Pandemics:
Would a typology improve out ability to prepare and respond?

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Peter Jackson's *Braindead* released 1992

Health warning "Splatter Romcom"

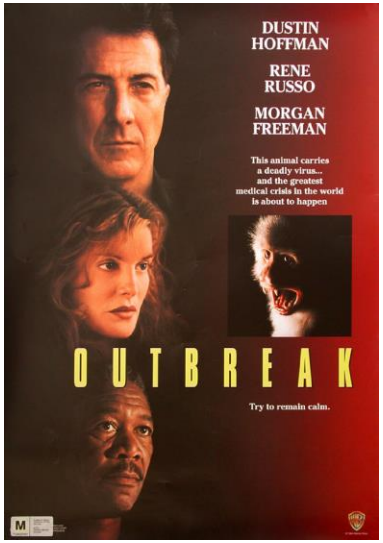
Skull Island (Southwest of Sumatra) 1957, intrepid *Zoo Official* from Wellington New Zealand is transporting his prized specimen home with his justifiably anxious assistant…

Lessons from *Braindead*

- Importance of zoonotic sources
- Pandemics cross borders
- Early recognition and case isolation can prevent a lot of gore !

Other 'pandemic' films

Released 1995



Released 2011

Outline

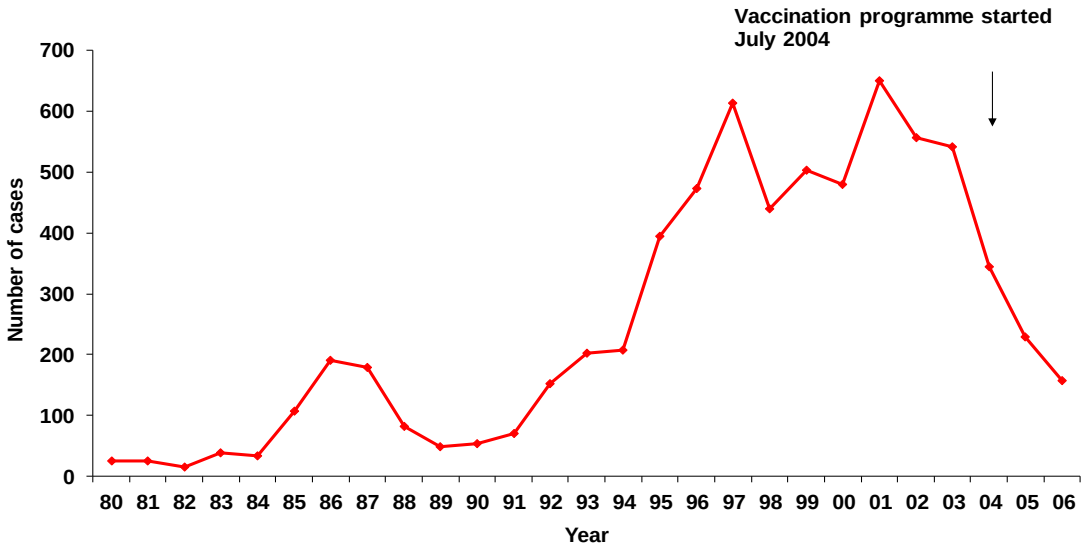
- Key terms & concepts
- Goals of pandemic preparedness
- Pandemic typology
- Potential benefits of pandemic typology
- Potential problems & limitations
- Conclusion
- Where to from here?

Key Terms

Epidemic

Epidemic: The occurrence in a community or region of cases of an illness, specific health-related behaviour, or other health-related events clearly in excess of normal expectancy

