



# Severe Influenza Pandemic In Macaronesic Islands: Preparedness and Response

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This set of text-only slides is intended as a summary of the main document, to assist in training. Some or all of the slides can be used as a starting point, as needed depending on the previous knowledge level of the trainees, and together with the main document and the spreadsheet.

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Based in part on *Dealing with security (understanding vital services and how they keep us safe)* <http://ResilienceMaps.org>, by Vinay Gupta, and on the OODA loop by Col. John Boyd (USAF).

*See details in the main document.*



# I. Justification

- Biology, history and surveillance show a severe influenza pandemic is possible.
- Were it to happen, it would cause high levels of disease, deaths, and systemic disruption of services and supplies.
- Civil protection and other essential services would play a vital role in an effective response.
- Severe pandemic scenarios share common issues with scenarios from other causes of wide systemic disruption.

## II. Pandemic challenge

1. The biology of influenza
2. History of pandemics
3. Animal-human influenza – H5N1
4. Impact of a severe pandemic

# 1. The biology of influenza

- Surface molecules: Hemagglutinin & Neuraminidase → subtypes: H1N1, H3N2, H5N1, and many others.
- Replication inside cells has no “quality control” → mutations (minor; or new subtype: 1918).
- Some times, two viruses inside a cell → hybridation (new subtype: 1957, 1968, 2009).
- Variability → influenza viruses in birds (acuatic, migratory), mammals (pigs, cats, humans, others).
- Transmisibility: respiratory and by contact, in initial stages, also from asymptomatic cases.



## 2. History of pandemics

- 1580, 1694, 1729, 1781, 1830, 1898, 1918, 1957, 1968, 2009, 20?? ...
- Not one winter wave, but several waves in 2 years, and sometimes the 2<sup>nd</sup> wave causes more deaths.
- Disease not in 5-10% of the population but in up to 30%; 40% in the young; 20% in the elderly.
- Hospitalisations and deaths: similar to winter influenza, or far larger.
- Lethality higher if “risk factors”. And in 1918 higher in previously healthy 20-40 year-olds.



# 3. Animal-human influenza – H5N1

- Virus adapted to animal + unfrequent disease in humans + limited person-to-person (P2P) infections = “pandemic potential”.
- Known so far: H9N2, H7Nx (2,3,7), H10N7, H5N1.
- **H5N1**: 1997 Hong Kong. Since 2003: panzootic + at least 603 human cases y 356 deaths (many young).
- Genetic variants (“clades”), different lethality (Indonesia 80%, Egypt 40%), few mild cases.
- P2P in Peshawar (2007): bird → person 1 → person 2 → person 3 → person 4.
- Persists in wild birds. Experiments with ferrets.



## 4. Impact of a severe pandemic

- **Disease:** Waves affect 30% of the population? 300,000 ill per million. At peak, 4-8% of local population? 40-80,000 ill per million and per week. How many severe?
- **Lethality:** Severe would be  $>1/10^2 = >3,000$  deaths per million,  $>300$  in each peak week. Similar to 1918-19: lethality 9+%.
- **Disruption:** Absenteeism from disease in self/family and disruption). Demand contraction. Supply issues from absenteeism, simultaneous demand and self-amplification. Non linear effects (e.g.: effect from pediatric deaths?) → complexity.

# III. Current preparedness

1. Design of preparedness and response phases
2. Preparations for detection, control, mitigation and recovery
3. Looking ahead

# 1. Phases and intervals

- WHO: Phases are about “proximity” for “planning”.
  - 1-2: new subtype in animals, 3-4: animal-to-human, 5-6: human-to-human. + extra phase “between waves”.
  - Phases *don't predict* virus, timing or severity.
- CDC: “Local” intervals for “response”.
  - Prepandemic = detect → assess.
  - Pandemic = initiation → acceleration → peak → deceleration → resolution. Local simulation with spreadsheet.



## 2. Preparations for DCMR

- **Detection:** surveillance in animals, detection of human outbreaks, detection of arrival in country, lethality assessment.
- **Control:** in animals, of initial outbreak, of travel and borders.
- **Mitigation:** contact reduction, treating the ill, assuring vital services and supplies.
- **Recovery:** starting with vital services and supplies.

## 3. Looking ahead

- **Motivation:** probability is unknown but “high enough”, timing is unpredictable, impact would be very high and complex. Some preparedness activities are common to other catastrophes.
- **On-going activities:** in health-care (vaccines, generics, etc) and wider participation (civil protection, essential services, whole of society).
- **Simple models for complex crises:** methodological proposal (map and loop), possibly useful in other crises.

## IV. Complex Crises ...

- Situation:
  - In each location, different impact and evolution.
  - It can change faster than response changes.
  - Possibility of rapid “cascade” effects.
- “Total” response:
  - Global ↔ National ↔ Local ↔ Individual.
  - Simultaneous, flexible, agile, centralised-distributed.

