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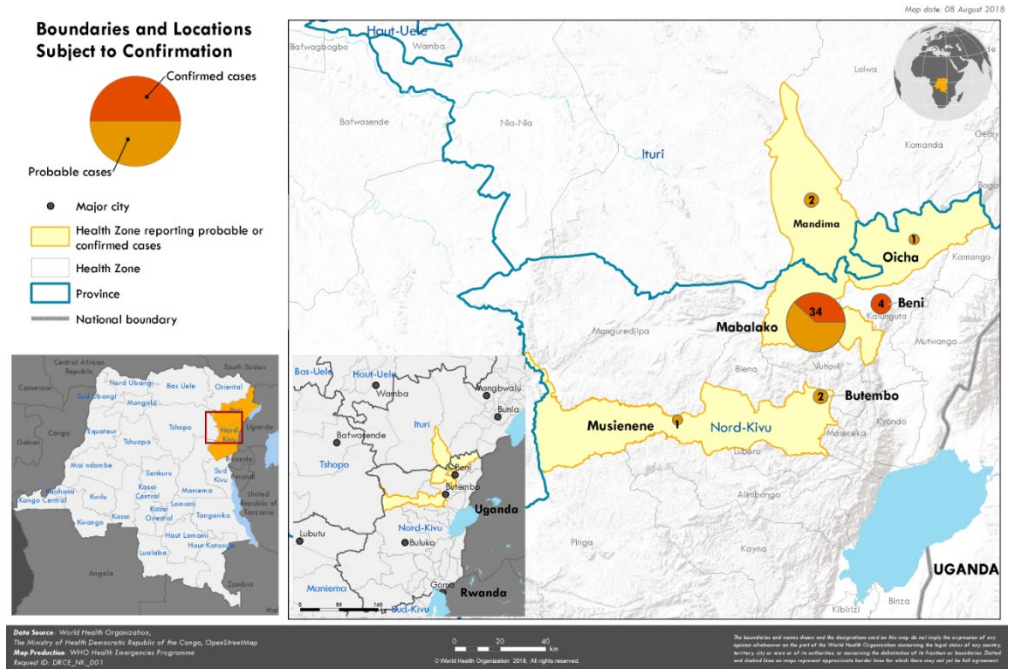
LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Epidemiology in the Field

Hilary Bower, Interim Deputy Director for Research and Epidemiologist, UK-PHRST

What does an Epidemiologist do in the field when part of the UK-PHRST?