Source: Porta, M. Editor. A dictionary of epidemiology. 6th ed. 2014

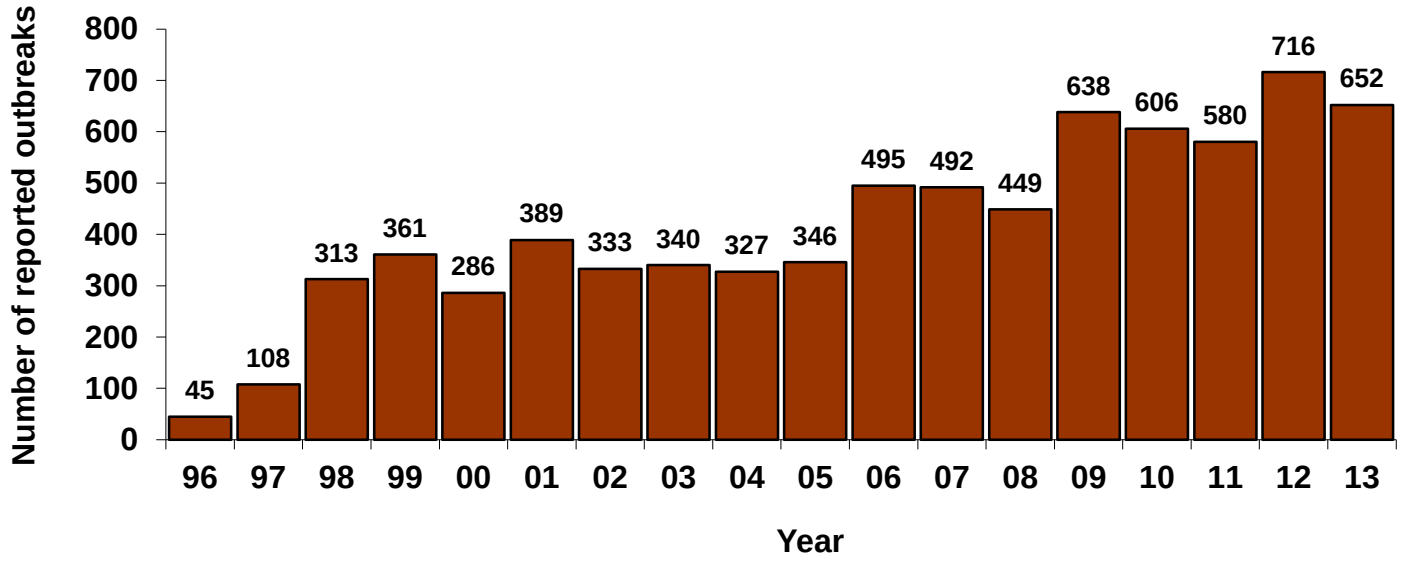


Key Terms

Outbreak

Outbreak: An epidemic limited to localised increase in the incidence of a disease eg, in a village, town, or closed institution.

Source: Porta, M. Editor. A dictionary of epidemiology. 6th ed. 2014



Key Terms
Pandemic

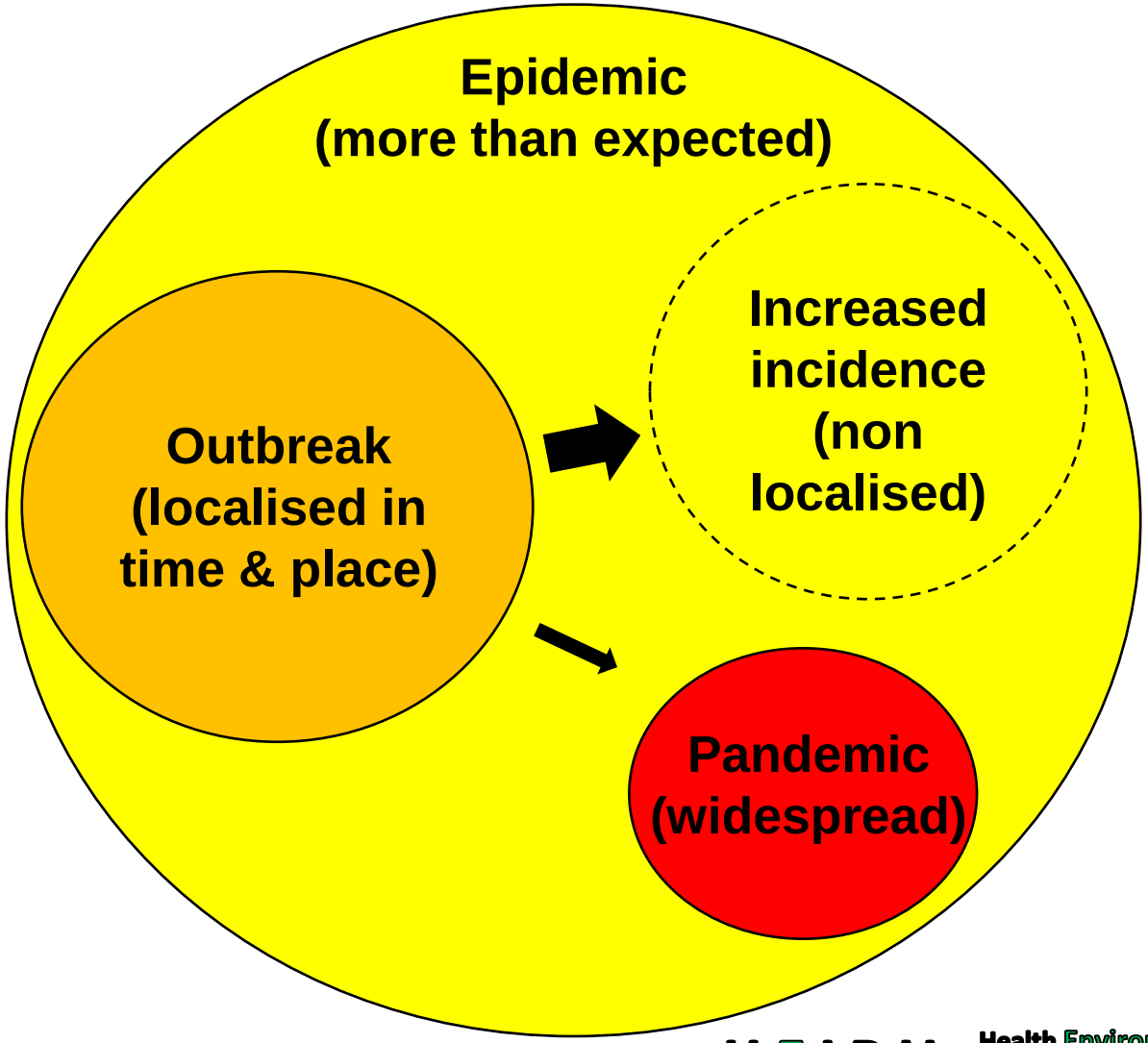
Pandemic: An epidemic occurring over a very wide area, crossing international boundaries, and usually affecting a large number of people.

