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Guidelines for Management of Outbreak/epidemics

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Introduction

An Outbreaks of HAIS infection should be identified and promptly investigated because of their importance in terms of morbidity, costs and institutional image.

Early identification of an outbreak is important to limit transmission among patients by health care workers or through contaminated materials.

An outbreak is defined AS

- **Occurrence of more cases of disease than expected HAIs outbreak-any group of illnesses of common etiology occurring in patients of a medical care facility acquired by exposure of those patients to the disease agent while confined in such a facility.**

Definition- (cont.)

- ***Occurrence of more cases of disease more than expected***
  - ***over a particular period of (TIME)***
  - ***in a given area (PLACE)***
  - ***among a specific group of people (PERSONS)***

Outbreak

- a sudden breaking out or occurrence; eruption: the outbreak of disease.

- a sudden and active manifestation: an outbreak of the flu.

Outbreak

An outbreak of an illness occurs when there is an increase in the number of people who live in the same area and are infected around the same time by an organism such as a virus or bacteria.

A community may have an outbreak of the flu or measles as that specific organism spreads through the water or food in that area. Organisms passed to people from insects or rodents can cause outbreaks too.

- ✓ **An outbreak is defined as the occurrence of an illness in a community or region with a frequency clearly in excess of normal expectancy.**

- ✓ **The number of cases indicating presence of an outbreak vary according to the infectious agent, the size and type of population, previous outbreaks (or lack of exposure to the disease), and time and place of occurrence.**

- ✓ **Therefore, the status of an outbreak is relative to the usual frequency of the disease in the same area, among the same population, at the same season of the year.**

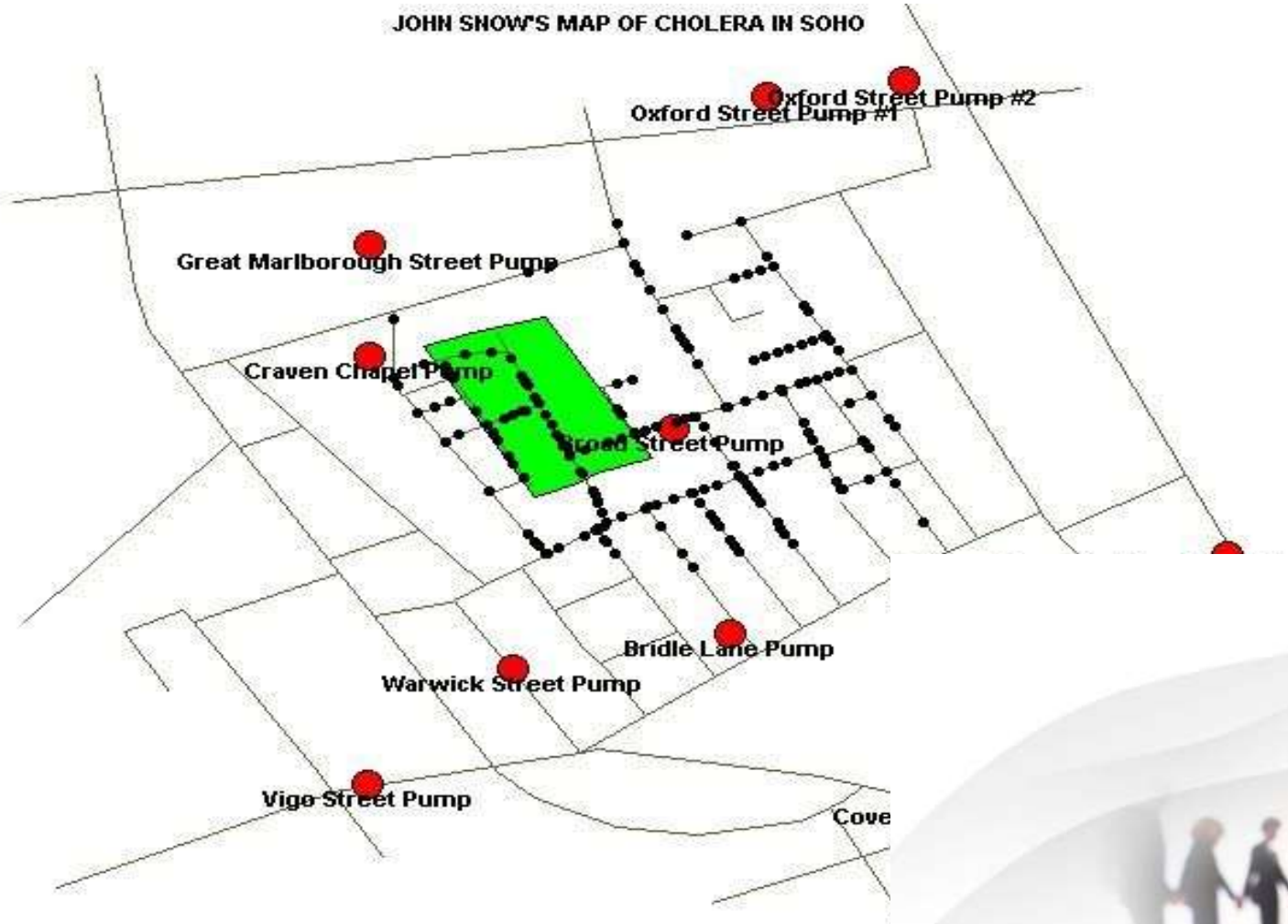
Time clustering

- **Not all outbreaks reoccur in a similar time patterns**
- **A group of cases can occur close together & have a well aligned distribution pattern {*in terms of time and place*}**
- **Or occur as rare or special events**
- **Cluster analysis is used for rare or special disease events.**

Time/Place clustering analysis {nearest neighbor distribution}

- **Probability distribution is an inferential statistics probability measure.**
- **Describes objects/events as they are distributed geographically.**
- **Geographical area divided into a series of equal square areas.**
- **Randomization i.e. each case has equal probability of falling into each square.**
- **If clustering occurs, probability of cause-effect relationship goes up or down.**

Outbreak of Cholera, Soho NY, 1934



Surveillance and response
Definition

- Health surveillance is the ongoing systematic collection, analysis and interpretation of health data essential for planning, implementing and evaluating public health activities.
- Surveillance needs to be linked to timely dissemination of the data, so that effective action can be taken to prevent disease.
- Surveillance mechanisms include compulsory notification regarding specific diseases, specific disease registries (population-based or hospital-based), continuous or repeated population surveys and aggregate data that show trends of consumption patterns and economic activity.

The epidemiologic approach: Steps to public health action

DESCRIPTIVE

- **What** (case definition)
- **Who** (person)
- **Where** (place)
- **When** (time)
- **How many** (measures)

ANALYTIC

- **Why** (Causes)
- **How** (Causes)

