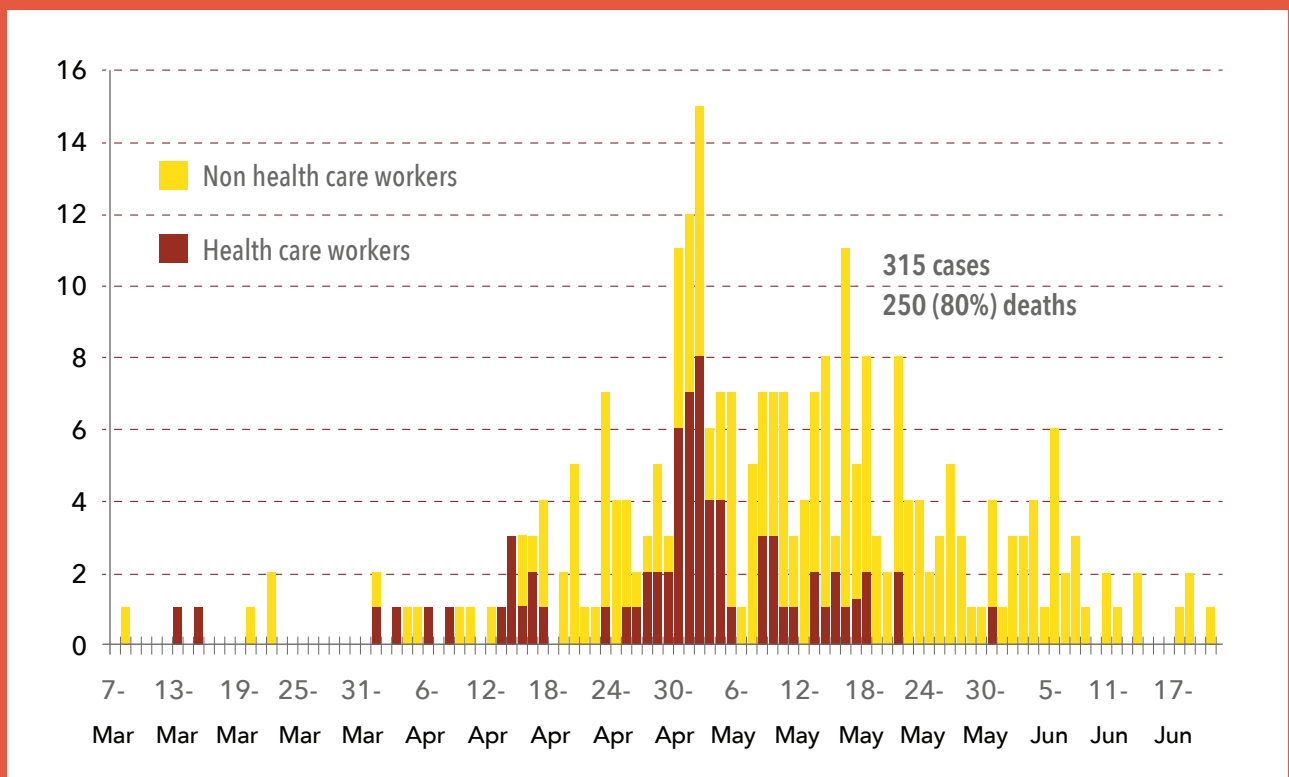


Fig. 6: Ebola Haemorrhagic Fever by mode of transmission, Kikwit Zaire, 1995 (Source: WHO/CDC)



### Impact of strengthening the overall health system

When implemented adequately, comprehensive components of health system strengthening should contribute to mitigating the impact of epidemics. The most deadly epidemics occur generally in low-income countries where governments' investments in health remain low despite their political commitment. Unless this lack of ownership is addressed, health system strengthening sustainability is doomed to failure. Among critical issues for the future are: (i) a thorough multi-stakeholders health system assessment/ review identify gaps; (ii) a "menu à la carte" of low cost and high impact interventions to address gaps; (iii) learning from previous experiences on inter-country cooperation; (iv) enhance socio-anthropology component of health system strengthening.

Patients can now take responsibility for their own health-related behavior as a direct result of widespread availability of information. Providers need to capitalize on this dynamic to forge new relationships with their patients.







# CURING and not THAT IS THE QUESTION

## CLINICAL PRACTICES & EMERGING DISEASES



## SYSTEMIC VIEW: INFECTIONS IN HEALTH CARE FACILITIES



HÉLÈNE LEPETIT



dr. Google

VERY DOCTOR-PATIENT



REFER TO RELIABLE

## DISCUSSION

DOES A FOCUS ON "SYSTEM" take focus away FROM CONTEXT, Social determinants, FUNDING.

JUST KNOWING MORE WON'T SOLVE IT ALL

WHAT'S THE ROLE OF LEADERSHIP?

PERSONAL RESPONSIBILITY re: bacteria infections

CAN DOCTORS (in FRANCE) REFER PATIENTS TO 1 VACCINE SITE?

• takes agreement ✓  
• most doctors want to refer 1 vaccine, 1 patient ~ Not ALL ~

UK HAS FLU SHOTS UPTAKE. DO HEALTH CARE WORKERS ADOPT?

→ W

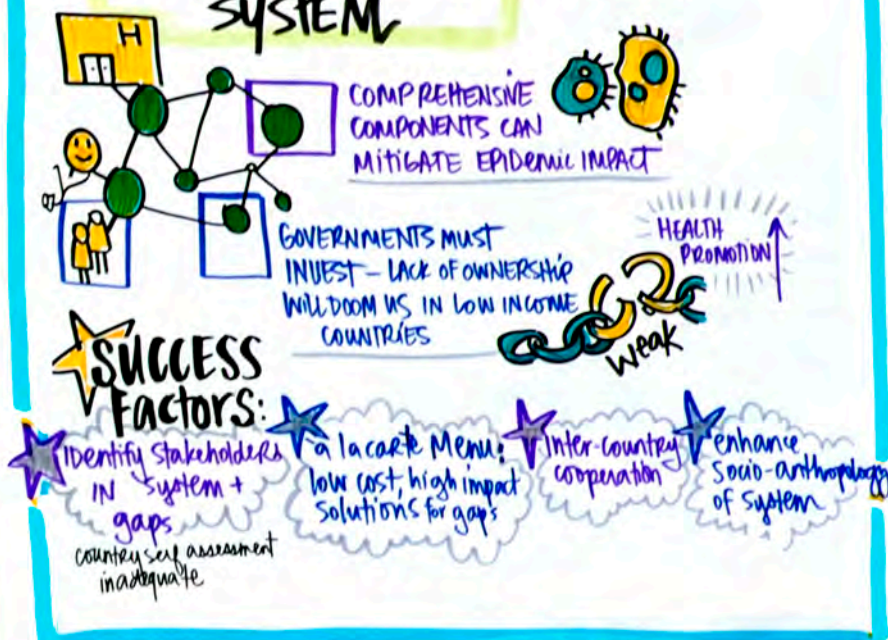


# HARMING: ON

## PATIENT-DOCTOR RELATIONSHIP IN AGE OF THE INTERNET



## STRENGTHEN the OVERALL HEALTH SYSTEM



EE - 50%  
why  
RE  
ALL  
hy?

FOR WEALTHY COUNTRIES, RETURN to low tech solutions: Soap, washing

WHAT is WHO ROLE IN ENSURING KEY DOCUMENTATION  
→ INFECTION control

Health sector is full of HOLES

→ WHAT are QUICK WINS?