August 2018: North Kivu, DRC



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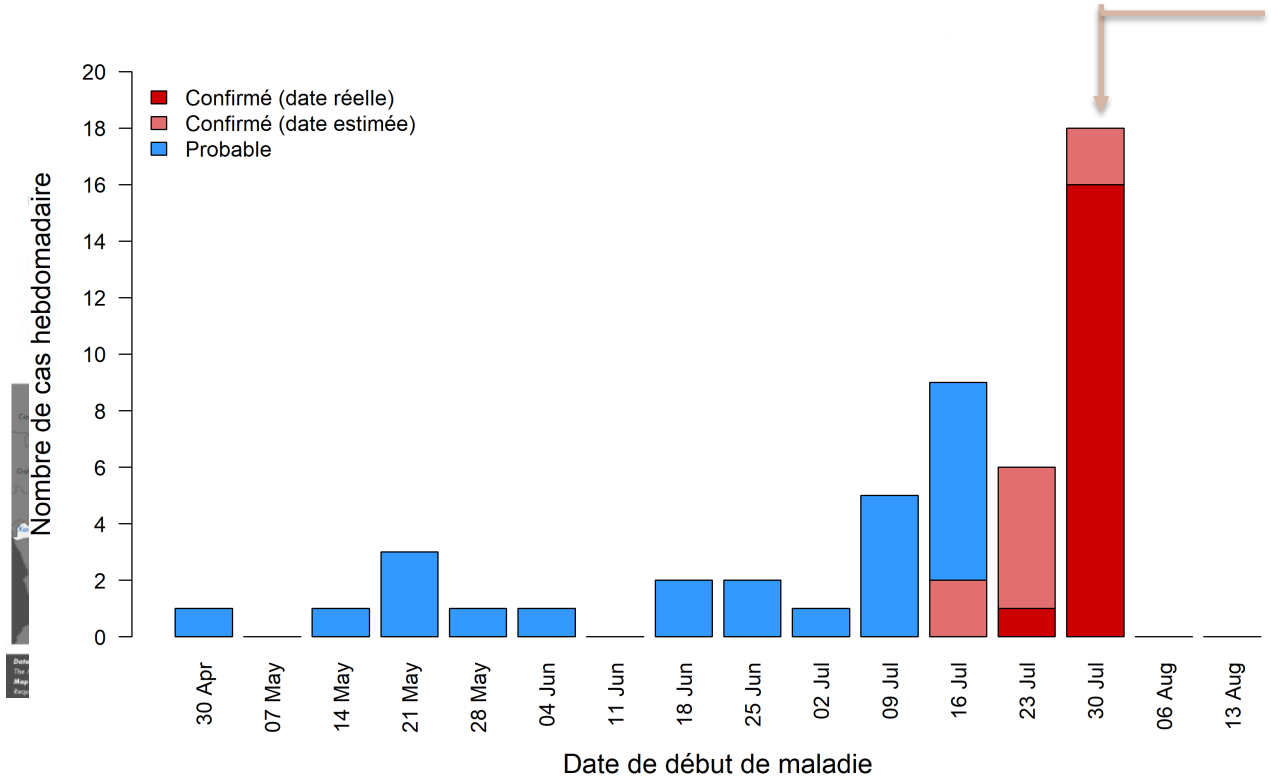
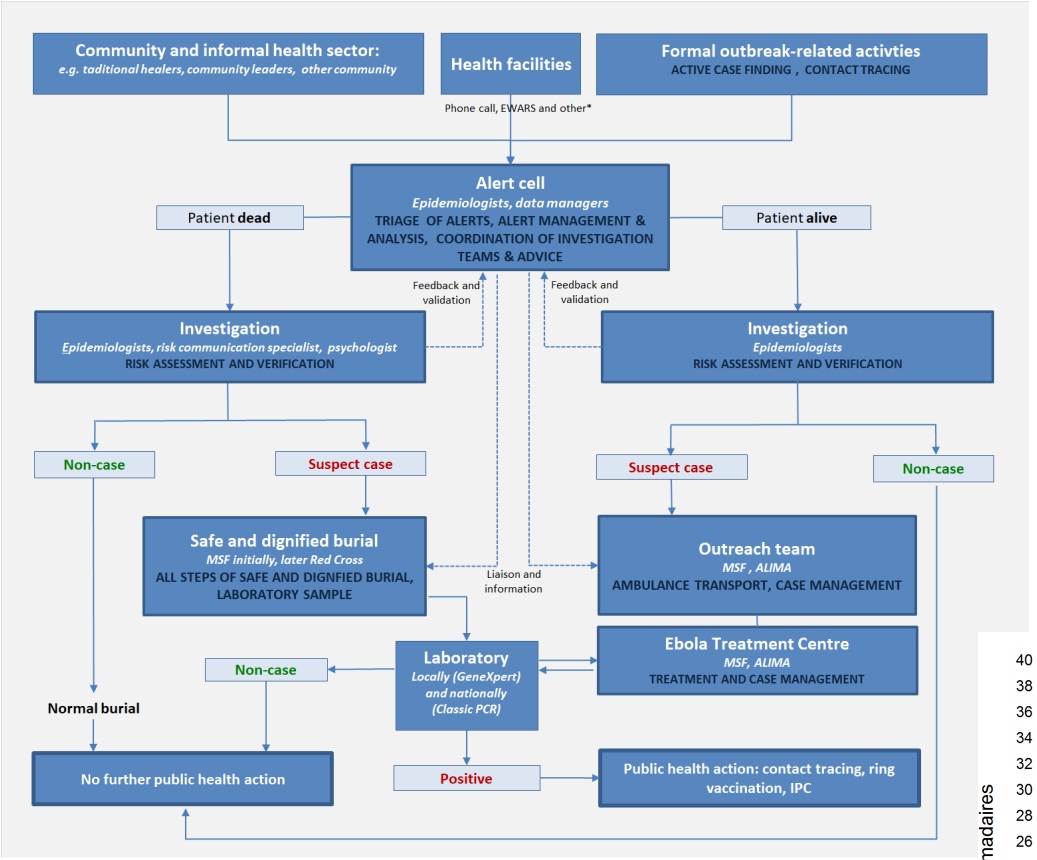
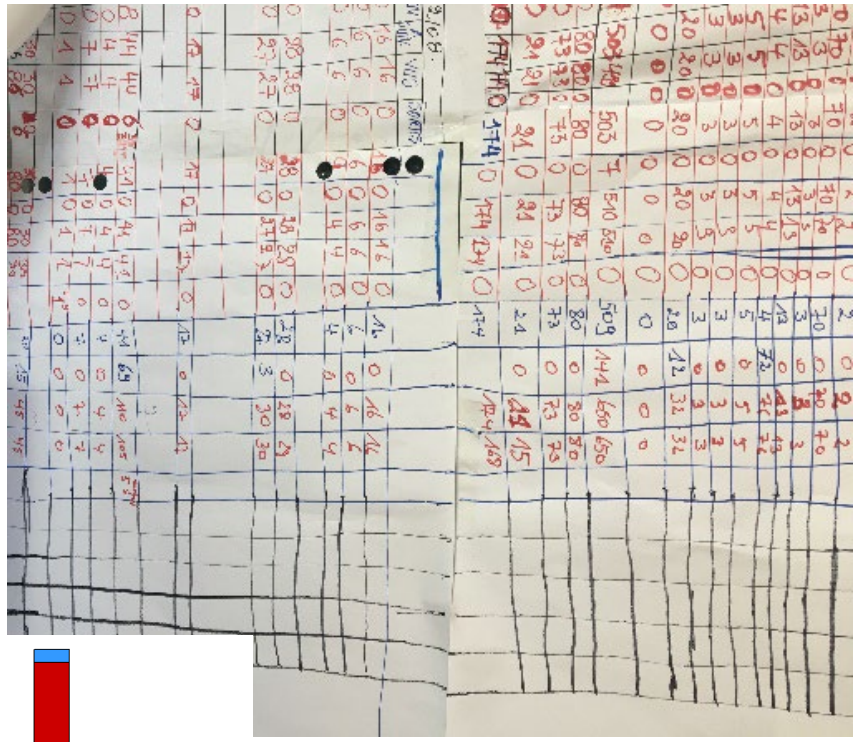
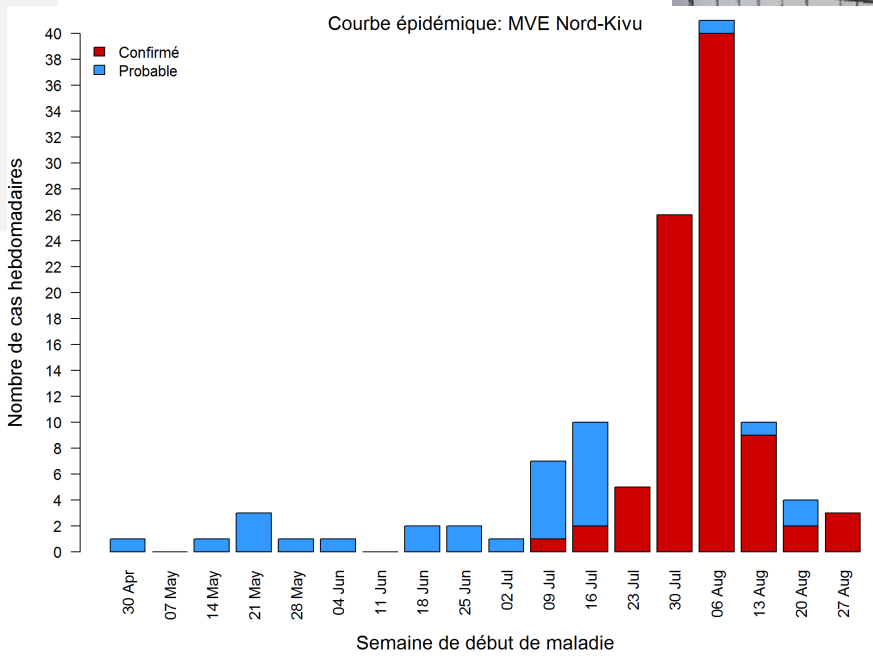