MEASURES

- Counts
- Times
- Rates
- Risks/Odds
- Prevalence

METHODS

- Design
- Conduct
- Analysis
- Interpretation

ALTERNATIVE EXPLANATIONS

- Chance
- Bias
- Confounding

INFERENCES

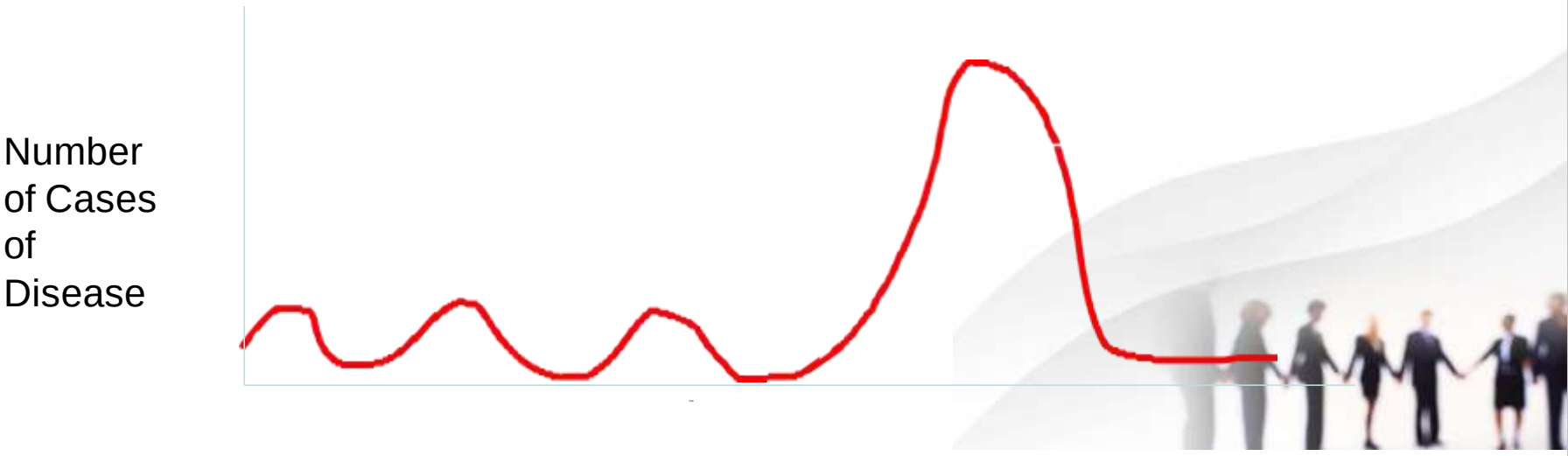
- Epidemiologic
- Causal

ACTION

- Behavioural
- Clinical
- Community
- Environmental

Endemic, Epidemic and Pandemic

- **Endemic - The habitual presence (or usual occurrence) of a disease within a given geographic area**
- **Epidemic - The occurrence of an infectious disease clearly in excess of normal expectancy, and generated from a common or propagated source**
- **Pandemic - A worldwide epidemic affecting an exceptionally high proportion of the global population**



y Epidemiological Terms

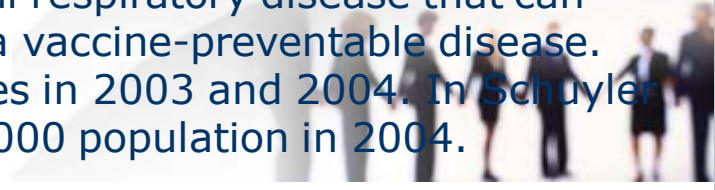
Patterns of Infectious Disease

Endemic Three key terms are used to describe basic patterns of infectious disease occurrence. The terms are defined by the American Public Health Association

Endemic: The habitual presence of a disease within a given geographic area; may also refer to the usual prevalence of a given disease within such an area.
Example: Campylobacter is a bacterium that causes acute enteric disease (diarrhea, abdominal pain, malaise, fever, nausea and vomiting).
It is usually transmitted through contaminated food, water or raw milk.
This disease is endemic in Missouri and throughout much of the US. Each year since 1990, there have been between 535 and 745 cases reported in Missouri.
In 2004, cases were reported in 95 counties and the City of St. Louis.

Patterns of Infectious Disease
Epidemic

Epidemic: The occurrence in a community or region of a group of illnesses of similar nature, clearly in excess of normal expectancy, and derived from a common or from a propagated source.
Example: Pertussis (whooping cough) is an acute bacterial respiratory disease that can cause severe coughing, especially in young children. It is a vaccine-preventable disease. Outbreaks of pertussis occurred in several Missouri counties in 2003 and 2004. In Schuyler County, the case rate rose from 0 in 2003 to 695 per 100,000 population in 2004.

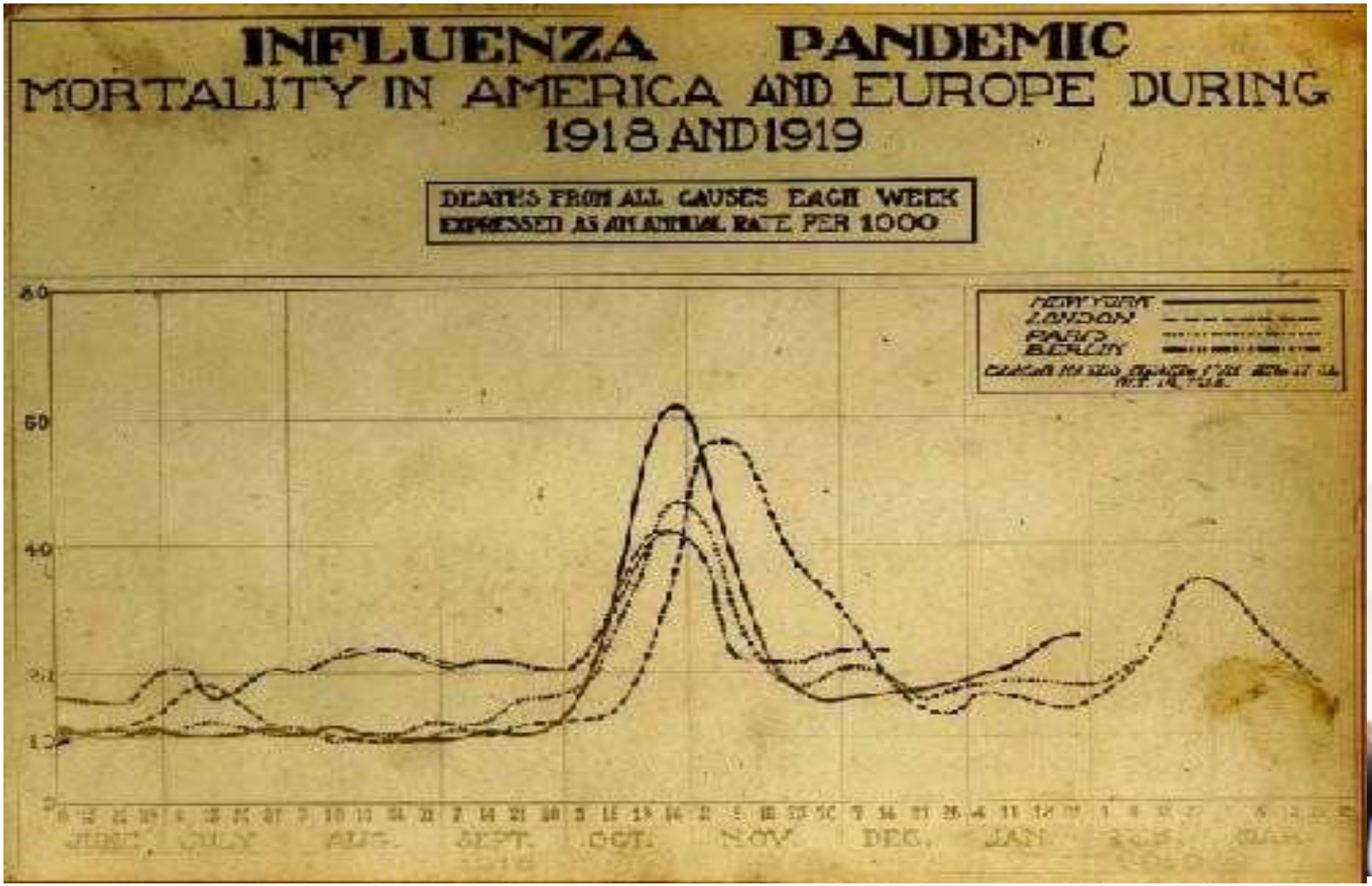


Pandemic

during the 1918 flu pandemic when many U.S. cities lifted their restrictions after 3-8 weeks and saw large second peaks of flu transmission. That pandemic eventually infected about a third of the world population and killed 50 million people.