→ "system" is more than hospitals

learning from Atlanta olympic: preparedness is a security issue

we're at full capacity in our hospital - that's our BASELINE

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## 08 SESSION 6

# Preventing the spread of infectious diseases in a global village

The session moderator highlighted the issue of defining global drivers and addressing risks in this world where interdependence and interconnectedness clearly show how global security has changed. Outbreaks and diseases are seen as destabilizing factors in the new health security paradigm where security is contrasted with global public good and solidarity. Risks are always defined virtually so the notion of threat becomes very important, i.e. who is defined as vulnerable and has to be supported? Managing risks means also managing the political dimension. Risk definition is a power game: who defines the risk? who holds the narrative? Looking from a WHO perspective, who gets to define a PHEIC – a committee of technical experts or a publicly elected director?

The session explored the following questions:

- How can we include socio-economic and political determinants into outbreak control?
- How can we modernize “traditional” control measures (isolation, quarantine, culling etc) in today's world?
- What are the politics and political challenges of responding to escalating outbreaks?
- What are the key drivers of epidemics in today's interconnected global ecosystem and the evolving social habitat?
- How to better engage with societies of today for preparedness and response to epidemics?
- What public health measures should we revisit and/or adapt, and how do we move from a biomedical approach to a more holistic one?

**Table 1: The Evolution of Global Health Security**

Past (19th to mid-20th Century)	Present (20th Century)	Proposed Future (21st Century)
International Sanitary Regulations	International Health Regulations	International Health Security Framework
List-based. Cholera, plague, yellow fever (smallpox, typhus, relapsing fever).	PHEIC (emerging infections including bioterrorism)	All public health emergencies, including climate change, emerging infections, antimicrobial resistance, & synthetic biology
Quarantines, limit restrictions to trade and travel	Improved Reporting & Building National Capacity	Prevention & Preparedness at National Level
Physical Infrastructure (trade routes)	Post-Industrial Infrastructure - electricity, electronics	Knowledge Infrastructure
Disjointed response	Revolutionary international law and global governance but still fragmented	Integrated
Country-based response	Multilateral response	Shared Information Response Global Response Teams Response Contingency Fund Global Fund for Health Security
Surprise	Expect (managing certainty)	Predict and Prevent (managing uncertainty)
Official government reporting	Non-state actors (organizations & media)	Everybody
No reporting of capability to meet the regulations	Self-assessments	Global Health Security Preparedness Index
French government. 14 International Sanitary Conferences	WHA (health centric) & WHO	UN Under-Secretary for Health Security (multi-sectoral)





## Evolution of health security concepts

Health security at a national level is broad-based protection, response, and recovery efforts to ALL public health threats and it requires capacity in ALL countries centred on government ownership and responsibility. Current reform efforts should consider establishing an essential core in all countries consisting of an emergency operation and data fusion unit with domains derived from the IHR. Fire-fighters and smoke-detectors – one and all, we are in the prevention business. However, ensuring global health security is not just a function of the health sector and requires national level leadership and the in-country support and planning of multiple other sectors. The drivers include changes in genetics and biological factors, ecology and the physical environment; human behaviour and demographics; and social, political, and economic factors. They must all be part of one system.

---

**A whole of society approach to health security must include diverse disease drivers: genetics and biological factors, ecology and the physical environment; human behavior and demographics; and social, political, and economic factors**

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## Revisiting traditional containment measures

The key to success is aligning incentives of victims, the exposed and a fearful public by building trust and investing in community supports. This means not only food, water, early diagnostics, available treatment and prevention; but also psychosocial support in culturally relevant manner through empowerment. We must recognize the limited times when compulsory measures of isolation and quarantine are necessary and not fear to use them sparingly and in time-limited fashion. The use of public health measures must delicately balance a fearful public without stigmatizing victims while justifiably controlling transmission through restrictive means. Transparent communication prior and during implementation is paramount in building support and trust for such a complex task.

## Managing epidemics in urban settings

The challenges associated with managing epidemics in urban areas are particularly acute in low and middle income countries with public sector resource and capacity constraints, and weak health systems. It is noteworthy that inequalities in living circumstances, incomes and access to services has become a feature of many large cities, which can leave people in certain parts of a city more vulnerable to disease because of trade-offs between health and livelihood. The implications of urban inequalities and urban informality for health risk in urban areas and for seeking strategies for preventative responses that could mitigate risk and build resilience in urban and peri-urban areas require a better understanding of local contexts and perspectives. Local innovations for risk mitigation and control require pragmatism in risk assessment within a “safe” informality.

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**Local contexts (e.g. urbanization) as well as global ones (e.g. migration, travel) must all be addressed to mitigate risks to the most vulnerable with particular attention to economic, social and political drivers and impacts.**

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## Epidemics and tourism

Travel and tourism is a growing important economic and societal activity. Many countries are using travel and tourism as a priority tool for economic development. The sector is heavily dependent on an intact environment, whether this is natural, cultural, social or human or animal health environment and thus, can be easily affected by negative events such as epidemics, as it is a trust and belief product. Close cooperation with WHO and other key actors is critical to provide timely information and to promote safe travelling behavior, while ensuring uniformity in information sharing, developing practical response strategies, and providing recommendations for the tourism and travel sector.

## Political perspectives of global risk

Political authorities face three major challenges in responding to epidemic threats:

- How to apply in the 21st century traditional public health measures in a complex, mobile and selfish society in crisis?
- How to talk about risk and uncertainty given the approach adopted by new media sources such as internet?
- How to guarantee fair access to resources in case of a crisis in democratic societies?

Political choices are described for preparation of societies and health system changes. Key actions are highlighted to fight threats associated with emerging infectious diseases: raising public awareness through information; coordinating multiple sectors and multidisciplinary methods; preventing non-health threats to health; promoting traditional prevention protocols as well as new tools for combating epidemics; manage operational health systems elements; and harmonize global policies for access to vaccines.

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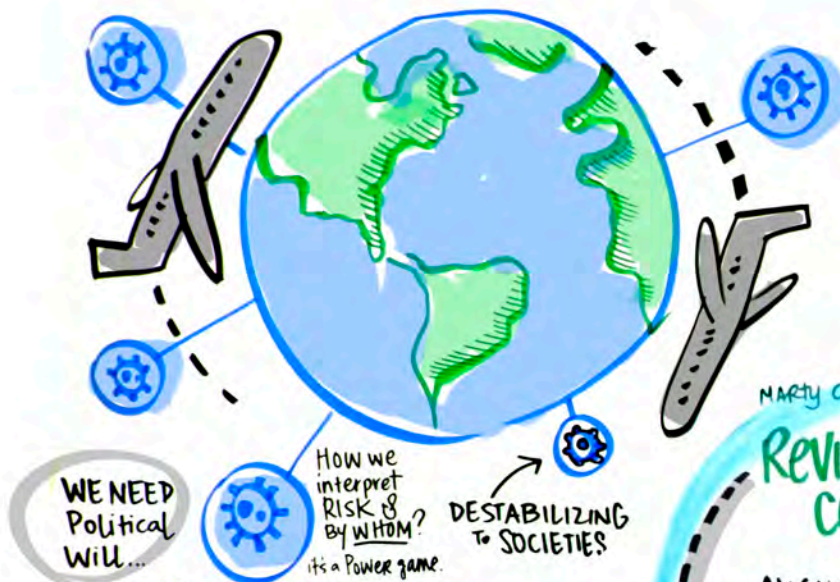
Close collaboration across various sectors and partners in developing risk reduction and risk mitigation strategies can be achieved under the guidance of national governments who are empowered to forge partnerships and alliances.