- **1 Aug 2018:** Epidemic declared
- **7 August**: Zaire ebolavirus strain confirmed
- **14 August**: 30-bed Ebola Treatment Centre (ETC) opens in Magina (MSF)
- Another ETC was built in Beni (ALIMA) and in Mandima (MSF)

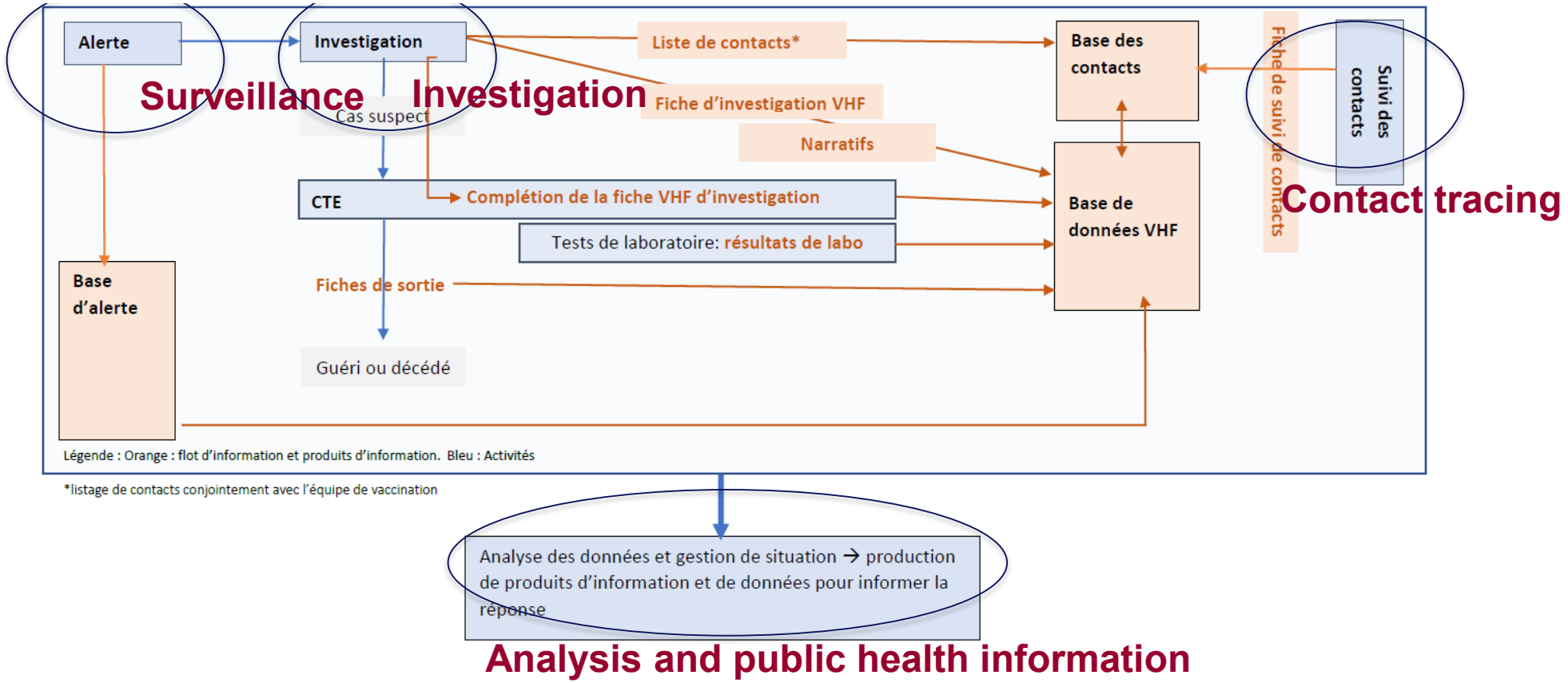

Community and informal health sector:
e.g. taditional healers, community leaders, other community
Health facilities
Formal outbreak-related activties
ACTIVE CASE FINDING , CONTACT TRACING
Phone call, EWARS and other*
Alert cell
Epidemiologists, data managers
TRIAGE OF ALERTS, ALERT MANAGEMENT & ANALYSIS, COORDINATION OF INVESTIGATION TEAMS & ADVICE
Patient dead
Patient alive
Feedback and validation
Feedback and validation
Investigation
Epidemiologists, risk communication specialist, psychologist
RISK ASSESSMENT AND VERIFICATION
Investigation
Epidemiologists
RISK ASSESSMENT AND VERIFICATION
Non-case
Suspect case
Suspect case
Non-case
Safe and dignified burial
MSF initially, later Red Cross
ALL STEPS OF SAFE AND DIGNFIED BURIAL, LABORATORY SAMPLE
Liaison and information
Outreach team
MSF , ALIMA
AMBULANCE TRANSPORT, CASE MANAGEMENT
Ebola Treatment Centre
MSF, ALIMA
TREATMENT AND CASE MANAGEMENT
Non-case
Laboratory
Locally (GeneXpert) and nationally (Classic PCR)
Normal burial
No further public health action
Positive
Public health action: contact tracing, ring vaccination, IPC