Pandemic: A worldwide epidemic.

Example:



Pandemics are large-scale outbreaks of infectious disease that can greatly increase morbidity and mortality over a wide geographic area and cause significant economic, social, and political disruption.

Evidence suggests that the likelihood of pandemics has increased over the past century because of increased global travel and integration, urbanization, changes in land use, and greater exploitation of the natural environment.

These trends likely will continue and will intensify. Significant policy attention has focused on the need to identify and limit emerging outbreaks that might lead to pandemics and to expand and sustain investment to build preparedness and health capacity.

Patterns of Infectious Disease In Animals

Enzootic

Enzootic: "Endemic" among animal populations

Examples of diseases that are enzootic in specific areas of the US are:

Lyme Disease

Plague

Leptospirosis

Epizootic

Epizootic: "Epidemic" among animal populations

Millennium Development Goals (MDGs)

- United Nations Member States unanimously adopted the Millennium Declaration in September 2000, setting 2015 as the year by which these overall development goals should be achieved.
- Eight MDGs were established as part of the road map for implementing the Millennium Declaration.
- These goals concern poverty and hunger, education, gender inequality, child mortality, maternal mortality, HIV/AIDS and other major communicable diseases, environmental sustainability, and the need for global partnership in development
- (see http://millenniumindicators.un.org/unsd/mi/mi_goals.asp for specific goals, targets, and indicators).
- While only three goals are explicitly health-focused, all have strong links to health.
- The MDGs emphasize reciprocal obligations between high-income and low- and middleincome countries.
- They hold to account the authorities responsible for providing health services, and they help define the role of health in development. By setting quantitative targets and encouraging steady monitoring of progress, the MDGs maintain awareness of the urgent need for action.
- One of the challenges raised by the MDGs is measuring progress.
- Sound epidemiological information is essential for tracking progress, evaluating impact and attributing changes to different interventions, as well as for guiding decisions on program scope and focus.

Aim of this Guideline

1. **Provide a management protocol of an outbreak in health care facilities.**

2. **Early detection of an outbreak and institute immediate control measures.**

3. **Assign roles and responsibilities of persons involved in management of an outbreak.**

Aim of Outbreak Investigation

1. **Prevent further disease transmission**
2. **Provide information that can be used to control the outbreak**
3. **Prevent similar occurrences in the future**
4. **Identify populations at risk of a disease**
5. **Identify modes of disease transmission**

Aim of Outbreak Investigation, cont-

6. Evaluate the effectiveness of infection control measures.

7.Learn more about a disease, including the impact of control measures.

8.Share knowledge and findings with other health professionals by documenting the outbreak investigations in reports or journal article

Steps Of An Outbreak Investigation

1. *Verify the diagnosis; identify the agent*
2. *Confirm that an outbreak exists*
3. *Search for additional cases.*
4. *Characterize the cases by person, place, time.*
5. *Form a tentative hypothesis (best guess at the time).*
6. *Institute preliminary control measures.*
7. *Test the hypothesis.*
8. *Refine the control measures.*
9. *Monitor and evaluate the control measures.*
10. *Prepare and disseminate a final report.*

Planning of Outbreak Investigation

Notify the appropriate individuals and departments in the institution of the problem; Establish terms of reference for the investigation.

This must include

- **development of an outbreak team.**
- **Infection control must be part of the outbreak team.**

1. Preparation

Investigation

- Scientific knowledge
  - Review literature
  - Consult experts
  - Sample questionnaires
- Supplies
  - Consult with laboratory
- Equipment
  - Laptop, camera etc.

1-Verify the Diagnosis; Identify the agent

- ***Describe the initial magnitude of the problem and what symptoms got the facility's attention .***
- ***What diagnosis has been established?***
- ***What agent (bacterial, viral, other) has been identified?***

Establish a Case Definition.

- ***Standard set of criteria for deciding whether an individual should be classified as (case) or non (cases) based on whether or not they meet the criteria identified for outbreak***

- ***Includes clinical criteria and restrictions by time, place and person.***

- ***Must be applied consistently and without bias to all persons under investigation***

Case Definition cont..

Classification

- ***Definite (confirmed)***
  - ***Laboratory confirmed***
- ***Probable***
  - ***Typical clinical features without lab confirmation***
- ***Possible (suspected)***
  - ***Fewer of the typical clinical features***

2. Confirm that an Outbreak Exists

Use your case definition to find all cases

Based on your knowledge in #1, are the numbers of cases above what is endemic (usually seen) in the facility?

If yes, consider that an outbreak exists

- **Total number of cases .?**
- **Do you have an outbreak?**

✓ **If yes, proceed**

✓ **If no, reasons why**

- **report will made with justification why this case is not considered an outbreak.**

3.Search for Additional Cases

Encourage immediate reporting of cases (laboratory, physicians, and personnel).

- **Search for other cases by retrospective record review, ADM , REFERAL ,lab reports, etc.**
- **Total number of cases: Date**

4.Characterize the Cases

by ***Person*** **-** ***Place*** **-** ***Time***

Prepare:

- ***Line Listing***
- ***Draw Epidemic Curve***

The Line List

It is an important tool in effective outbreak management. collecting data that are.

- **Consist - of Rows and columns.**
- **Each Row represents a case**
- **Each column represents descriptive factors or clinical details (i.e. date of birth, onset date, symptoms**

Epidemic Curves

- Epidemic curve plots the number of cases on the –y- axis
- and time (in days or weeks or months) on the -x- axis
- What time interval you use on the x axis depends on the incubation period and the time period over which cases are distributed.