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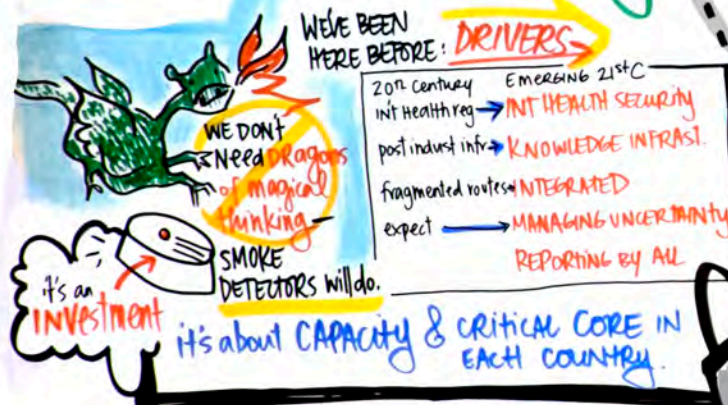


# PREVENTION OF INFECTIONS



ALI S KHAN

## HEALTH SECURITY



MARTY CETRON

## Revisiting traditional CONTAINMENT

- ALIGN:
- INCENTIVES FOR "VICTIMS"
- BUILD TRUST
- MORE COMMUNITY SUPPORTS - NOT CRIMINALIZED

culturally relevant COMMUNICATION



psycho-social support



- 1 MAY I
- 2 CAN I
- 3 SHOULD I

VICTIMS NOT STIGMATIZED

## URBAN EPIDEMIOLOGY

SOON 1/2 of AFRICANS Will live in CITIES



## INEQUALITY

URBAN AREA IMPACT HEALTH

- peripheral violence
- must take VOICES of people into account

WHAT ARE INNOVATIONS?

Health measures in INFORMAL settings



Political SUPPORTS

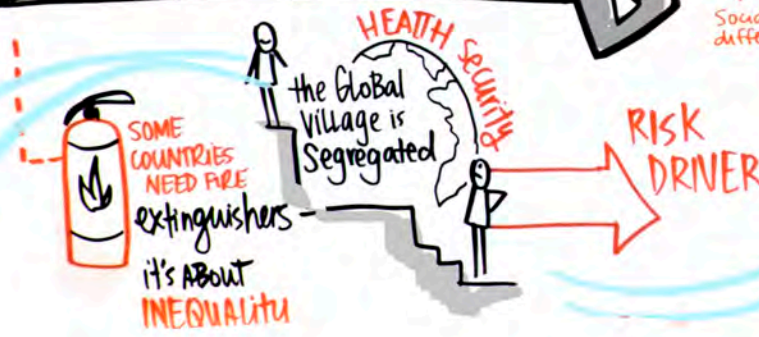
social differences

undocumented people

MOVING out of a BIO-MEDICAL MODEL.

Role of TEACHERS in public Health

Holistic





# CONTAINING THE SPREAD OF DISEASES IN A GLOBAL VILLAGE

WILEY MacGREGOR

**EPIDEMICS**  
demands on:  
urban planning  
densification  
rural/places of flow  
peri-urban areas  
can be underserved

DIRK GLASSER

## EPIDEMICS & TOURISM

1.8 BILLION  
INT ARRIVALS  
by 2030

# ON THE RISE

WE DON'T  
KNOW ENOUGH ABOUT  
POINT TO POINT TRAVEL

WE create  
geo-referenced  
DATA: useful  
to health

TOURISM = \$\$\$  
\$ DEVELOPMENT

Travel +  
TOURISM  
is emotional  
+ depends on an  
INTACT ENVIRONMENT.

we need  
consistency  
IN screening

IN A  
RAPIDLY  
CHANGING  
WORLD

★ STRENGTHEN  
SYSTEMS -  
2 way communication

★ UNIFORM  
INFO SHARING +  
COOPERATION w/  
WHO.

INTEGRATE  
CAPACITY IN  
TOURISM  
SECTOR

are we  
medicalizing  
SOCIETY?

SOCIAL +  
HEALTH are  
NOT at ODDS:  
COMMON objectives

PROTECTING  
PEOPLE IN THEIR  
OWN COUNTRIES:  
the Global is **Here**  
NOT **There**.

Global Health  
Security is too  
**BIG** FOR HEALTH  
ALONE

## POLITICAL PERSPECTIVES ON GLOBAL RISK

MS. FABRIENNE KELLER,  
SENATOR

3 FACTORS:

1. PUBLIC HEALTH IN A RAPIDLY CHANGING WORLD?
2. HOW TO TALK ABOUT RISK?
3. ACCESS TO FAIR RESOURCES?

10 TIPS:

- BOOST PUBLIC AWARENESS
- ACT ON ALL FACTORS
- REPRESS THREATS
- INFO IN NORTH & SOUTH
- MULTIDISP. METHODS
- Reintroduce trad. Protocols
- NEW TOOLS TO TREAT EPIDEMICS
- REGULATE MVT OF HEALTH WORKERS
- ACCESS TO VACCINES
- DECENTRALIZE COMMUNICATION - local + other levels



## DISCUSSION

drawn live  
graphic recording

Drawing  
Change





## 09 CLOSING SESSION

### Convergence and looking forward

Dr Sylvie Briand presented a **summary** of each of the sessions of the meeting. She described “bingo” words that we brought up a number of times: trust, training, social science, solidarity.

**Two concrete outcomes were to:**

- **Develop new types of information systems** to better anticipate risks but these have to rely on new approaches and engaging new partners.
- **Revisit the concept of preparedness.** It has been 10 years that we have been developing IHR core capacities but new approaches are necessary.

Dr Marie Paul Kieny, Assistant Director General for Health Systems Innovation at WHO, presented the recently developed **WHO R&D Blueprint** which is an attempt to map what should be done to have the world better prepared through R&D. The Blueprint aims to prepare for the inevitable – what is uncertain is what and when.

It has two complementary objectives:

- Roadmap for priority pathogens – 5 to 10 that are the most threatening in the next years plus unknown pathogens.
- Enable roll out of an emergency R&D response

It aims to reduce time between declaration of PHEIC and availability of effective medical technologies by encouraging production of diagnostic tools and generating safety data (Phase 1 trials) for vaccines and treatments for most promising experimental products for priority diseases. It also aims to map knowledge and good practices, identify gaps and establish enabling environment for sharing of data so it is a collaborative effort. There are five work streams:

- (1) Prioritization of pathogens
- (2) Identification of research priorities
- (3) Coordination of stakeholders and expertise
- (4) Alignment of preparedness and impact of intervention
- (5) Development of innovative funding options

For the finale, Dr David Nabarro, Special United Nations Secretary-General's Special Envoy on Ebola, spoke about having to reassess our thinking and put the **lessons learned into practice**. The 2030 development agenda (SDGs) required massive change. For instance, climate has now become global citizen issue (COP 21, Paris) and no longer something discussed behind closed doors. This is a period of review of institutional orientation and considerable rethinking at WHO which is in a process of reengineering their work.

Dr Nabarro presented thirteen points for consideration by the participants as outlined below.