## IV. ... and Simple Models

- Complexity and “noise” → simplified language:
  1. Check-list (SCIM): vital needs of individuals, groups, organisations and states.
  2. Loop (OODA): observation → orientation → decision → action.
- Simple: easy to learn it fast.
- Lightweight: allows to rapidly “cut to the chase”.
- Open: shared by all those who act.



# 1. Simple Critical Infrastructure Maps

- Needs, not systems:
  - Individuals: too-hot & too-cold (shelter), hunger & thirst (supplies), disease & injury (security).
  - Groups: workspace, communications, transport, control of shared resources.
  - Organisations: shared map, plan and succession model.
  - States: effective organisations, etc.
- Provision: levels and substitutions.



# Individual's needs

- Protection from too-cold and too-hot:
  - Shelter, clothing, heating/cooling.
- Hunger and thirst:
  - Supplies, conservation, cooking.
- Health:
  - Prevention, treatment.
- Safety:
  - Police, army.



# Provision alternatives = “substitutions”

- Current needs are ~satisfied by current systems.
- Current systems may be changed by disruption or to reduce infections.
- Reinforce: more resources, prioritise before other systems.
- Substitutions: each system → needs → alternatives.
- Change in levels (Individual ... Municipality, Island ... International). E.g.: if phones fail, use walkie-talkies (more local) or sat-phones (more global).
- Change ways of delivery: Local production, Cables/Pipes, Deliver, Fetch. E.g.: to reduce infections in food-markets, distribute food to homes.



# Needs of groups

- **Communications:** in a pandemic, add some redundancy for essential groups.
- **Workspace** for the groups' activities (home, office, public space): not much affected by pandemic.
- **Transport** (vehicles, fossil fuels): relocate, prioritise for what's essential, save, bikes, walk.
- **Resources control:** usually share within group and organise within organisation. In a pandemic, re-prioritise and share among groups and among organisations.



# Needs of organisations

- **Like groups**, orgs need: communications, specialised spaces, transport, control of specialised resources.
- **Shared map** is aims, activities and action space. In a pandemic, prioritise or redirect efforts.
- **Shared plan** is usually yearly plans, day to day activities and authorisations. A pandemic may need more flexibility and autonomy.
- **Shared succession model** is usually designation, hiring and training. In a pandemic there is need to anticipate illness, cooperate with volunteers, do cross-training.



# Needs of states

- Legal and public order system:
  - Specific rules for a pandemic.
  - Organisations must adapt how they work in a pandemic.
- Citizens lists.
- Territory.
- Effective organisations:
  - Pandemic: must adapt (see before).
- International recognition.

## 2. OODA loop

- **Observation:**
  - Facts and questions.
  - Information systems and rumours.
- **Orientation:** the hardest.
  - Threat model.
  - Priorities.
  - Possibilities of change and action.
- **Decision:** alternatives and consequences.
- **Action:** distributed, fast enough, reversible.



# Uses of the OODA loop

- During interpandemic period: wide loop.
- During the pandemic: actualise frequently.
- Within each SCIM item (see later).
  
- Integrated Needs Map: country, region, municipality.
- Among organisations: interdependencies.
- Within organisation: actualise plan.
- Individual level, families, groups and networks.

# V. Response to a severe pandemic

1. Numeric and qualitative scenarios.
  2. Reduce infections.
  3. Treat the ill.
  4. Continuity of vital services and supplies.
- Preparedness stage: simulate → suggest actions that might be useful in real situations.



# 1. Numeric and qualitative scenarios

- Spreadsheet (simulate quantities):
  - Start with: population, attack rate, case fatality rate.
  - Simulate: ill, hospitalised, death / week.
- Integrated Needs Analysis Matrix (qualitative):
  - 18 needs x 7 levels.
  - Detect vulnerabilities.
  - Hand responsibilities to individuals, groups, organisations and networks.

## 2. Reduce infections

- x2:  $1 \rightarrow 2 \rightarrow 4 \rightarrow 8$ .      x3:  $1 \rightarrow 3 \rightarrow 9 \rightarrow 27$ .
- Goals:
  - Delay and reduce peak.
  - Maybe reduce volume.
- Advantages:
  - Reduce health-care and social overload.
  - Gain time for treatment and vaccine.
- Actions:
  - Information, coordination, facilitation.



# Prevention toolbox

- Incubation → with symptoms / without symptoms.
- Measures:
  - Frontiers: porous. Doesn't take long to enter.
  - Isolation: diseased. Quarantine: contacts.
  - Contact reduction: “social distance”.
  - Protection: hygiene, masks, vaccination.
- Combination:
  - Layers: less than perfect, on top of each other.
  - Reversible measures first, vaccines when available.