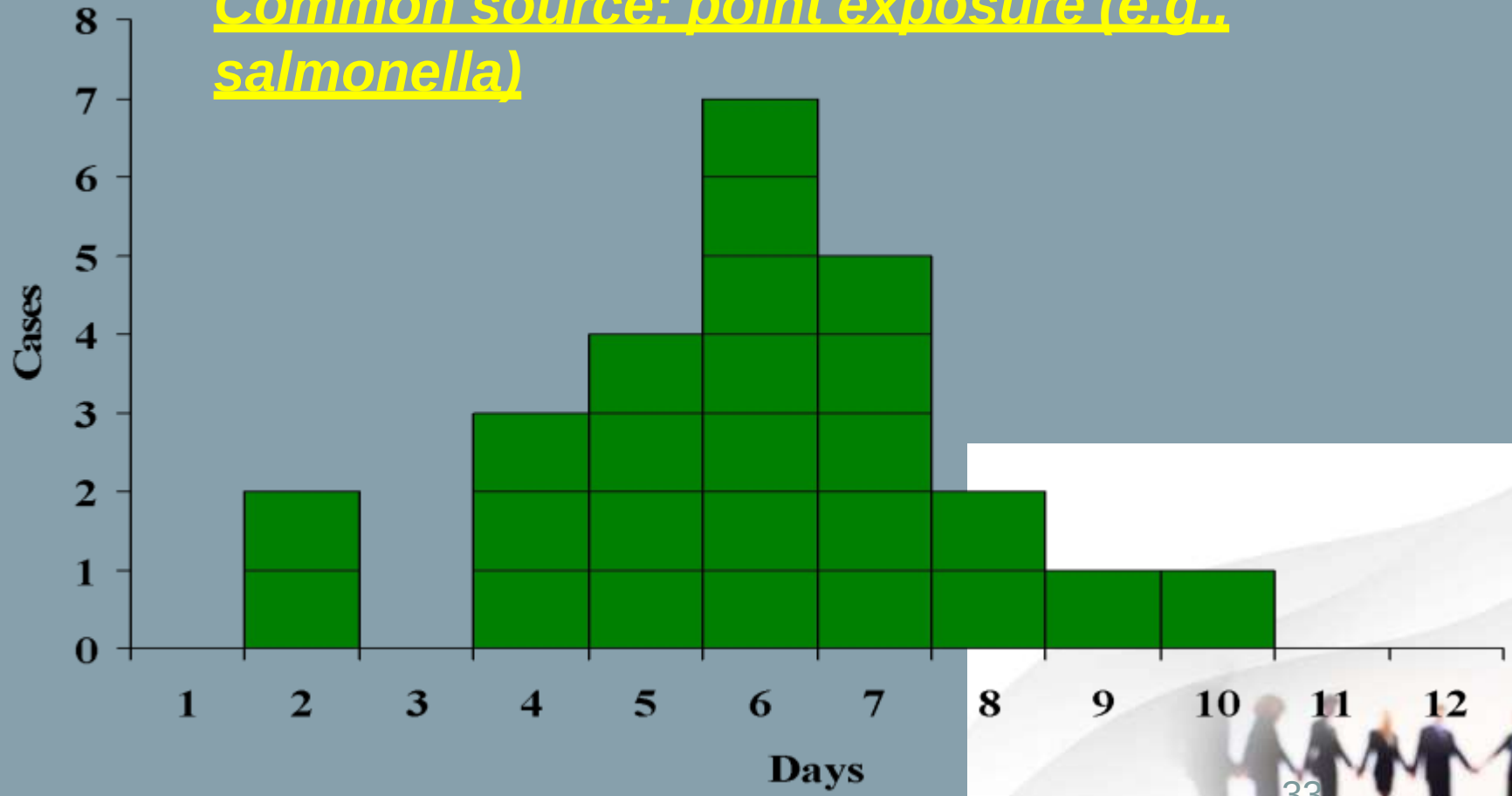
Epidemic Curves

What it tells you

- **Mode of transmission**
  - **Propagated**
  - **Common source**
- **Timing of exposure**
- **Course of exposure**
- **Incubation Period**

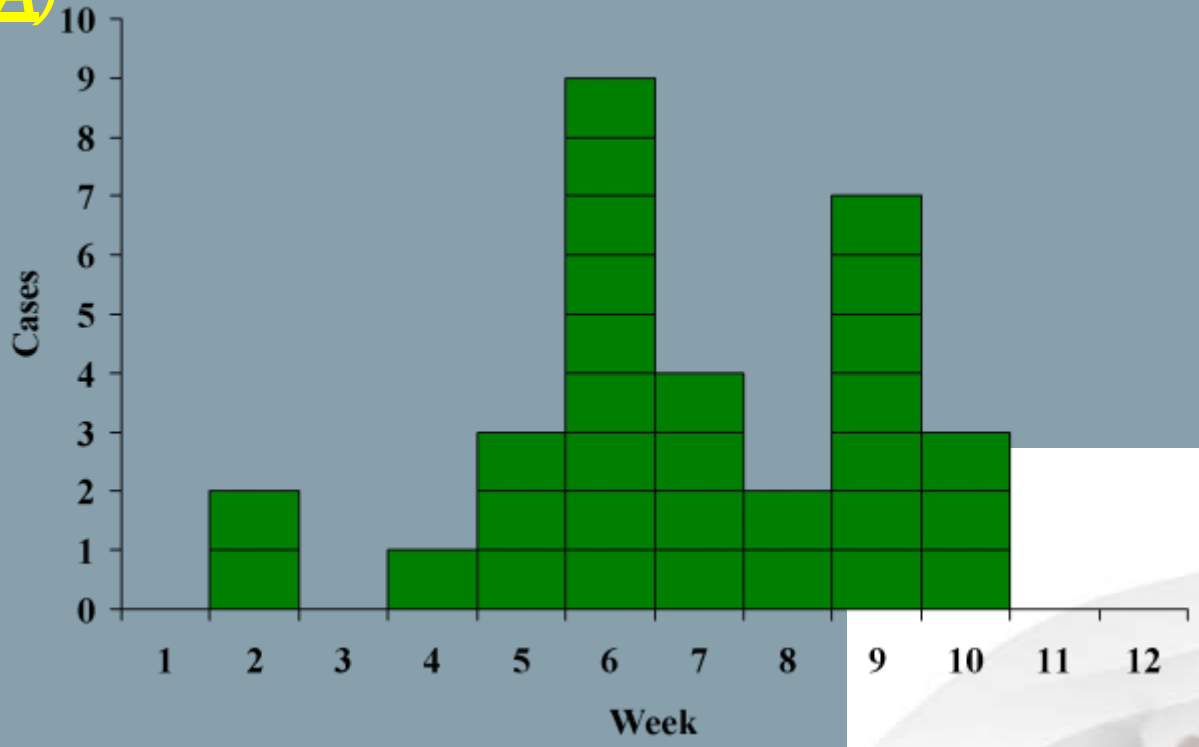
Epidemic Curves

Common source: point exposure (e.g., salmonella)