- (1) More presidents and prime ministers are thinking of global health now than ever before. More journalists are writing about global health. There is a greater sense that health risks warrant political attention. The paradigm is "keep us safe in ways we can trust".
- (2) More actors are involved in public health. We have to look at our narrative and make it much more acceptable and understandable to all kinds of actors. We can no longer say "we are the experts, we'll tell you what to do" because we are not providers of truth but partners.
- (3) Societies are putting more focus on being strong and resilient. They have a wish to have greater control on their destiny and leadership must be able to work with multiple actors.
- (4) Early detection involves listening to multiple actors, not just health people. Everybody has to be engaged to find a potential threat. Risk assessment will not only be based on health professionals – rumors will come from everywhere.
- (5) Humans are becoming increasingly embroiled with nature and health threats are going to reflect this. Agro-ecology: close co-habitation people-animal has public health implications.
- (6) Communications have to be two-way. We cannot just convey information – we must use empathy, transparency, trustworthiness in the business of earning trust (respect to all).
- (7) What is done with data (forecast) – ethical use, sharing and accessibility, inter-operability – is key as is applying information to action.
- (8) Rather than the term "health systems" use "systems for health" – systems for life, ability, functions that are predictable, accountable, accessible for all at a quality that can be trusted.
- (9) Trust and respect come from creating space so that each has a place and a role. Coordination so that others can participate, provide a contribution that is respected in safe spaces with defined roles.
- (10) Real relearning we have to do is multi-disciplinary, multi-dimensional, and multi-sectorial. The SDGs signify that the goals are universal, people centred, collaborative, respect for all so no one is left behind.
- (11) What to do now? This meeting is about paradigm shifts – new ways of thinking and acting. Allow new thoughts and thought models to emerge, enriched by talking to each other we can apply new ways and be agents of transformation. Be ready to evolve – regenerating and renewal for public health.
- (12) We are all communities. As a community of health professionals we can challenge the power structures using the language of "we" and be change agents whilst maintaining humility.
- (13) Power and politics requires a disciplined and ethical use of power. We need to become good at power games. We are all humanitarians regardless of our organizational mandate which sometimes create differences between us and those whom we are trying to help.