EWARS Mobile


Courbe épidémique: MVE Nord-Kivu
Confirmé
Probable
Nombre de cas hebdomadaires
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
30 Apr
07 May
14 May
21 May
28 May
04 Jun
11 Jun
18 Jun
25 Jun
02 Jul
09 Jul
16 Jul
23 Jul
30 Jul
06 Aug
13 Aug
20 Aug
27 Aug
Semaine de début de maladie

Establishing a Surveillance workflow



Running the Epi Cell: main workstreams

- **Information architecture and data flow**: Ensure that a reliable system for collecting and transmitting epidemiological data is in place
- **Data quality and data capture**: quality control of epidemiological data, including consistency of data and reports, feedback to teams
- **Data analysis**: Provide daily data analysis (micro-level analysis), including epidemiological and operational data, to guide operations in-depth global and specific analyses (macro-level analysis) for strategic guidance
- **Information products**: Sitreps, presentations, and others
- **Training**: Develop training materials on the three components above, for preparation and readiness or capacity building in place

Types of activities

- Put in place an **early warning** ‘alert’ system
- Establish **contact tracing**
- Undertake in-depth **investigations**
- **Analysis and health information**
- **Training** of staff, local and international

→**Supervise/coordinate** response activities

→**Orient decision-making** at the strategic coordination level

→Linking up with other response pillars

Cox's Bazaar, Bangladesh

Epidemiological activities

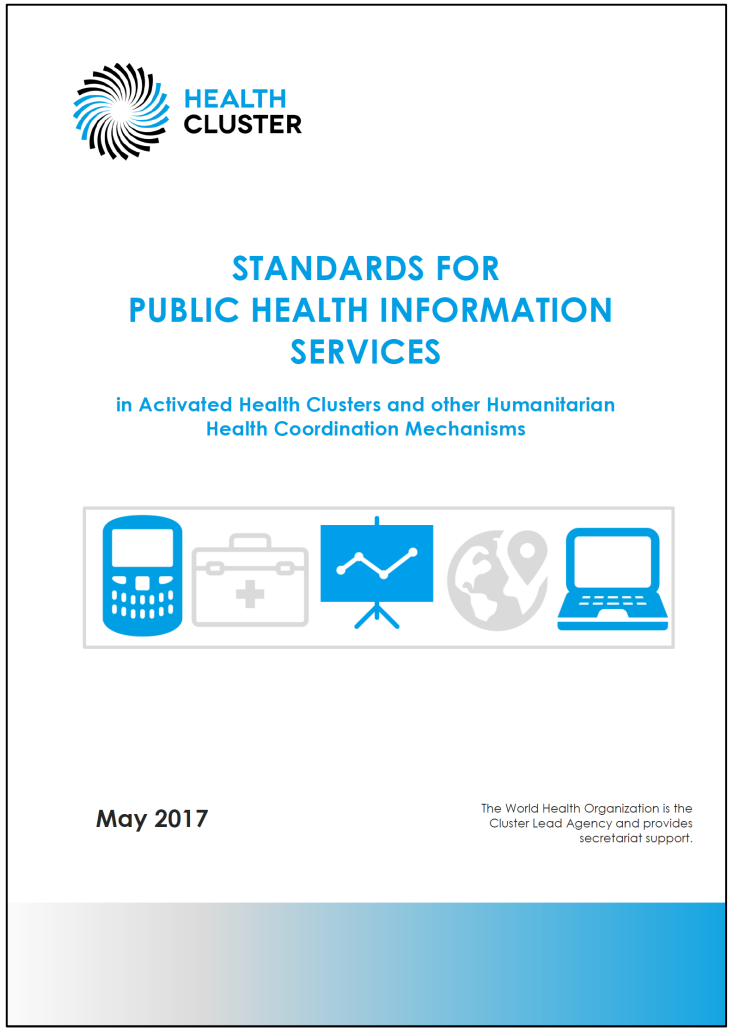
- **Diphtheria outbreak**: compile and analyse information (line list, contacts), produce daily/weekly information, orient response teams, analysis and forecasting

- **Wider response:** Public Health Information Services (PHIS)
  - Early warning Alert and Response (EWAR), including outbreak response
  - Needs assessments and situation analyses
  - Public Health Information Products
  - Response to specific outbreaks (measles, AJS)
  - Preparedeness: AWD/cholera, pre-monsoon situation analysis