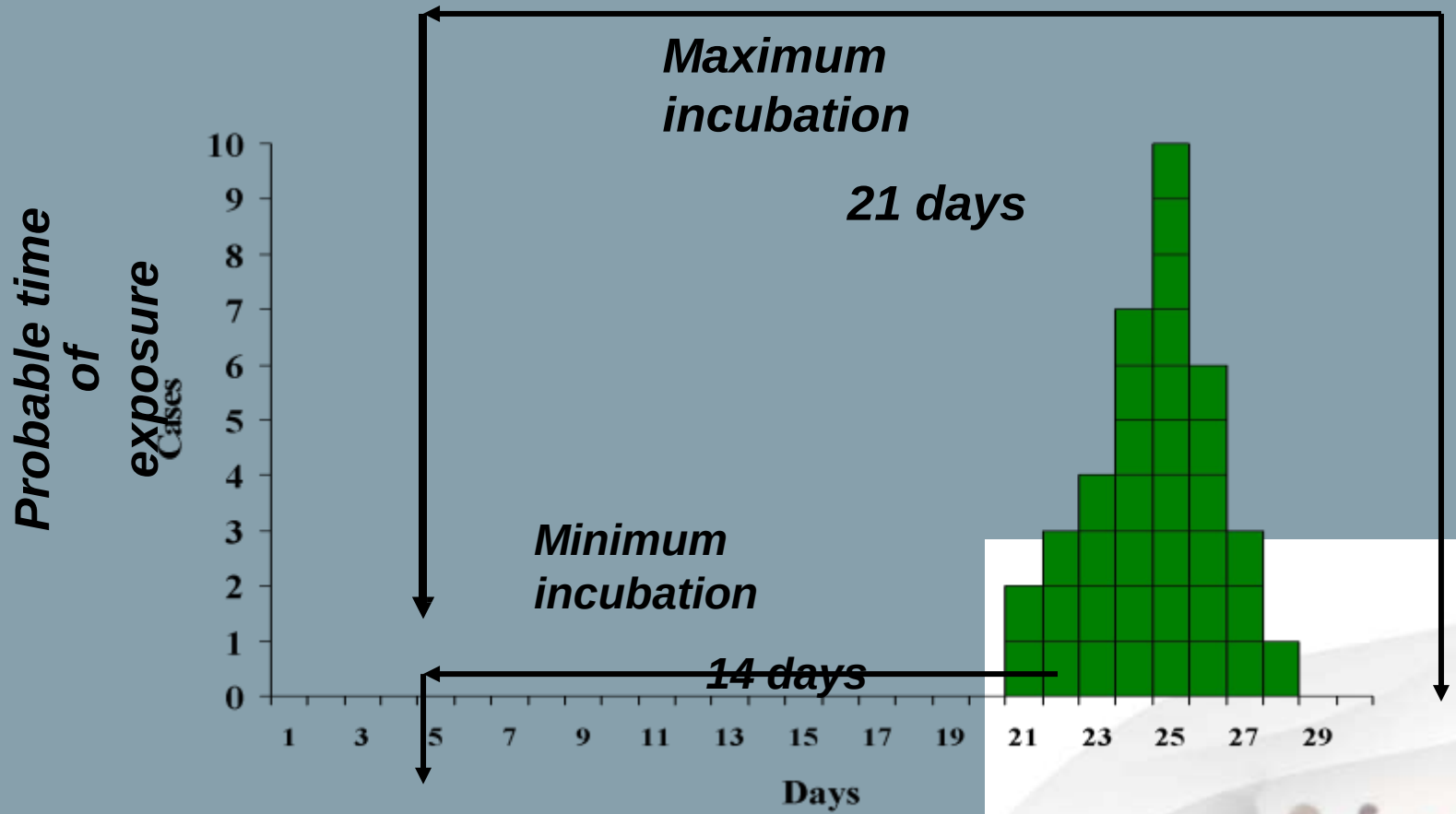


Epidemic Curves

Propagated source: secondary and tertiary cases (e.g., hepatitis A)



Estimating date of exposure



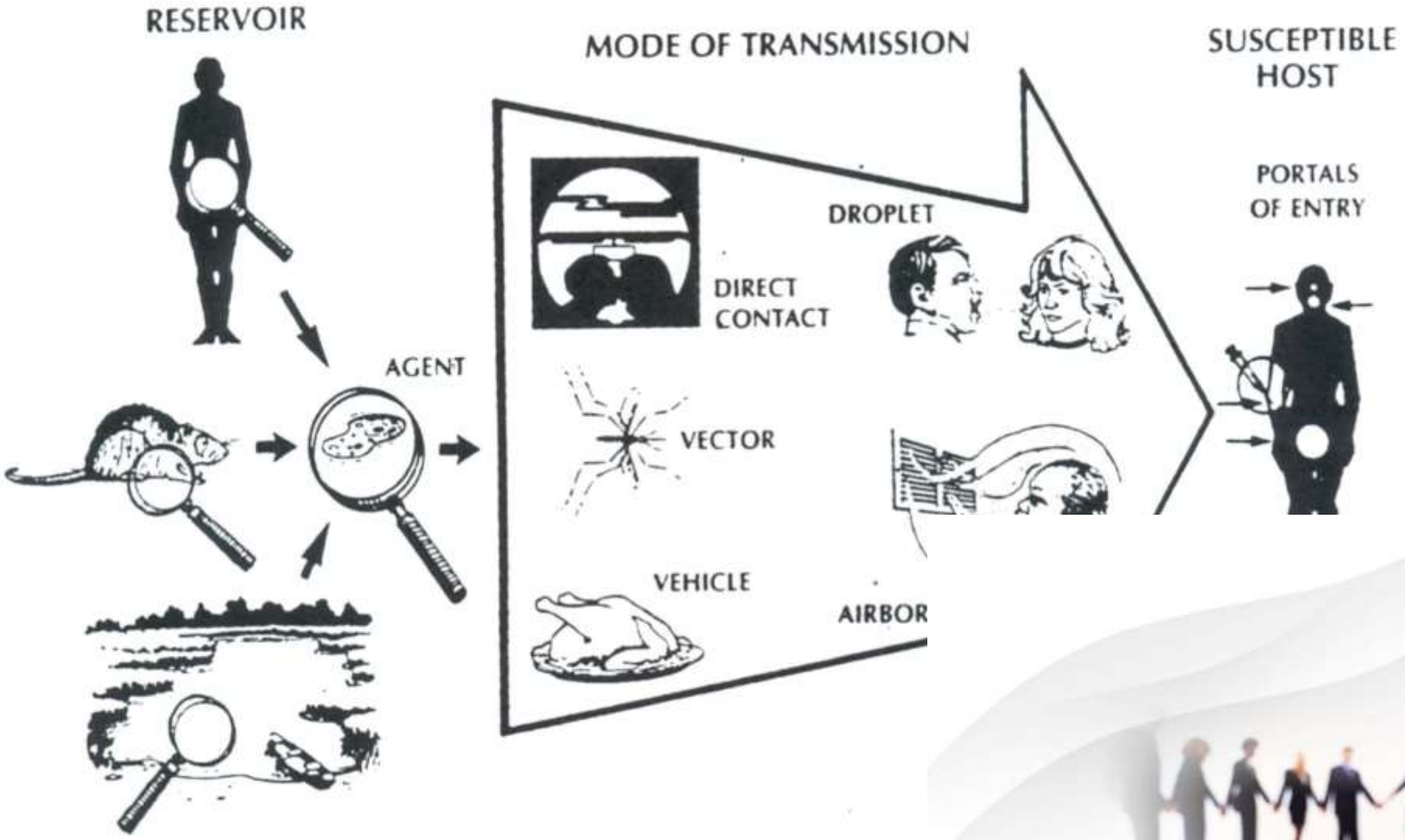
Develop Hypotheses(best guess at the time)

Hypotheses should address

- ***Reservoir***
- ***Source of the agent***
- ***Mode of transmission (Vector or vehicle)***
- ***Exposure that caused disease***

Review data to determine common host factors and exposures.