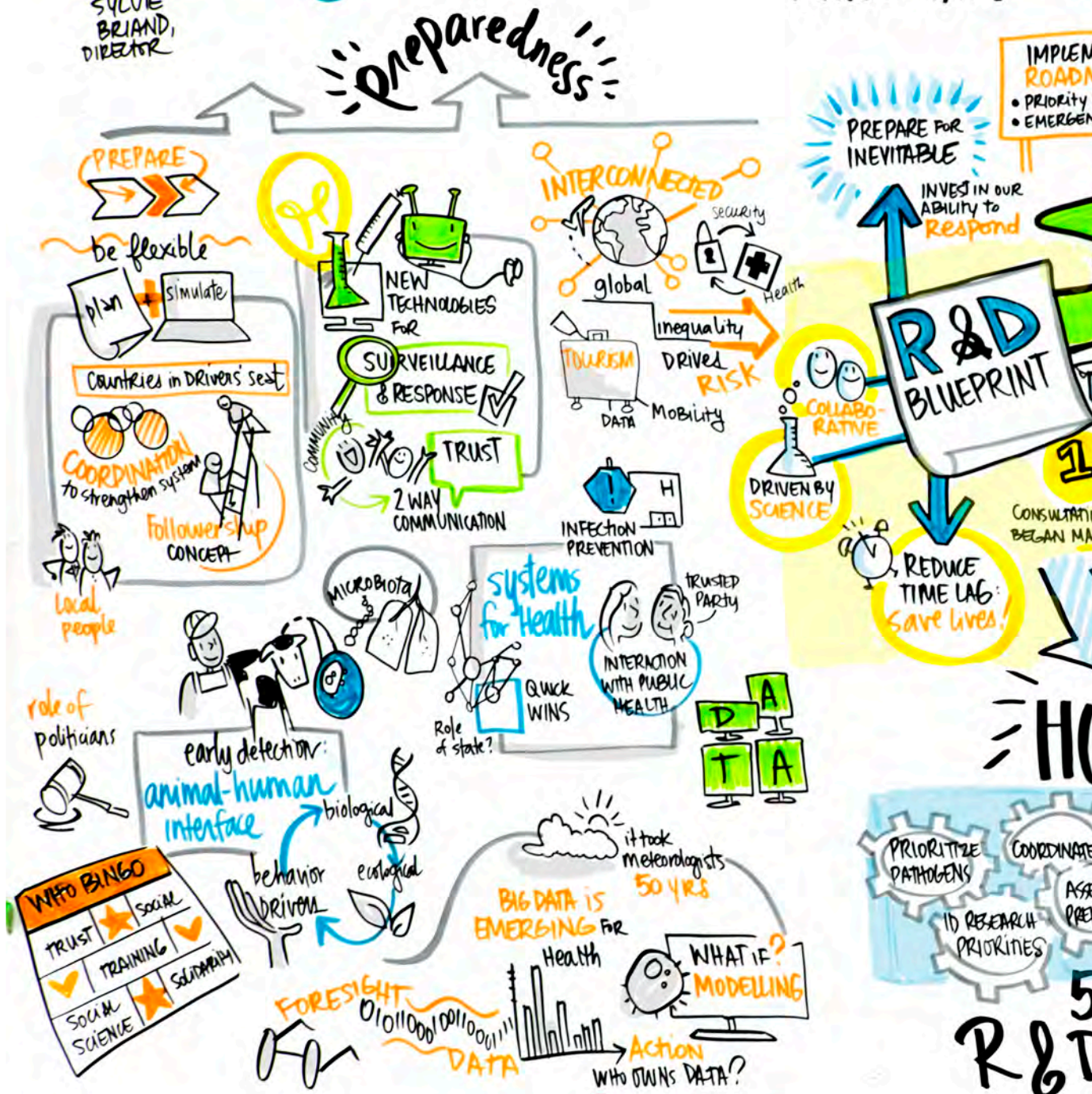




# SUMMARY: REVIEW OF THE MEETING

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MARIE-PAULE K



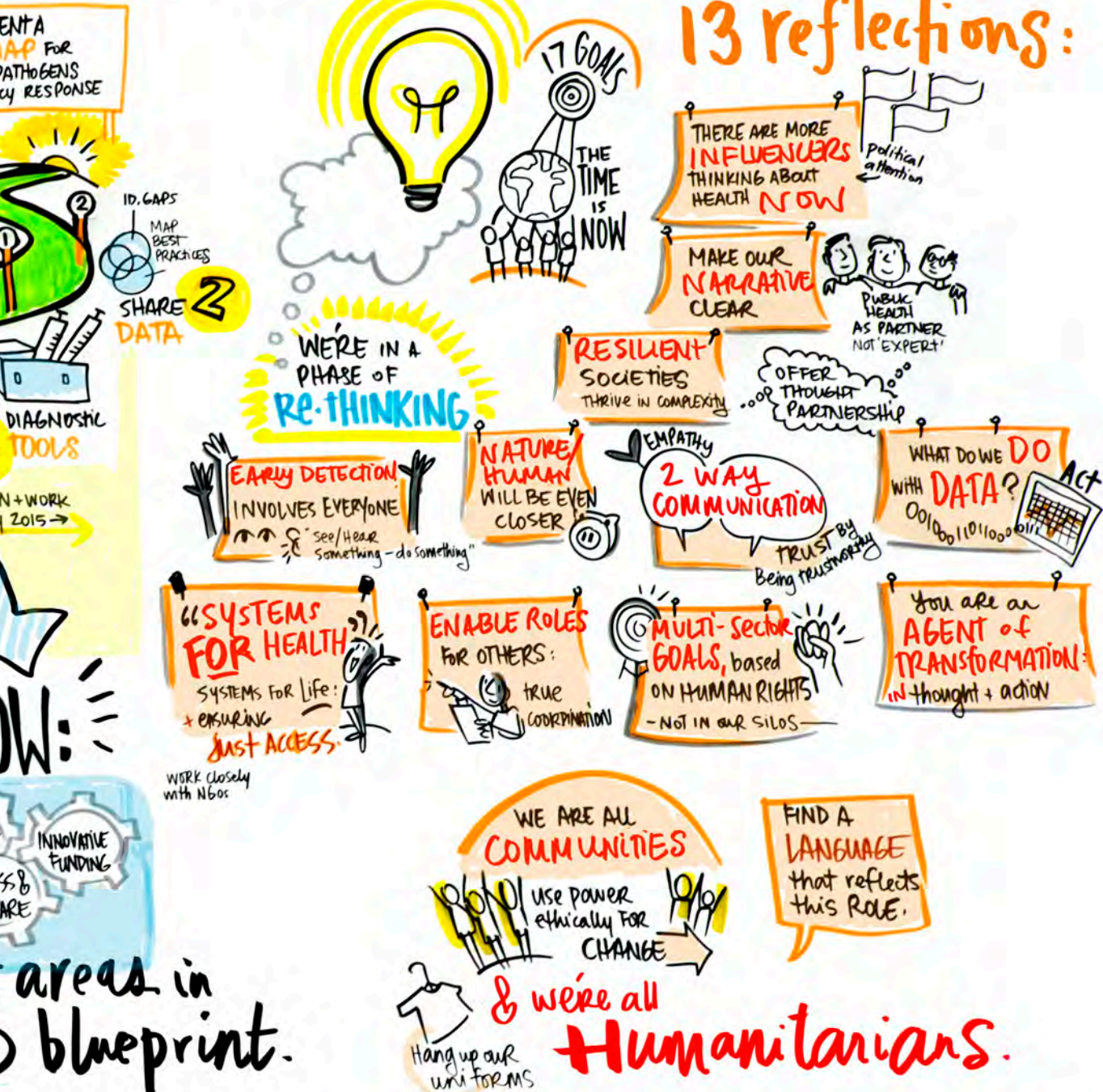


NIENY, ASSISTANT DIRECTOR  
GENERAL, WHO

DAVID NABARRO

UN SG SPECIAL ENVOY ON EBOLA

## 13 reflections:



drawn live  
graphic recording

Drawing  
Change





## 10 MAJOR DISCUSSION THEMES

Recent epidemics have highlighted critical deficiencies in our response mechanisms and control measures. There is little doubt that new paradigms are necessary for developing creative solutions to current problems. Some of the key areas for reforming our approaches were reflected in the plenary discussions:

- In an emergency response, coordination and collaboration for collective action between the various actors is crucial. Clearly defined roles based on an assessment of strengths and weaknesses of the different sectors is necessary to ensure adequate local operational and logistics mechanisms, as well as engagement with local communities. Incident management systems allow for command and control but trusted leadership and mechanisms are keys to success. The fear factor is what makes decision-making irrational.
- National governments have to be at the forefront and held accountable to ensure their surveillance systems are designed to pick up early “signals”. Clinicians have to be linked to the public health infrastructure through appropriate communication channels and networks. The private sector brings impressive resources and a lot of goodwill but mechanisms and accountability for their engagement requires good leadership by national authorities. How can we convince the public to invest sustainably in preparedness even for risks that may not happen? The issue of trusting politicians was raised, with the suggestion of a public debate after each event to teach them to make the better decisions. Ensuring countries have the necessary functional national IHR core capacities by testing them in exercises (exercise the “unthinkable” scenario) requires adequate investments for preparedness during the inter-epidemic periods – this is a continuing challenge for government attention and resources.
- We need to move beyond the biomedical approach to epidemics because they are social problems as much as medical ones. Social sciences need to be an integral part of surge capacities – perhaps reverse the order of the disciplines brought into a response by having anthropologists as first responders – so that we can address issues of fear and trust within the social context. Communities need to be engaged in advance as part of preparedness to ensure that there is an understanding of the human ecology. This will link community and biomedical perspectives for enhancing effective partnerships ensuring pre-existing relationships are built to respond to epidemics. There is a clear need to have anthropologists working in the field and to coordinate information so it rapidly combines what people know from the frontline with emerging medical evidence.
- We could “get ahead of the curve” by using technologies and working jointly to assess risk and uncertainties to respond to potential threats. Laboratory capacity for detection of a wide range of pathogens in the field level was discussed including ensuring biosafety and biocontainment; PCR and supply chain logistics; identifying existing subnational capacities available through large public health programs such as polio, influenza and tuberculosis; and possibility of target product profiles for outbreak detection. Strategic, targeted and evidence-based tools can help understand the mechanisms of emergence and engineer ways of reducing the risks for humans by prioritizing hotspots based on geographical, biological and ecological data. For instance, tools that knock down viral load and undercut viral evolution opportunities or ones that reduce opportunities for reassortment in virally diverse geographical locations.



- Strengthening of the workforce through education – training of the next generation of public health professionals, doctors and veterinarians so that they think through problems together by working horizontally across ministries (e.g. health and agriculture) will empower the health system to work towards prevention. For instance, the One Health approach supported by WHO, FAO, OIE and USAID ensures a close relationship through coordination mechanism across human and animal sectors at all levels (central to local) that requires sharing of information as well as triggering a joint response.
- New technologies won't solve the issues of communication and community engagement. Dealing with uncertainty and adjusting messages throughout an evolving epidemic requires real-time information sharing, data analysis, and feedback. This remains a challenge for the research community, particularly maintaining quality control in the process of translational research. Journalists covering science are considered to be trustworthy sources of information amongst the many sources of information the public is now exposed to daily. The relationship between these journalists and the public health community should be nurtured during the inter-epidemic periods so that effective technologies and interventions can be implemented built on trust.
- Compiling big data is no longer the limiting factor. It is the shared responsibility of interpretation with the end-users who are non-scientist politicians where the issues are to establish ground rules for analysis and privacy and ownership of data. A number of data-related issues were raised: how do we address scale, data gaps and possible innovations, connecting models, data security, privacy and consent, working across sectors, translation at community level for action, "popular" epidemiology to empower local communities to analyse their own data and make local decisions, lack of baseline data, outcomes of foresight scenarios translated into actions, is big data harmful?, ability to geolocalize. Huge opportunities but also challenges exist in using big data.
- On one hand we need to focus outside the health system, on communities and individuals, for disease control measures to work. But addressing the health system deficiencies based on health system research to identify gaps, is also critical, particularly for addressing outbreaks and reducing mortality. These include recognizing the role of health care workers in spreading infection; primary health care; individual responsibility of every citizen; lack of basic facilities in developing countries for sanitation and hygiene; need for political will; cross sectoral challenges for public health systems; and role of family level care givers. For hospitals in particular, challenges include hospital accreditation across large and small hospitals and ensuring surge capacity when they operate at full capacity in normal times.
- The concept of "health security" is implicitly inequitable because it begs the question "whose security?" (e.g. influenza vaccines held by rich countries are not equally distributed to poor ones). Reducing the gap in access to science and technology for developing countries is a key barrier to address but one that requires resources and investment. Global health security should be made a world issue, like climate change, so that it works at all levels. Recognition that health security is broader than just the health sector and requires a holistic, multisectoral approach that will engender global solidarity for health protection.