Epidemiology workplan

Work stream	Key activities	Status
EWARS	Daily technical assistance to partners on the ground	Ongoing | ad hoc
	Training of partners and system implementation in new facilities	Ongoing | ad hoc
	Daily alert verification and risk assessment, where required, and maintenance of alert logs	In place
	On the field investigation of events and alerts requiring investigation (e.g. clusters, host community diphtheria cases, verbal autopsies in 30-day follow up of diphtheria etc)	Ongoing | ad hoc
	SOPs for systematic alert verification and risk assessment, and event reporting, integrating national guidelines	In progress – being finalised
	Integrated enhanced surveillance EWARS capacity (CRFs, investigation algorithms etc.) for preparedness against all major epidemic syndromes, including electronic forms ready on EWARS	In progress – finalisation w/c 18 March after feedback from partners
	Routine analysis and feedback for information requests	Ongoing | ad hoc
	Structured integration of Laboratory Management Information System and laboratory results into EWARS	In progress
	Advanced analytics, forecasting and geo-spatial modelling for preparedness and planning	Starting
Specific outbreak/event response (change and adapt as things evolve)		
Diphtheria	Contact tracing: Coordination of activities and data entry, 30-day follow-up study, and in-depth investigations	Ongoing
	Data management: Collection of line lists, compilation of EWARS data, routine analysis	Ongoing
	Analysis: Contact tracing performance, advanced analytical epidemiology, DAT sensitivity, positive predictive value of signs and symptoms	In progress
	Field investigation: host community: transmission patterns and risk factors	In progress
	Investigation of new/unusual clusters	Ongoing
Measles	Collection of line lists, compilation of EWARS data, routine analysis, and inform health operations/public health action	Ongoing
	Investigation of new/unusual clusters	As required

Work stream	Key activities	Status
Mumps	Collection of line lists, compilation of EWARS data, routine analysis, and inform health operations/public health action	Ongoing
	Investigation of new/unusual clusters	As required
AJS	Establish enhanced surveillance,an, invetigation tools and investigation plan	Completed
	Collection of line lists, compilation of EWARS data, routine analysis, and inform health operations/public health action	Ongoing
	Investigation of new/unusual clusters	As required
Other	As needs arise. Ensure appropriate investigation tools, EWARS capacity and laboratory algorithms and rapid response staffing are in place to respond to new alerts and/or epidemics.	Ongoing work on SOPs and EWARS preparedness (see above)
Community based surveillance	Initial scoping with key partners, development of a concept note	Completed
	Develop comprehensive CBS strategy to agree on with partners and MoH.	In progress
Needs assessment and analysis	Rapid risk assessments & field investigations	Ad hoc | when required
	Public Health Situation Analysis	Outdated – review in progress
Health resources availability Monitoring	Who does What Where and When (4W) Matrix [Health Sector Product – with IMO]	Ongoing - done by health sector IMO
	Health facility monitoring, and work on enhancement of current monitoring tool [with Health Sector coordination]	First round undertaken by health sector in January – define next steps
Information Products	Weekly Epi bulletin	Ongoing
	Weekly WHO Sitrep (Epi input)	Ongoing
	Disease specific Sitreps as needs arise	Ongoing
	Systematic and regular detailed epidemiological summary reports for main epidemics / conditions under enhanced surveillance [internal document]	In progress – needs systematisation
	PHSA for publication	In progress
Health System performance	Health management information system: evaluate current status, capacity, and needs in collaboration with MoH and key stakeholders (DHIS2 and other HIS)	Early discussions, moderate progress
	Vaccination coverage estimations: compilation, evaluation of gaps [currently with IVD team]	Coordinate with Health ops and IVD