Source: Porta, M. Editor. A dictionary of epidemiology. 6th ed. 2014

WHO Pandemic Influenza Phases (2009)	
Phase	**Description**
Phase 1	No animal influenza virus circulating among animals have been reported to cause infection in humans.
Phase 2	An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a specific potential pandemic threat.
Phase 3	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks.
Phase 4	Human to human transmission of an animal or human-animal influenza reassortant virus able to sustain community-level outbreaks has been verified.
Phase 5	The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.
Phase 6	In addition to the criteria defined in Phase 5, the same virus has caused sustained community level outbreaks in at least one other country in another WHO region.
Post Peak Period	Levels of pandemic influenza in most countries with adequate surveillance have dropped below peak levels.
Post Pandemic Period	Levels of influenza activity have returned to the levels seen for seasonal influenza in most countries with adequate surveillance.

Key terms

Epidemic, Outbreak, Pandemic



Pandemic preparedness

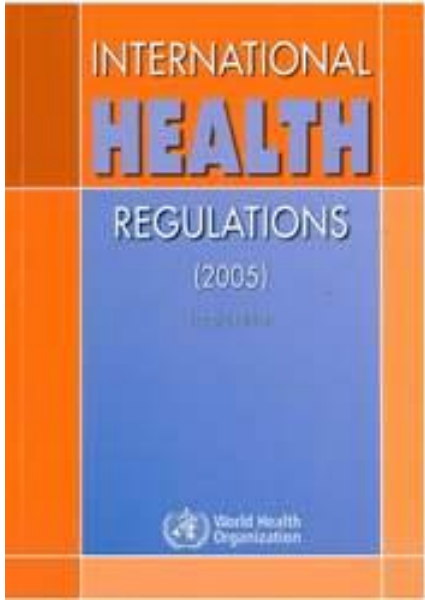
Goals

- Preventing pandemics by reducing their risk of emergence and spread
- Controlling established pandemics by early recognition and limiting their spread and health impact
- Supporting rapid recovery from a pandemic

Pandemic preparedness

Pandemic plans focus on influenza

All-hazards Approach



International Health Regulations (2005)

Public Health Emergency of International Concern (PHEIC)

"an extraordinary event which is determined, as provided in these Regulations:

- to constitute a public health risk to other States through the international spread of disease; and
- to potentially require a coordinated international response".

Source: WHO, International Health Regulations, 2005

All-hazards Approach

Serious cross-border threat to health

"a life-threatening or otherwise serious hazard to health of biological, chemical, environmental or unknown origin which spreads or entails a significant risk of spreading across the national borders of Member States, and which may necessitate coordination at Union level in order to ensure a high level of human health protection.