# Isolation and quarantine

- **Patients** isolated for 7-10 days: mild cases at home or specific locations, severe cases at hospitals.
- **Contacts** quarantined during incubation period: at home or specific locations. Health-care workers may cycle: “work away from home, quarantine, home”.
- Facilitation:
  - Mutual help in networks: family, neighbours, etc.
  - Frequent communication → logistic support.
  - Assist those who live alone or care for dependents.



# Reduction of respiratory contacts

- History & mathematical models → act soon.
- Simultaneous layers:
  - (Inter)national travel restriction. ↓ effect.
  - Send students home. To “small and stable” groups.
  - Business: aggregate, asynchronous transfer.
  - Leisure: postpone.
  - Work: staggered entry, work from home, partitions, crossed training.
  - Urban decompression: distributed infrastructure.



# Protection

- No substitute for contact reduction.
- Hygiene: hand washing, surface washing. Cough and sneeze in elbow.
- Face masks:
  - Surgical for those ill & office workers.
  - FFP2/N95 for health-care, FFP3/N99 if aerosols.
  - Home-made, washable.
- Vaccination:
  - If “little & late” → quantify needs & facilitate.

## 3. Treat the ill

- Ill with flu: mild, moderate, severe.
- Other diseases, accidents, baby delivery – don't go away.
- Goals:
  - Treatment appropriate to severity & resources.
  - ↓ infections (in origin, during transport, in health-care centers).
- Civil protection actions:
  - Information, coordination, facilitation.
  - Transport people and material resources.

# Health-care organisation

- Scenarios: cases & hospitalisations / week. Pre-existing diseases & vulnerable groups.
- Shared protocols ↔ Plans adapted to each territory.
- Reduce infections: differentiated access, see-through screens & cleaning, assist through phone.
- Staff: extra help, shifts & substitutes, remote assistance. Lodging close to the health-care center.
- Delay prevention & elective surgery, physical fan-out as possible.
- Basic supplies & infrastructure → “substitutions”.



# Information, triage & transport

- Call centers → add distributed network.
  - Points of contact + Common protocols.
- Protocols: severity & vulnerability → actions.
  - Treat, move, visit, deaths.
- Transport:
  - Vehicles: own, shared, adapted. Cleaning.
  - Staff: management, training, protection.



# Primary and home health-care

- See “health-care organisation”.
- Mutual help networks: chronically ill, experienced care-givers, neighbours.
- Support networks for primary health care-givers.
- Training in basic health problems: measure fever etc, manage fever & respiratory insufficiency, manage frequent diseases & injuries.
- “Likely immunised” people.



# Hospital & community health-care

- See “health-care organisation”.
- Reserve beds, delay elective surgery, possible “home hospitalisation”, assess risk of baby delivery at home.
- Combine hospitals: segmentation according to territory & type of disease.
- Protection & “substitution” of vital infrastructure at the hospital.
- Hospitals for convalescents.

# 4. Continuity of vital services & supplies

- SCIM / OODA.
- Individuals, groups, organisations, states.
- Sequence of tasks:
  - Map needs and levels of provision.
  - Vulnerabilities.
  - Response capacity (who, what, what with).
  - Immediate action plan.
  - Actions: self & facilitated.
  - (Back to top.)



# Individuals

- **Too cold / too hot:** needs, resources, adaptations.
- **Hunger:** “hoarding” vs “pre-crisis staggered stock-up”, transport, production. Specific “food security” plans (supplies). **Thirst:** same.
- **Disease:** prevention (hygiene, sanitation → reinforce, appropriate tech) and treatment (see health-care plans).
- **Injury:**
  - General supplies & services → prevent violence.
  - Organisations: civil protection, police, army.



# Groups

- Relocate **workspaces**:
  - Needs: reduce respiratory density.
  - Available spaces.
- **Communication**:
  - Useful to coordinate & reduce infections.
  - Interdependencies: energy & phone chargers.
- **Transport**: prioritise, savings & adaptation.
- Shared **resources control**: flexible cooperation.



# Organisations ...

- **Map** the situation: information systems → SCIM (big picture, adapted with organisational specific needs).
- Look at needs → systems' vulnerabilities → needed changes → action **plan**.
- **Succession** model:
  - Illness or disruption → absenteeism.
  - Specialists, managers, subject matter experts.
  - Training, simplification, distant support, etc.

... and **States** (work via effective organisations)

## VI. Executive summary

- A severe pandemic is possible and would start rapidly.
- Goals: reduce infections, treat the ill, keep vital services & supplies.
- Existing plans (=resource) + actions by many (flexible coordination).
- Proposal: Simple Critical Infrastructure Maps (SCIM) & Observation, Orientation, Decision and Action loop (OODA). 18 needs → (prepare to) adapt.
- Before a pandemic: training, prepare predictable adaptations in each location.



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