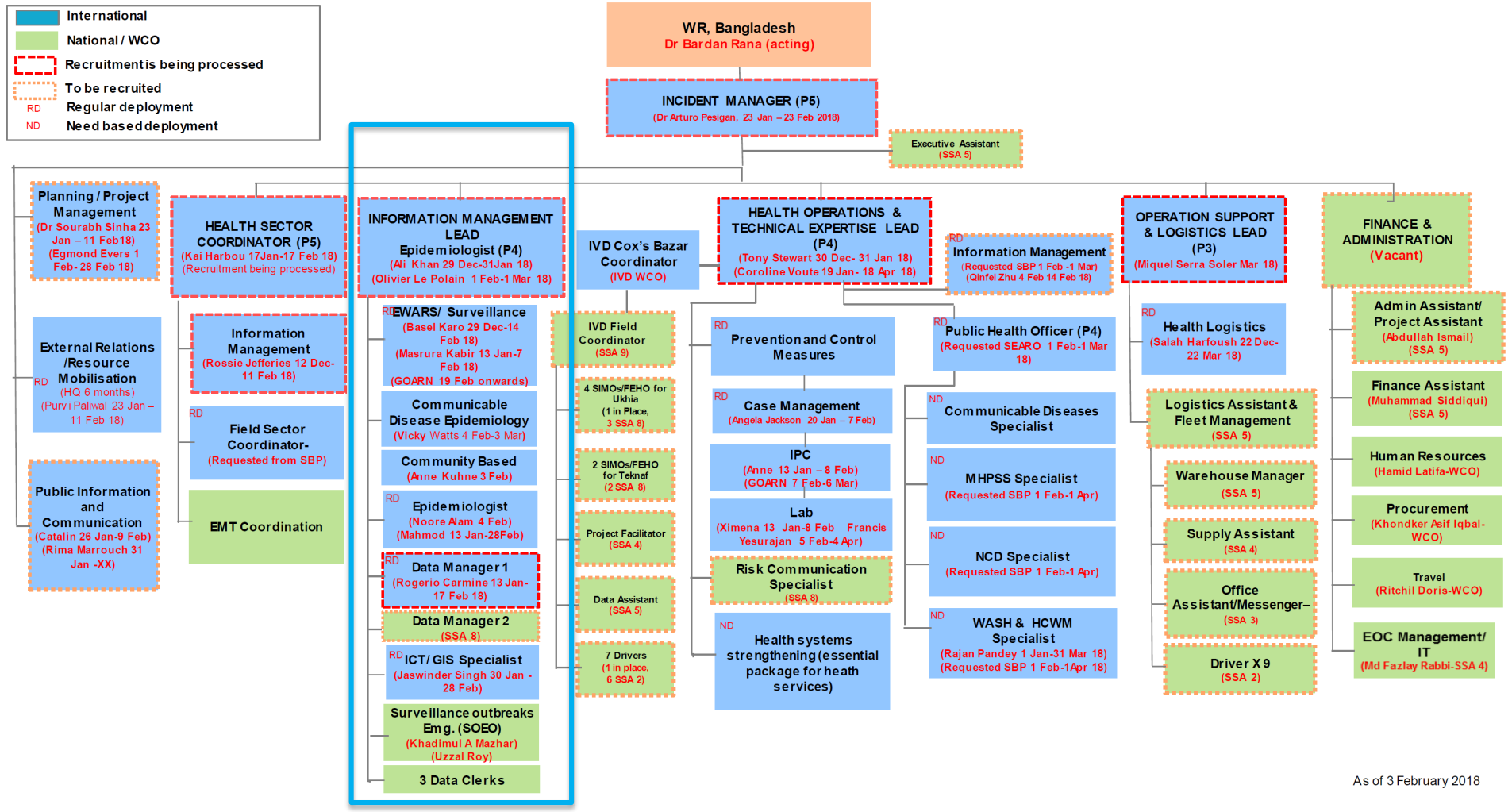


https://www.who.int/health-cluster/resources/publications/Final-PHIS-Standards.pdf?ua=1

PHIS Toolkit

https://www.who.int/health-cluster/resources/publications/PHIS-Toolkit/en/

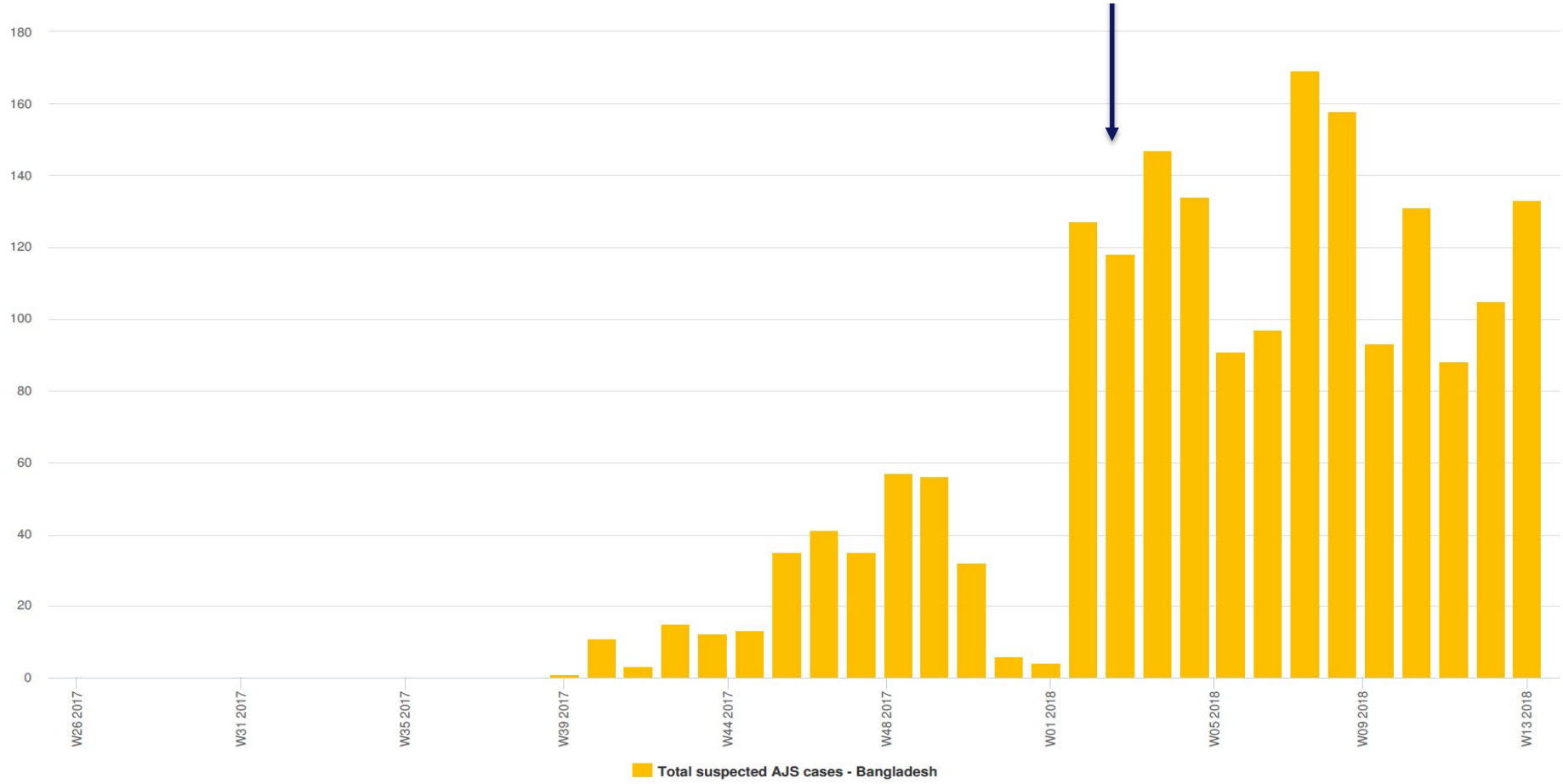
Incident Management System: Bangladesh



As of 3 February 2018

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Acute Jaundice Syndrome (AJS) outbreak



AJS response

- **Establishing enhanced surveillance:** daily reporting of cases, detailed epidemiological characteristics of reported cases.
  - Case report form: detailed demographic characteristics, geographical origin of patients, clinical presentation, exposure factors (water and sanitation exposure, household environment) and laboratory results, if any samples were taken

- **Laboratory testing**: samples taken from key HCFs and testing done for HAV, HBV, HCV, HEV, leptospirosis, HEV RDTs rolled out