Source: Decision No 1082/2013/EU of The European Parliament and of The Council of 22 October 2013

All-hazards Approach

Global health security agenda (GHSA)

- Broadens thinking about range of threats to global health security & responses
- Global health security = collective health security + individual health security from access to safe health services, products & technologies

Source: Heymann et al. Lancet 2015;385:1884-2015

All-hazards Approach

There are ~ 1415 known human pathogens

- All can theoretically cause outbreaks/ epidemics (more than expected)
- Some are far more epidemic-prone than others
- Eg, 75% of emerging pathogens are zoonotic (132/175)

  Source: Taylor et al. Phil Trans R Soc Lond B 2001; 356: 983-9.

- Eg, 72% of emerging pathogens (145/202) originate in wildlife

  Source: Jones et al. Nature 2008; 451: 990-6.

All-hazards Approach

Pandemics are likely to follow a finite set of established pathways, largely based on the biology of the organism and its human host interaction

Avalanches metaphor - tending to follow valley catchments

Pandemic typology

Basis for developing a typology

- **Biology** (source of infection & mode of transmission) → interventions & sectors involved
- **Epidemiology** (CFR, reproduction number, asymptomatic transmission, incubation period) → controllability & level of risk
- **Level of knowledge** (particularly about biology & epidemiology) → Need for research/investigation to guide prevention and control
- **Dependence on infrastructure** (eg water & sanitation, healthcare, immunisation, response infrastructure) → level of risk for particular countries & need for development assistance

Pandemic typology

Pandemic Type	Examples (*PHEIC)
A. Pandemic IDs transmitted between people with short to medium incubation periods	
1. ID with well-established pandemic potential	Pandemic influenza in 1918, 1957, 2009*
2. Poorly characterised emerging ID with pandemic potential	SARS 2002, MERS-CoV 2012
3. Synthetic or weaponised ID with pandemic potential	Synthetic bioterrorist agent, eg smallpox
4. Well characterised ID with re-introduction potential	Diphtheria 1998, Polio 2014*, Measles (post-elimination)
5. Exotic ID with pandemic potential in low income countries	Plague in India 1994, Ebola in 2014*
B. Pandemic IDs with predominantly asymptomatic transmission & long incubation	
6. ID with high asymptomatic transmission, long latency and pandemic potential	HIV/AIDS 1981, nvCJD 1996
7. Increase in serious antibiotic resistance	Drug resistant tuberculosis (MDR / XDR / TDR)
C. Pandemic IDs predominantly transmitted from animals, vectors, food, and water	
8. Exotic vector borne & zoonotic ID with moderate to high introduction potential	Arboviral diseases eg, Zika*, Dengue, Chikungunya
9. Imported food, drink or other product with serious contaminant	Botulism in canned food, Radiological agent in food

Potential Benefits of Typology

- **Comprehensive** - Clarifies that the pandemic scope includes this broad set of types
- **Effective** –May increase timeliness of responses based on greater clarity about type of response to implement and the agencies involved
- **Prevention focussed** - May support a more proactive approach, particularly for slowly evolving pandemics, by clarifying the role of specific sectors in risk management
- **Efficient** - Supports move towards an 'all hazards' approach so resource are used more efficiently with less duplication of surveillance & response systems

Potential Benefits (continued)

- **Nuanced** – Identifies where general pandemic planning needs to be varied for specific pandemic types
- **Adaptive** - Supports learning from successful (and unsuccessful) responses to different types of pandemic events

Potential Problems of Typology

- **Uncertain validity** - May lack validity if pandemics are too unpredictable to be classified in a valid way
- **Potential errors** - May delay responses if pandemics are incorrectly classified
- **Potential complacency** - May reduce aid efforts during international pandemics if pandemic is rapidly assessed to have low potential for spread to middle & high income countries
- **Continuing boundary issues** - Does not fully eliminate definitional issues about pandemics and other cross-border threats

Potential Problems of Typology

Boundary Issues – should we include:

- All-hazards, eg biological, physical, chemical & radio-nuclear contaminants of food
- Environmental hazards, eg contaminated air & surface water
- Natural disasters, eg floods, earthquakes
- Climate change effects, eg heatwaves
- Substandard and falsified drugs, vaccines & other healthcare products
- Chronic diseases caused by international trade in tobacco, alcohol, harmful food & drink
- Personal health security, eg lack of access to healthcare

Source: Heymann et al. Lancet 2015;385:1884-2015

Next steps

- **Discuss** ideas to assess their value and answer the opening question: "Would a pandemic typology support improved preparedness?"
- **Research** views of 'pandemic sector' including planners, policy makers and front-line staff (MPH project)
- **Apply** typology to pandemic planning process
- **Test** ideas, ultimately with future pandemic exercises and events

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