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# Annex 2

## AGENDA AT A GLANCE

Tuesday, 01 December 2015		
Time	Session	Topics
9:00 – 10:00	Opening session	<ul style="list-style-type: none"> <li>• Welcome</li> <li>• Purpose and methods of the consultation</li> <li>• Introduction of experts and stakeholders</li> <li>• Group photograph</li> </ul>
10:00 – 10:30	Coffee break	
10:30 – 12:00	<b>Session 1</b> Back to the future: Learning from the past	<ul style="list-style-type: none"> <li>• Ebola West Africa: drivers and lessons learned</li> <li>• Multidisciplinary response: strengths and challenges</li> <li>• New perspectives on outbreak response after SARS in Canada</li> <li>• A mild pandemic: critics and anticipation</li> <li>• The role of NGOs and health sector partners</li> <li>• Discussion</li> </ul>
12:00 – 13:00	Lunch	
13:00 – 14:30	<b>Session 2</b> Future epidemics: moving and blurry targets	<ul style="list-style-type: none"> <li>• Human-animal interface: anticipating risks of emergence</li> <li>• Managing the risks of emergence at the animal level</li> <li>• Knowledge on microbiome and research</li> <li>• From science to action: microbiome and respiratory diseases</li> <li>• Ecosystem surveillance: predicting the next emergence?</li> <li>• Discussion</li> </ul>
14:30 – 15:00	Coffee break	
15:00 – 16:30	<b>Session 3</b> Science and technology: opportunities and challenges	<ul style="list-style-type: none"> <li>• What's new for surveillance and detection?</li> <li>• Advances in biology and their applications</li> <li>• What's new in diagnostics?</li> <li>• Risk perception and community engagement</li> <li>• Communicating in the 21st Century</li> <li>• Discussion</li> </ul>
16:30 – 17:00	Wrap-up	



## Annex 2: AGENDA AT A GLANCE continued

Tuesday, 01 December 2015		
Time	Session	Topics
9:00 – 10:30	<b>Session 4</b> Making the most of Big Brother	<ul style="list-style-type: none"> <li>• Modelling outbreaks: pros and cons</li> <li>• Learning from successes in meteorology</li> <li>• Use of big data to anticipate epidemics and their evolution</li> <li>• Learning from the insurance expertise</li> <li>• Discussion</li> </ul>
10:30 – 11:00	Coffee break	
11:00 – 12:30	<b>Session 5</b> Curing and not harming – that is the question	<ul style="list-style-type: none"> <li>• Clinical practices and emerging diseases</li> <li>• Systemic view of infectious in health care facilities</li> <li>• Patient-doctor relationship at the age of the Internet</li> <li>• Impact of strengthening the overall health system</li> <li>• Discussion</li> </ul>
12:30 – 13:30	Lunch	
13:30 – 15:00	<b>Session 6</b> Preventing the spread of infectious diseases in a global village	<ul style="list-style-type: none"> <li>• Evolution of health security concepts</li> <li>• Revisiting traditional containment measures</li> <li>• Managing epidemics in urban settings</li> <li>• Epidemics and tourism</li> <li>• Political perspectives of global risk</li> <li>• Discussion</li> </ul>
15:00 – 15:30	Coffee break	
15:30 – 17:00	<b>Final session</b> Convergence and looking forward	<ul style="list-style-type: none"> <li>• Summary of the meeting deliberations</li> <li>• WHO's R&amp;D Blueprint for epidemic preparedness</li> <li>• The changing landscape for WHO: Global ecosystems, partners and mechanisms</li> </ul>
17:00 – 17:30	Close	

# Annex 3

## SPEAKERS BY SESSION

### SESSION 1: Back to the future: Learning from the past

**Moderator:** Didier Houssin

Oyewale Tomori (Nigeria)

Ron Waldman (George Washington University)

Ron St John (Canada)

John Watson (UK PHE)

Sean Casey (International Medical Corps)

### SESSION 2: Future epidemics: Moving and blurry targets

**Moderator:** Malik Peiris

Nadia Khelef (Institut Pasteur International Network (RIIP))

David Murdoch (University of Otago, New Zealand)

Monique Eliot (World Organisation for Animal Health (OIE))

Julio Pinto (Food and Agriculture Organization of the UN (FAO))

Dennis Carroll (USAID)

### SESSION 3: Science and Technology: Opportunities and challenges

**Moderator:** Gabriel Leung

Nur Hassan (COSMOSID)

Jim Ajioka (University of Cambridge)

Mark Perkins (FIND)

Amanda McClelland (International Federation of the Red Cross (IFRC))

Barbara Bentein (UNICEF)

### SESSION 4: Making the most of Big Brother

**Moderator:** Brian McCloskey

Christl Donnelly (Imperial College, London)

Paolo Ruti (World Meteorological Organisation (WMO))

Kamran Khan (University of Toronto)

Cécile Wendling (AXA Insurance Company)

### SESSION 5: Curing and not harming: that is the question

**Moderator:** David Heymann

Abdullah M Assiri (Kingdom of Saudi Arabia)

Abdul Ghafur (Apollo Hospital, Chennai, India)

Hélène Lepetit (Institut des Mamans (IDM))

Idrissa Sow (Mauritania)

### SESSION 6: Preventing the spread of infectious diseases in a global village

**Moderator:** Ilona Kickbusch

Ali S. Khan (University of Nebraska)

Inger Damon (US Centers for Disease Control and Prevention (CDC))

Hayley MacGregor (Institute for Development Studies)

Dirk Glaesser (UN World Tourism Organization (UNWTO))

Fabienne Keller (France)



## Annex 4

# IDEAS WALL AND IDEAS BOX

The Ideas Wall and Ideas Box collected written, anonymous comments from participants. They are reproduced below, verbatim, with minor edits.

### *Learning from the past*

- Rapid and easy communication of new findings to those who need local and global overview is essential.  
- Solution could be web-based data collection system for both syndromic info as well as e.g. genomic info. This could be combined with novel IT tools for genomic analysis and text – mining, machine learning and A.I.

### *Session 1 Remark*

One is struck by the blatant discrepancy between the delayed reaction to the severe west-African EVD outbreak (both at national and international level) and the strong over-reaction to a mild influenza pandemic in the UK. Similarly the contradiction is conspicuous between large scale endemic infections and parasitic diseases which have been neglected for decades and limited epidemics attracting both public resources and media focus. These issues should be addressed adequately.

Instead of emphasizing on enhancement of IHR/capacity building, have we explored the root causes of why countries are not doing these activities, and address the root causes?

We need a global advocacy campaign that will engage multiple stakeholders, especially non-health stakeholders, to both expand ownership of the issue and increase political support for epidemic preparedness/disease surveillance and response. This will ensure greater support and drive up public participation on this issue.

We need to be communicating about epidemics between epidemics, not only when outbreaks happen. Communities need to be seen as partners in surveillance and response, not just terrains of response, therefore we need to integrate this into education and public information and communication department as soon as possible.

How do we train to be surprised? Factors of resilience are key.

Anthropologists are not new to these topics! A lot of work had been done (see DVD, Formenty, Epelboin, Ebola, no laughter) → rediscovery?