- **Environmental investigation**

- **Weekly detailed reporting to all partners**

Acute Jaundice Syndrome Case Report Form

Location of the health facility*:_____ **Report date** (dd/mm/yy): ___/___/___

Facility number (Leave blank until further notice- health facility number will be provided):_____

Case ID* (Today's date (ddmmyy) followed by case number assigned at the facility today; e.g. 1st AJS case at your facility on 15th Feb 18 would be 150218001)

D	D	M	M	Y	Y	#0-9	#0-9	#0-9

Case ID used by the facility if available and different from the case ID above:

I.CASE IDENTIFICATION/ DEMOGRAPHIC DETAILS

Patient name:	Sex*: ☐ Male ☐ Female ☐Unknown	Date of birth (dd/mm/yy) ___/___/____
Age in years (for children aged less than 12 months, enter 0 as the age in years) :		
Father's /husband's name:	Family card/ Ration card/ RRRC card number: (completion of this field NOT compulsory):	
Family phone number:	Mahji name:	Mahji phone number:
Mosque name:	Imam name:	Work as food handler: ☐ Yes ☐ No ☐ Unknown
Nationality: ☐ FDMN ☐ National ☐ Other		

For Forcibly Displaced Myanmar National case		For National case
Camp (new camp names, e.g. C7)	Hill (Local description)	Upazilla
Zone (e.g. AA)		Division
Block	Place (Local description)	Union/Ward
House number		

Pregnancy related information

Pregnancy ☐ Yes ☐ No ☐ Unknown If pregnant, which trimester ☐ First ☐ Second ☐ Third

Miscarriage/ stillbirth/ neonatal death during this period of illness ☐ Yes ☐ No ☐ Unknown

II. CLINICAL DETAILS:

Date of jaundice onset (dd/mm/yy) ___/___/____	Date of symptoms onset (dd/mm/yy) ___/___/____	Date of examination (dd/mm/yy) * ___/___/____
Symptoms & Signs (history or at admission-tick all that apply)		
☐ Fever	☐ Generalized itch	☐ Diarrhoea
☐ Jaundice	☐ Joint pain	☐ Bleeding
☐ Dark Urine	☐ Nausea	☐ Convulsions
☐ Loss of appetite	☐ Vomiting	☐ Altered Mental state
☐ Fatigue	☐ Abdominal pain	☐ Other, Specify _____
Was patient admitted: ☐ Yes ☐ No	Date of admission (dd/mm/yy) ___/___/____	

III. FAMILY HISTORY:

Number of persons living in the household: _____	Other people in the household with jaundice in the last 3 months: ☐ Yes ☐ No
If yes, number of people in the household with similar illness (enter number): _____	Onset of the first case in the household: ☐ <2 weeks ago ☐ 2-<4 weeks ago ☐ 4-<6 weeks ago ☐ 6-<8 weeks ago ☐ 8 weeks or longer

V.HYGINE AND SANITATION

Water source most often used (one answer): ☐ Tube well ☐ Communal tap ☐ Tanker truck ☐ Spring water (local word: shora) ☐ Rain water collection ☐ Other, Specify _____	Usually wash hands before taking food: ☐ Always ☐ Sometimes ☐ Never
Water storage most often used (one answer): ☐ Aluminium/Metal pot ☐ Plastic bucket ☐ Jerry can ☐ Ceramic Jug ☐ Clay pot ☐ Other, Specify _____	Usually wash hands after defecation or changing nappies: ☐ Always ☐ Sometimes ☐ Never
Use Water purification: ☐ Always ☐ Sometimes ☐ Never	Use soap to wash hand: ☐ Always ☐ Sometimes ☐ Never
Method of water purification usually used: ☐ Boiling ☐ Filter ☐ Water purification tablets ☐ Other, specify _____	Usual place of defecation: ☐ Latrine ☐ Open defecation ☐ Other, specify_____
	Condition of latrine last time used: ☐ Empty ☐ Somewhat filled ☐ Close to over-flowing ☐ Overflowing

VI. DIAGNOSTIC RESULTS:

Rapid diagnostic test done*: ☐ **Yes** ☐ **No**

If yes, mention the test result and date of the RDT

RDT	Result	RDT date(dd/mm/yy):
Hepatitis E	☐ Positive ☐ Negative ☐ Indeterminate ☐ No RDT done	___/_____/____
Hepatitis B	☐ Positive ☐ Negative ☐ Indeterminate ☐ No RDT done	___/_____/____
Hepatitis C	☐ Positive ☐ Negative ☐ Indeterminate ☐ No RDT done	___/_____/____
Malaria	☐ Positive ☐ Negative ☐ Indeterminate ☐ No RDT done	___/_____/____
If other RDT (Specify):	☐ Positive ☐ Negative ☐ Indeterminate ☐ No RDT done	___/_____/____

Specimen collection done*: ☐ **Yes** ☐ **No** ☐ **Unknown**

If yes, type of sample collected: ☐ Blood ☐ Serum Date of collection (dd/mm/yy): ___/_____/____

Test	Result	Date of result (dd/mm/yy):
HAV IgM	☐ Positive ☐ Negative ☐ Indeterminate ☐ No Test done	___/_____/____
HBsAg	☐ Positive ☐ Negative ☐ Indeterminate ☐ No Test done	___/_____/____
HCV IgM	☐ Positive ☐ Negative ☐ Indeterminate ☐ No Test done	___/_____/____
HEV IgM	☐ Positive ☐ Negative ☐ Indeterminate ☐ No Test done	___/_____/____
Leptospirosis	☐ Positive ☐ Negative ☐ Indeterminate ☐ No Test done	___/_____/____
Malaria (Blood Smear)	☐ Positive ☐ Negative ☐ Indeterminate ☐ No Test done	___/_____/____
Other test (Specify)	☐ Positive ☐ Negative ☐ Indeterminate	___/_____/____