FIGURE 1.18
Chain of infection



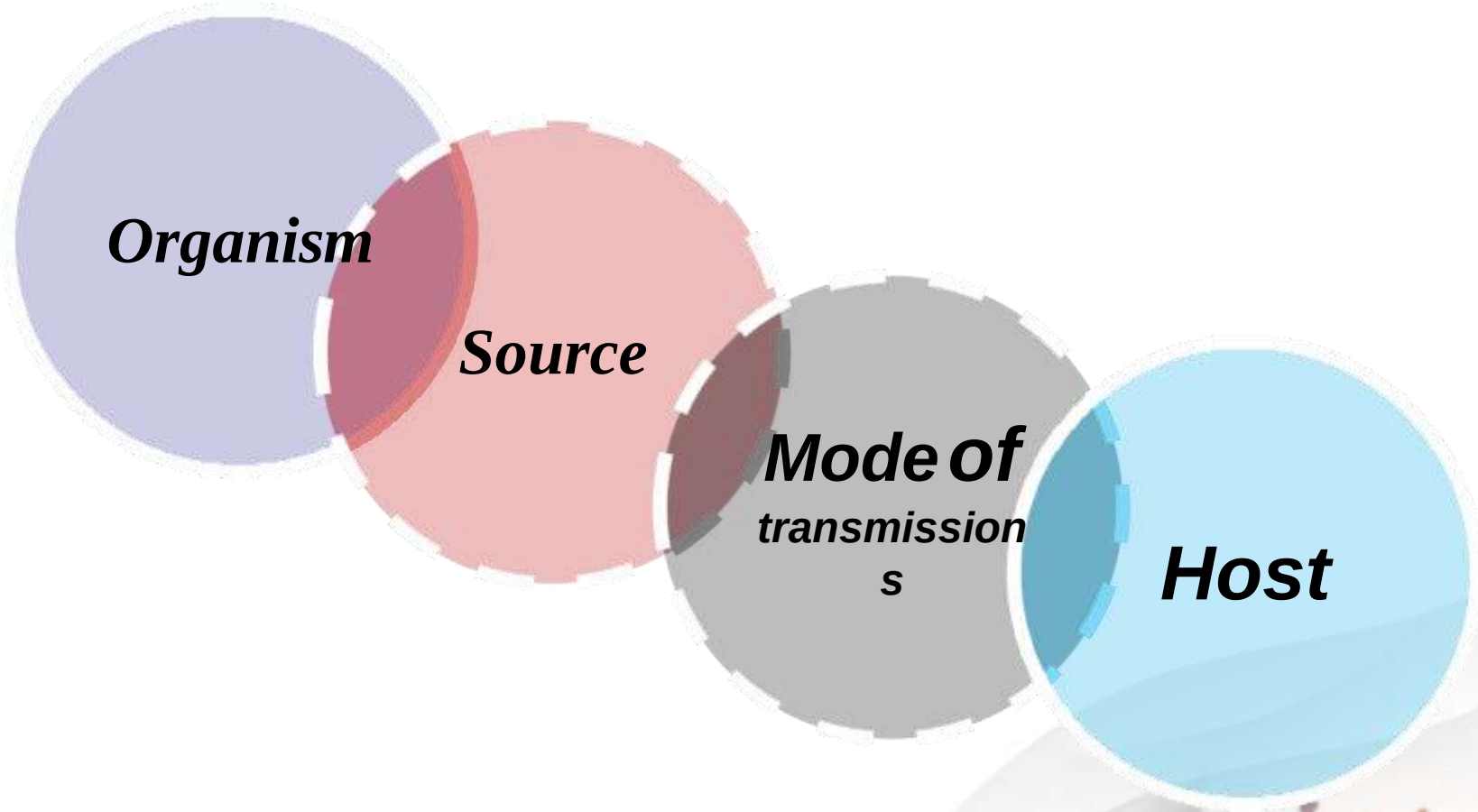
Implement Control /Prevention Measures

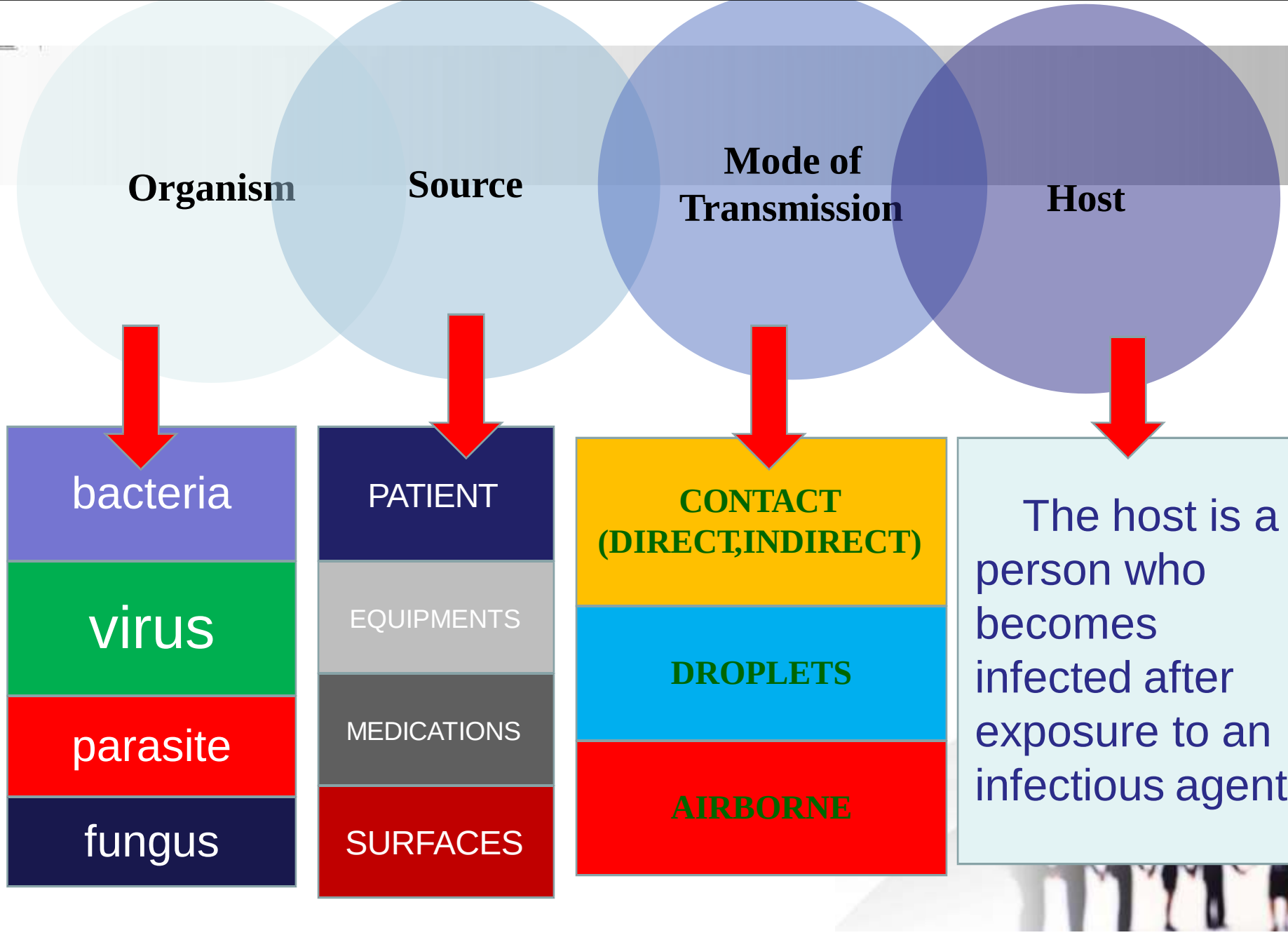
- ***Implement control measures as soon as possible if you know the source of an outbreak.***