There are many possible contributors or amplifiers of epidemics. How do we focus our attention to the key drivers, so that we can best utilize our limited resources. Can we model this?

In terms of preventions, we should distinguish the primary one aiming at blocking the very emergence of the outbreak from secondary prevention targeting the spread of the epidemic. The tool of the first type is science and technology whereas the second type depends on multidimensional social factors (political will mostly

The main note during today's Sessions is: Coordination is critical in all aspects of preparedness.

Coordination, and levers to achieve it, are king. All focus should be on states, NGOs and INGOs rapidly deployable mechanisms to work together. THIS was the big failure, not WHO. Resist the urge of introduce new process and bureaucracy. Some failures were humans' inability to implement sound methodology – such as IDSR. Accept that if we get this right, we'll never know... but if we get it wrong we certainly will. Consider novel approaches to data & analytics as a starting point, not a tool for business as usual. New models of governance, operations, planning & communications are available, we don't need another database...

Rapid detection is only relevant if you use the data. In international outbreaks you need to compare data from several places in real-time. We should focus more on data sharing paying for it will be impossible expensive. The frontline needs to be engaged

- Studies in how people bio-psychosocial beings are critical for the everyday practice of medicine.  
- Vaccine development/drugs development → "people before profits"

STANDARDIZED  
NEED COMMUNICATIONS  
MESSAGES BEFORE (FOCUS  
ON PREPAREDNESS & PREVENTION)  
AND DURING OUTBREAKS (FOCUS  
ON PREVENTION & RESPONSE USING  
LATEST DATA). DON'T WAIT UNTIL

- Community approach is not static, is evolving and unique in each community
- Adaptation of medical "aid" to the political climate of the host country
- Preventive community health training as a long-term programme (not only during the emergency)
- Medical "aid" as a paternalistic approach
- Medical "aid" messages should focus on medical collaboration or medical cooperation.

#### Research and Development

##### First opportunity →

- 1) Separation of Research and Development expenses from prices of drugs/diagnostics technologies, etc.. Does private sector is ready to do it?
- 2) Other topics where it is not need only to focus on expensive technology:
  - Health Resilience Research
  - Community Health delivery research
  - Preventive medicine

We should remember that bio data are big both in complexity and size; a size that cannot be handled locally and often difficult transferred through internet (petabyte). We should ensure access for all to sufficient supercomputer infrastructure.

Increasing incentives for sharing data is important, but we also need to address barriers for the frontline diagnostic people and researchers. One aspect is the fear of others stealing and publishing your data. A solution could be if people can do prepublication release for public health but not for research – Would require enforcing by the bio scientific journals.

#### Build a task force.

Build an international training centre for infectious diseases.

- Research centres for diagnostic viral diseases
- Prepare or train people for handle samples and the mechanism for sending samples
- Epidemiological surveillance centres.

Knowledge of such factors as a pathogen's spread and persistence into a variety of different ecosystems, its number of amplifying hosts and its number of possible competent vectors, would help predict its potential for emergence.

#### System for health

- Should we not give responsibility for PH/GHS to Ministries of Education/Education System
- Teachers were key in Ebola control
- They are key in empowering children and communities → health literacy
- They can do surveillance
- Higher education for health workers needs substantial rethinking → PH – GHS has to be central

How to increase the level of knowledge of statistical modelling at the local countries where the epidemic or the emergency disease will stand.

These countries will need human resources and technology and technician to observe and diagnostic during epidemic great events. How we can prevent that those disease cross from country to countries.

The work with the communities, the need to find and train leaders in the communities and help with the social work. In order to have their personnel well prepared ahead of the emergency. Important to help the local government to have those people ready and with the necessary knowledge to set whenever emergency. The role of education. Important to have people well trained to stand and to do diagnostic.

Cuba is willing to continue work with WHO and help with medical personnel (doctors and nurses and also train people with/from those countries in order to be prepared to face an emergency disease.

#### Elements to have in place vaccination:

- Multi sectorial (make "adaption" move easy) socialized medicine
- Vaccination programs
  - Active community participation
  - Universality
  - Trust



## Annex 4: IDEAS WALL AND IDEAS BOX continued

- Emphasis in vaccine education from an early age
- Community groups follow-up on vaccine schedules
- Improve health provision and design at the community level
- High levels of epidemiological awareness and vigilance
- Organizational features in developing countries health system
- Fragmented health system vs integrated health system

How can we, concretely, find + harness the opportunities in "big data" and "open data" without getting lost in, or, overwhelmed by it?

"Little data" is proliferating, e.g. mobile support applications for citizens, communication tools for clinics. What does WHO (or central monitors) want to "ask" these networks?

What specific signals should be monitored (both freedom + structured data sets)?

Clear guidelines, formats for data submissions, and global/national/regional points of contact would allow community health system designs and owners to share data more effectively and efficiently.

When discussing data and big data we are assuring that information and facts drive political decisions. We know this is not the case, climate change is an example of this political decisions are made on an emotive as well as ration bases, therefore we need other means of getting messages across soul as a public campaign.

How relevant are "countries" alone? "Sovereignty" is nearly most false? The accountability paradigm has to change? Make communities "in large sense" accountable?

- PCR is good, but not all that is needed during an outbreak.
- You need a number of assays (for antigen, for antibis – IgG, IgM, etc.) to control on outbreaks.

For example:

- 1) PCR doesn't work if no pathogen is present. So if the patient comes into the clinic after his viraemic period, PCR will not work and ... detection is important. This is often the case with viral encephalitis that develops after viraemic – perhaps because the developing antibodies cause the illness.
- 2) Surveillance of where an illness has been requires serology.
- 3) Determining possible amplifying or maintain .... After requires serology.
- 4) Not all labs have the expensive equipment and training to do PCR

- 5) This treatments develop, beside diagnosis (i.e. lateral flow) would be needed (cheap+fast)
  - 6) To evaluate if a vaccine works, antibiol. and T-Cell assays are vital
  - 7) To evaluate if a therapy works, immunological measurements are important to establish if the treatment stopped an infection.
- Past epidemics showed that multiple Rx assays were vitally important.

Should include military as a contributor in a number of ways:

1) Surveillance:

- Military research laboratories worldwide
- Moving acceptable groups of soldiers into epidemic areas

2) Dial with response:

- Treatment
- Logistics

- Mosquito movement and invasion of new countries is important
- Also we are losing methods for mosquito control – this is important. Also not training many medical entomologist.

Basic research has a major role in establishing pathogens' potential for emergence. Example would be establishing a pathogen ability to infect and be transmitted by different mosquito species

- To anticipate emerging diseases, it is important to have good knowledge of the pathogen's ability to spread and exist in different environments.
- It's vital for research to give us knowledge of the pathogen's amplifying hosts (many of few) and its transmission methods (i.e. does it infect many or few mosquito species?)
- The more hosts and vectors, the more spreadable to new areas.

The model proposed by FIND runs the risk of setting the stage for a very costly system, commercially driven. Alternatives: look at routine labs and see how they handle EID. FY: we run 100 targets for clinical virology AND emerging diseases preparedness with a small number of people

Issue with availability of tests "for research only": this is regulatory and protection of markets. There are models for doing that, used across Europe (see ENND network, i.e.). Model is: back-up tests until there is sufficient expertise to transfer to routing testing.