VII. DISCHARGE DETAILS (For admitted patients)

Outcome at discharge: ☐ Discharged ☐ Death ☐ Referred ☐ Left against medical advice ☐ Unknown	Date of Discharge(dd/mm/yy): ___ /_____/____	Date of Death(dd/mm/yy): ___ /_____/____
Comments:		

Key steps in outbreak investigation

1. Establish the existence of an outbreak
2. Confirm diagnosis
3. Case definition
4. Case finding
5. Generate hypotheses using descriptive findings
6. Analytical study to test hypotheses
7. Draw conclusions
8. Additional investigations
9. Communicate findings
10. Control and prevention measures

Establish existence of an outbreak

- Outbreak = occurrence of cases of disease above expected levels
- Threshold will vary depending on the disease/country

How are outbreaks detected?

- When confirming the existence of an outbreak:
  - Time – Place – Person
  - Existing incidence data? Any previous known outbreaks?
  - Discuss with others – those reporting outbreak, public health staff etc
  - Rule out potential pseudo-outbreak
    - Numerator: enhanced surveillance/awareness? Lab error?
    - Denominator: sudden change in population?

Confirm diagnosis and case definition

Confirm diagnosis

- Clinical
- Laboratory

Case definition

- Standardised set of criteria for determining if somebody has the disease
- Usually have multiple definitions: Confirmed, Probable, Suspected
- TIME – PLACE – PERSON **and** clinical and/or laboratory criteria
- Not rigid – will often change as an outbreak progresses

Case finding

- Where and how could you look for cases?
- All data on cases should be recorded in a line list

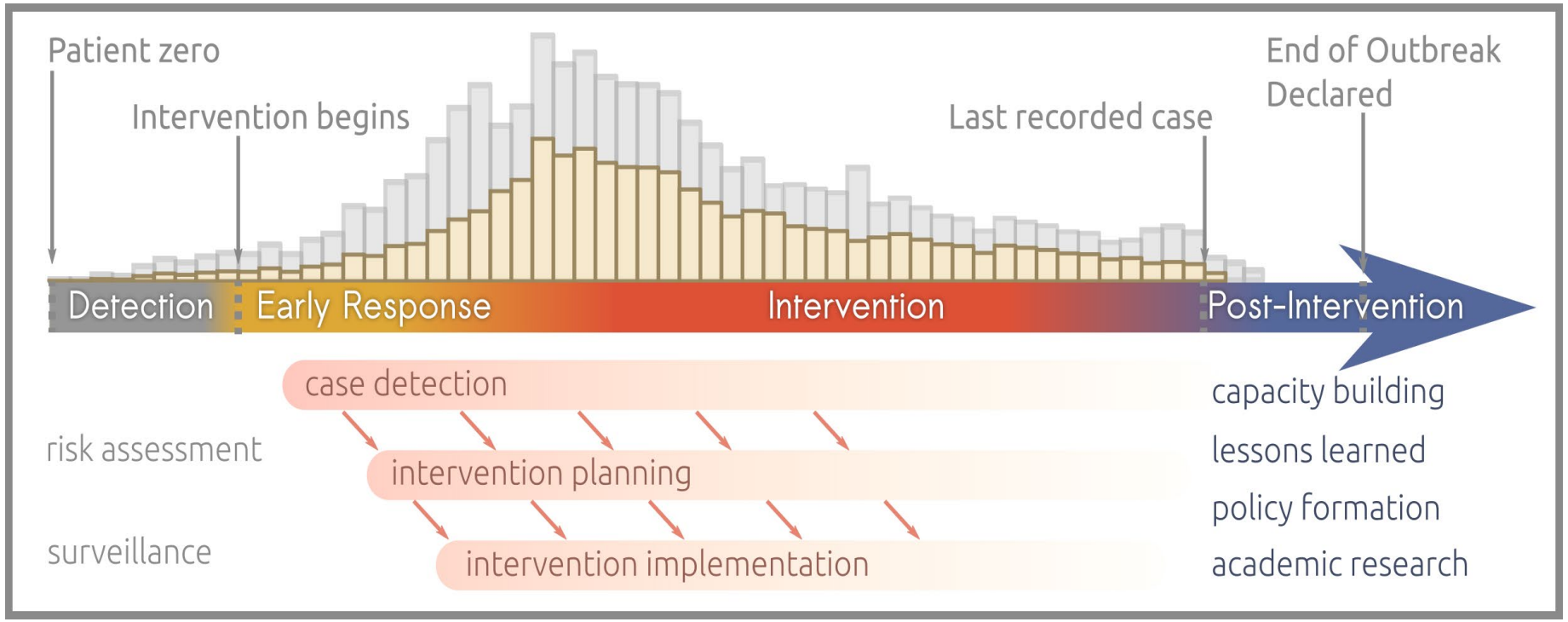
Generate and test hypotheses

- What are your findings telling you about:
  - ✓Pathogen?
  - ✓Source
  - ✓Mode of transmission?
  - ✓Possible exposures?
- Formal study to test hypotheses may not be necessary

Communicate findings

Implement control measures

Information for action



Polonsky J, Baidjoe A et al. (2019) Outbreak analytics: a developing data science for informing
the response to emerging pathogens. Phil Trans Roy Soc B. In press

Some general reflections

- Generation of public health information is needed in the field with “real-time” interaction with decision makers
- Epidemiology there to orient health operations and interventions – speed essential, requiring balancing complex/slow work vs timelier/less sophisticated work
- Data collection requirements need to be tailored to
- Data sharing issues discussed early on in responses to avoid misunderstandings, frustrations and conflict
- Options for tools: no ‘one size fits all and needs to tailored to context’

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Thank you for joining

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