- ***Aim control measures at the specific agent, source, or reservoir.***

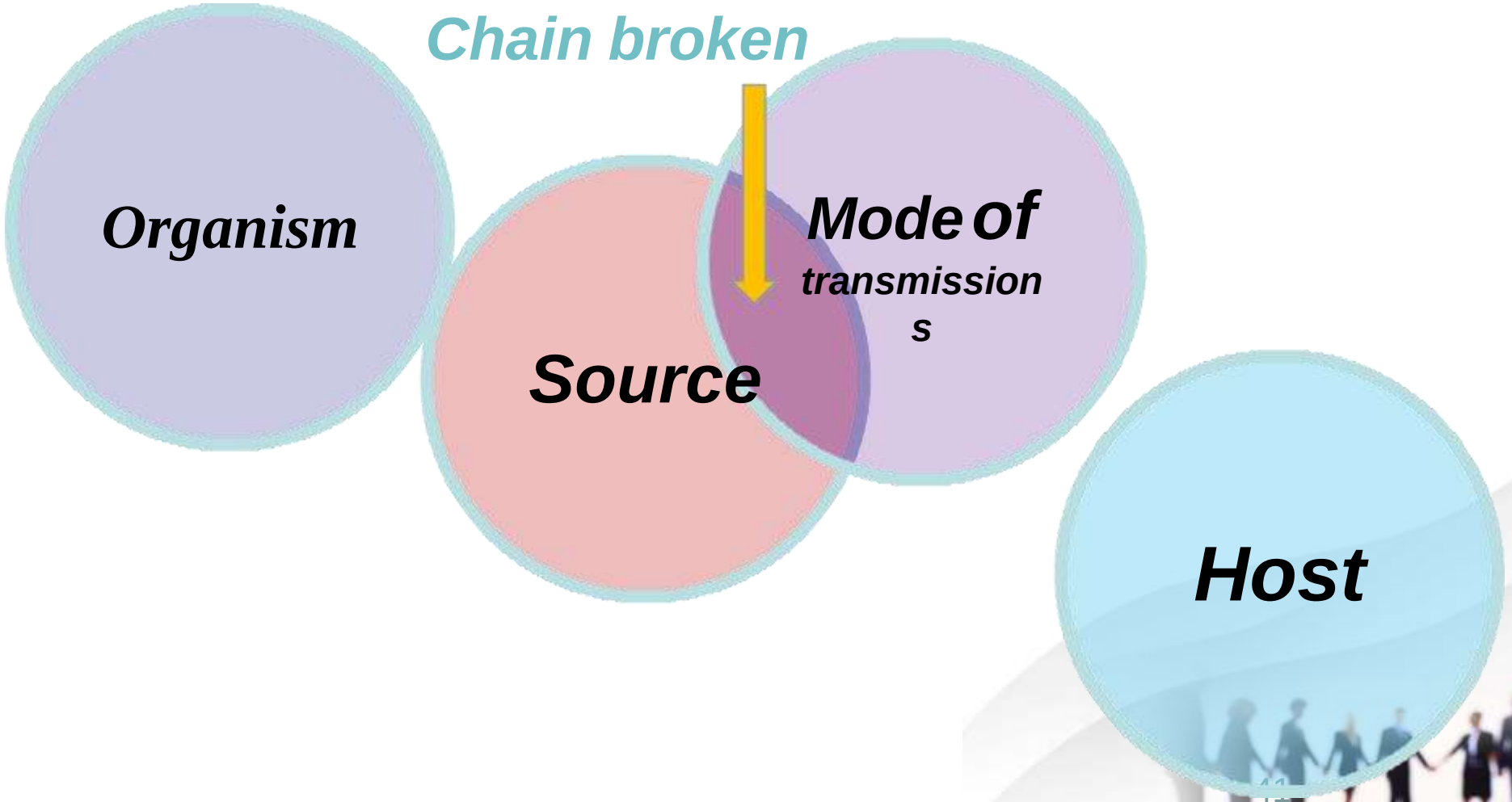
- ***Aim control measures at the weak link in the chain of infection. (mod of transmission)***

Infection Chain




Organism
Source
Mode of Transmission
Host
bacteria
virus
parasite
fungus
PATIENT
EQUIPMENTS
MEDICATIONS
SURFACES
CONTACT (DIRECT,INDIRECT)
DROPLETS
AIRBORNE
The host is a person who becomes infected after exposure to an infectious agent

Control Measure



The burden of communicable disease

- The estimated global burden of communicable diseases dominated by HIV/AIDS, tuberculosis and malaria.

- Emerging diseases such as viral haemorrhagic fevers, new variant Creutzfeld-Jakob disease and severe acute respiratory syndrome (SARS), COVID-19 as well as reemerging diseases including diphtheria, yellow fever, anthrax, plague, dengue, Polio, Measels and influenza place a large and unpredictable burden on health systems, particularly in low-income countries.

- In a contagious, or propagated, epidemic the disease is passed from person to person and the initial rise in the number of cases is slower.

- The number of susceptible individuals and the potential sources of infection are the critical factors in determining the spread of disease.

- For example, SARS was first recognized as a global threat in March 2003.

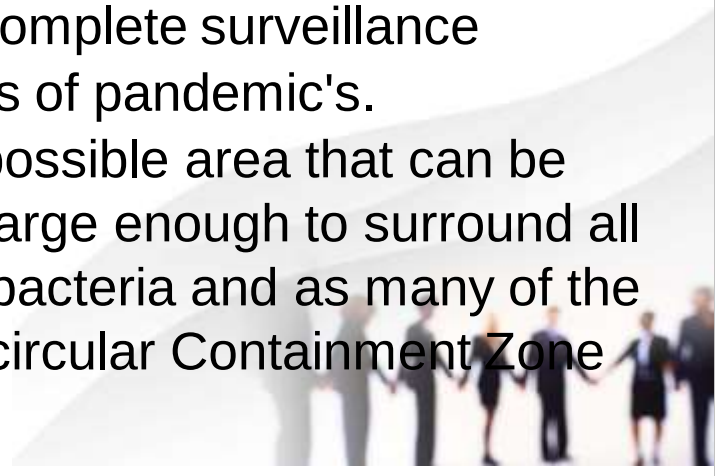
- It spread rapidly to 26 countries, affecting adult men and women, with a fifth of all cases occurring among health-care workers

The control of such diseases

- May involve changing on or more of these components, the first three of which are influenced by the environment.
- These diseases can have a wide range of effects, varying from silent infection – with no signs or symptoms – to severe illness and death.
- The major thrust of communicable disease epidemiology is to clarify the processes of infection to develop, implement and evaluate appropriate control measures.
- Knowledge of each factor in a chain of infection may be required before effective intervention can take place.

The containment strategy

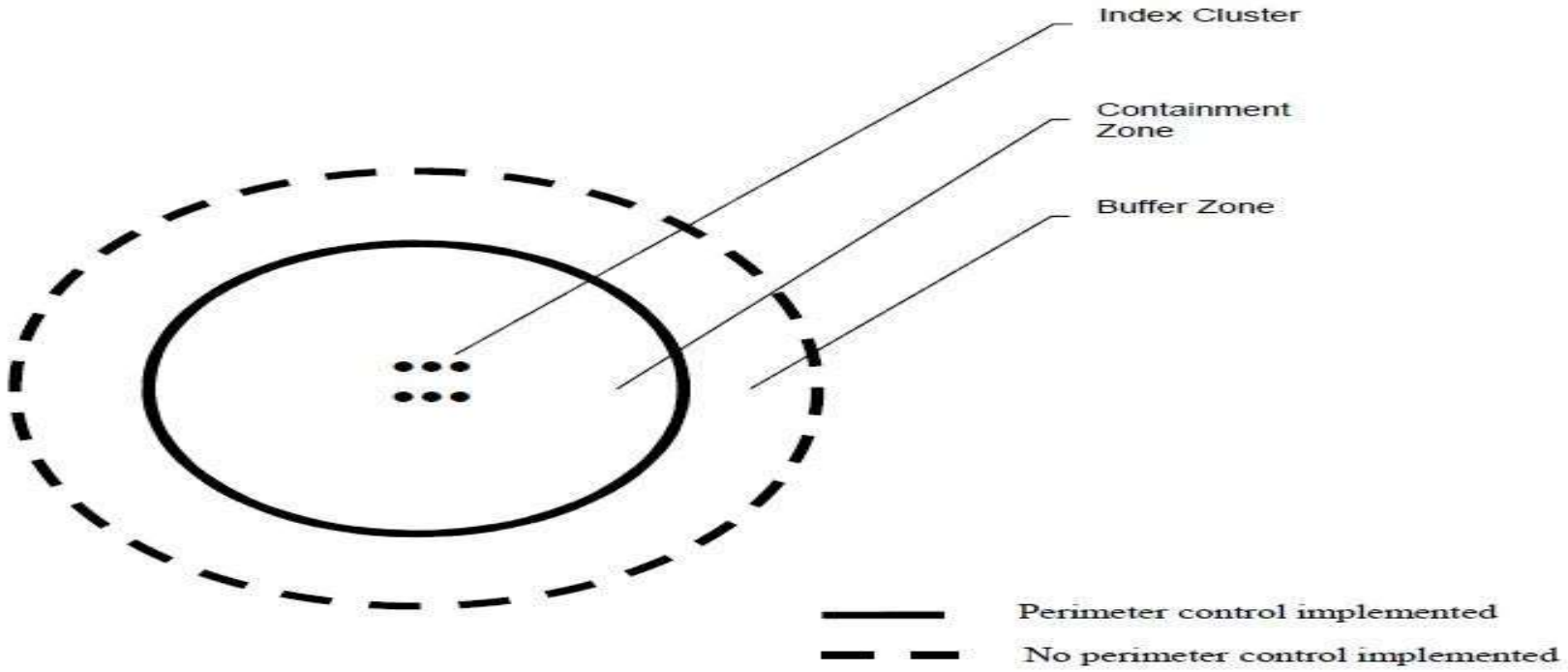
- Localized geographical containment
- The basic containment strategy is to identify the initial cases (i.e. Index Cluster) as earlyas possible, while they are still limited to a localized area, and implement routine control measures.
- A geographically-defined Containment Zone would then be created
- around the cases where widespread antivirals and non-pharmaceutical interventions should be used..
- In addition to the Containment Zone, a Buffer Zone will be defined surrounding the Containment Zone.
- The Buffer Zone is an area where active and complete surveillance
- should be initiated to detect any possible cases of pandemic's.
- The Containment Zone should be the largest possible area that can be created and feasibly maintained and must be large enough to surround all known persons infected by pandemic virus or bacteria and as many of the people in frequent contact with them. While a circular Containment Zone is conceptually the simplest,