## Annex 4: IDEAS WALL AND IDEAS BOX continued

*ID outbreaks and epi analysis & modelling: the current model, where ... institution has access to mandatory reporting data provided by a wide group of volunteers, and produces high profile publications, is setting a bad example. The data sharing platforms should apply to lab and epi data and be somehow accessible to data relevant providers and other stakeholders.*

*An important challenge is decision making in the absence of evidence, coupled with the willingness to help collect essential info and share that while an outbreak evolves.*

*We do need a data/info/sharing & analysis platform, that could be WHO coordinated but customized to the situation. No one knows how ED work, we need an open mind.*

*Nearly every speaker says public information is crucial. Most people get information from journalists. Yet the relationship between health actors and journalists is poor. Perhaps the two groups shared discuss how to improve it include journalists.*

*Public health people should seek to be, not trusted, but accountable. This is hard for many, as they feel they are the "good guys". Attacks prompt defensiveness, rarely effective response.*

*Learn to engage and respond.*

*They don't care how much you know until they know how much you care.*

*Let us speak with one voice – tell countries to own the control of the diseases in their domains. Donors stand back and only assist, not take over Nation's duty.*

*Nations wake up, do your duty; depend on self.*

- 1) Build on existing capacities
- 2) Avoid vertical capacity building (H5N1, Ebola...)
- 3) Use what we have: i.e. IHR course, 4 way linking protect animal/human – need funds!
- 4) Data management – big gap countries & WHO
- 5) WHO report: burden of outbreaks

*Try to build a transdisciplinary model team that can initiate the process of capacity building at a global scale (or the more global it could be).*

*Many attacks on public health people & measures are led by a class of delusional people called "denialists". Learn about this psychology, and prepare to deal with it promptly and publicly.*

*How can we use the systems designed to follow/answer/ contribute to social media and other communications to fight other rumours basting important domains such as vaccination (so needed to prevent epidemics!)?*

*How do we better use digital epidemiology and participatory epidemiology to help anticipate epidemics?*

*Peer-review.*

*What is its role in signifying the quality of evidence?*

*We all know of wrong papers which got through peer review!*

*Big brother*

*How does the health community develop informative & standardized variables to use "big data" for epidemic anticipation.*

- 1) Capacity/lab ability/cure are abstract terms without concrete measures
- 2) Failure of H1N1/Ebola due to stubbornly sticking to the playbook. Need better way to integrate new science in real-time during a response.

*Data collection and management is still a big challenge on the field. Needs:*

- Send IT
- Use system that can be adapted to local field constraint

*Standardized need communications messages before (focus on preparedness & prevention) and during outbreaks (focus on prevention & response using latest data). Don't wait until after outbreaks start to begin developing messages.*

*Engaging public before outbreaks build trust early which is not easily done in the middle of an outbreak.*

*Being a medical professional does not equate to being a bureaucrat.*

*While exploring new sophisticated technologies, don't forget but implement the basics:*

- IHR core capabilities
- Strong coordinating entity
- Education and training
- Transparent information sharing

- The best way to prevent a global spread is to stamp out an outbreak very early
- Then should be a triggers for international support below PHEIG declaration
- In classical humanitarian aid funds and mechanisms for immediate response are in place → should be implemented for epidemic as well.



## Annex 4: IDEAS WALL AND IDEAS BOX continued

*Can we learn how little we have managed to do to protect the health of civilians in conflict settings as Syria.*

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*We should think about creating cluster like systems for epidemics.*

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- Global change
  - Host environment change
  - Disease ecological change
  - New pathogen emergence
- And so we're doomed!*
- 

*Nature still better than humans for biological threats is one said.*

*So what type of lessons are we to learn from mother-nature: her gifts or her threats?*

*An old French saying goes: "you only get command over nature by obeying to it". It seems the 3rd millennium science called "biomimicry" (biomimétisme) didn't forget this proverb. Since there's only one planet earth and one global village let's get together to put an end to double standard.*

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- Crucial questions of weakness of States in Africa
  - Links between science, democracy & development
  - More and more specialized academic training vs pluri-disciplinarity.
- 

*R&D can't be isolated from its socio-economic environment. Funded mainly by public money it requires a paradigm shift to fulfil its mission:*

- Mind set: secular and not religious
  - Objectives: nor for profit rather than profit
  - Approach: civilian and not military
  - Outcome: majority well-being rather than minority luxury
- 

*There is neither a developed world nor an underdeveloped one; there is only one ill developed world*

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*Inequality is a disease medics can't cure but politicians can and should*

---

*The major change during the 20th century is urbanization. More than 50% of the population are living in urban places.*

- A new challenge
  - The next places of emergence and diffusion of ... old & new diseases.
- 

*The monitoring parameter of preparedness and core capacity is the success of control of endemic diseases that is dress rehearsal for response to emerging diseases*

---

*Focus on creating decentralized, community-based, health systems that care for people every day – we will get data (as a by-product) and responsive/resilient health systems as a result.*

*We need health systems that "know" people, that people trust and that can delines many types of thing to people.*

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*Should always think about "WHO IS NOT IN THE ROOM"*

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*How does the global community maintain focus on the current health emergency and the accumulating number of other emerging threats (with no new money or staff)?*

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*How to get big pharma to invest: POSITIVE PSYCHOLOGY such as done by ACCESS TO MEDICINES FOUNDATION*  
*Ranking on R&D for development*

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*The future? World Health Security Organization (WHSO)*

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*The agriculture/ farm industry is frequently manned by migrant workers, who may not all be regular migrants. In many countries preparedness plans, this group, although vulnerable, is not adequately included. This needs to change..*

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*We need NEW TOOLS for qualitative risk assessment in the face of little or poor data for decision making and response to "new" pathogens.*

---

- Mobile data collection is key
  - Geocode everything!
  - Data quality is a bigger challenge than the analytics
- 

*No integration/collaboration at field level between human/animal health.*

*Solution: train them together and put them in same EOC, go to OI as a group*

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*Behavioural drivers of outbreaks: epidemics necessarily include cultural understandings (epistemology) of health, illness, and mechanisms of disease spread.*

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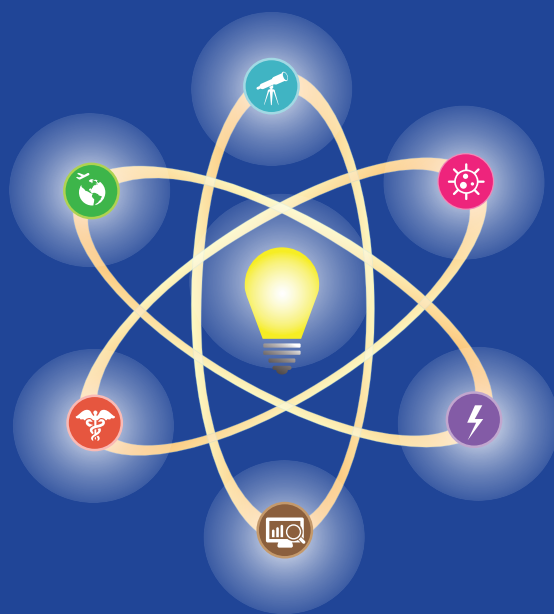












## **ANTICIPATING EMERGING INFECTIOUS DISEASE EPIDEMICS**

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1211 Geneva 27 - Switzerland

### **FOR MORE INFORMATION**

[www.who.int/csr/disease/anticipating\\_epidemics/en](http://www.who.int/csr/disease/anticipating_epidemics/en)



**World Health  
Organization**