The actual size and shape of the Containment Zone and the Buffer Zone is expected to be influenced by pragmatic considerations such as:

- known movements and geographical distribution of cases and contacts;
- important local or national administrative boundaries as well as important natural boundaries that may limit the movement of people;
- infrastructure and essential services (e.g. power, water, sanitation, food supply, communications) considerations that may substantially affect the safety and health of people within the Containment or Buffer Zones.

Containment and Buffer Zones for Rapid Containment



Containment Zone: The geographical area and population which contains the Index Cluster and where extensive interventions are applied

Buffer Zone: The geographical area and population around the Containment Zone where active and complete surveillance is applied.

Follow-up of persons who have moved outside the Containment Zone

It is possible that some persons may have left the Containment Zone either before or after it had been established. Such persons may have been exposed to the virus. As part of the containment operations, every reasonable effort should be made to identify such persons through media messages and other communication channels so that they can be given antiviral prophylaxis, quarantined, and carefully monitored. Persons who have an influenza-like illness when they are first evaluated or who develop a respiratory illness while in quarantine should be tested, isolated, given antiviral therapy, and their contacts traced.

If, despite such measures, human-to-human transmiss
Containment Zone and Buffer Zone, then WHO and natic
jointly re-assess the situation and decide whether to contin

Table 1. Major activities undertaken during the rapid response investigation of the Index Cluster and in the Containment Zone and **Buffer Zone** during rapid containment

	Isolation and treatment of cases	Contact tracing	Antiviral prophylaxis	Voluntary quarantine	Hand and respiratory hygiene	Social distancing measures	Perimeter control	Surveillance strategy
Index Cluster	✓	✓	Contacts of cases	Contacts of cases	✓	No	No	●Active case-finding ●All cases laboratory confirmed
Containment Zone	✓	Not routinely*	Everyone	Contacts of cases	✓	✓	✓	●Active and passive surveillance** ●Sample of cases laboratory
Buffer Zone	✓	✓	Contacts of cases	Contacts of cases	✓	No		

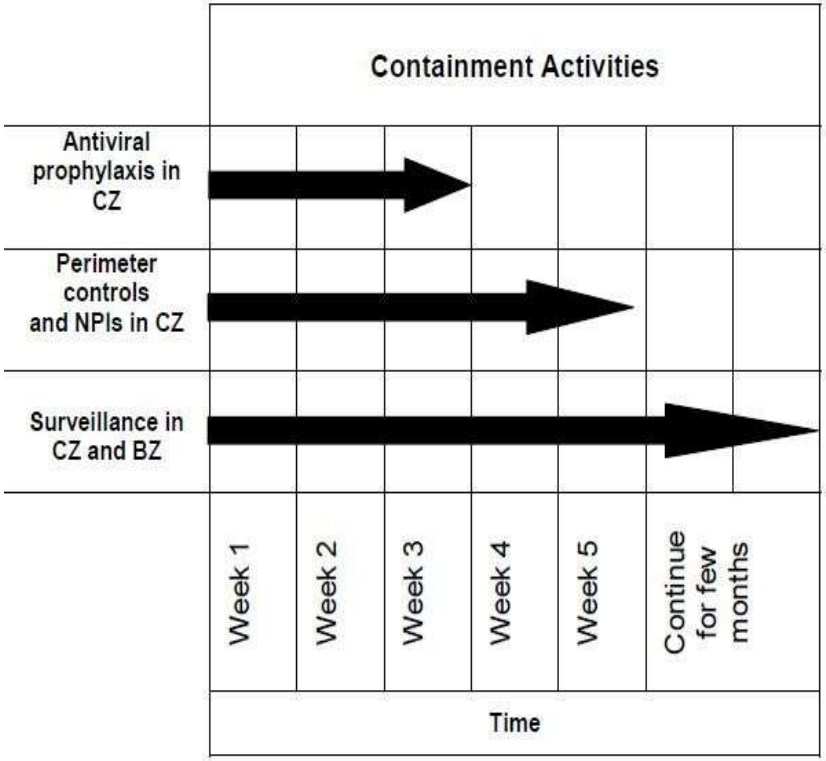
Rapid containment communications

Appropriate and timely public communication will underpin the success of all aspects of containment operations. Rapid containment communications, which includes the range of local, regional, national and international public communications activities required, will play a direct role in the containment effort, guiding and organizing the ways in which information and advice are disseminated to those inside and outside of the Containment and Buffer Zones. In addition, it will also guide the international coordination and collaboration required for a successful effort.

The objectives of an effective communications response during rapid containment are :

- to provide the best information available in a ti
  fashion;
- to promote compliance with containment meas
  facilitating factors to compliance, and adapt appı
  through a policy of transparent communication.

Timeline of Containment Activities



CZ= Containment Zone; BZ = Buffer Zone

The timeframes depicted are provided for illustration purposes only. During an actual rapid containment operation it is likely that adjustments would be necessary.

Investigation

- The initial stage of investigation should verify the diagnoses of suspected cases and confirm that an epidemic exists.
- The preliminary investigation also leads to the formulation of hypotheses about the source and spread of the disease, and this in turn may lead to immediate control measures.
- Early reports of a possible epidemic may be based on observations made by a small number of health workers or may reflect figures gathered by the formal communicable disease notification system that operates in most countries.
- Sometimes reports from several health districts are needed; the number of cases in a single area may be too small to draw attention to an epidemic.

Identifying cases

- The investigation of a suspected epidemic requires that new cases be systematically identified, and this means that what constitutes a case must be clearly defined Often, detailed information on at least a sample of the cases needs to be collected.

- The cases reported early in an epidemic are often only a small proportion of the total; a thorough count of all cases is necessary to permit a full description of the extent of the epidemic.

- As soon as an epidemic is confirmed, the first priority is to control it. In severe contagious epidemics, it is often necessary to follow up contacts of reported cases to ensure the identification of all cases and limit the spread of the disease.

Management and control

- The management of an epidemic involves treating the cases, preventing further spread of the disease and monitoring the effects of control measures.

- Treatment is straightforward except in large-scale epidemics – especially when these occur as a result of social or environmental disruption – for which external resources may be needed.

- The public health action required in emergencies caused by epidemics of different diseases has been described in detail.

- 16 Control measures can be directed against the source and spread of infection and towards protecting people exposed to it. Usually all of these approaches are required.

- Once control measures have been implemented, surveillance must continue to ensure their acceptability and effectiveness.

- This may be relatively easy in short-term epidemics but difficult when dealing with longer-term epidemics.

- For example, epidemic meningococcal meningitis requires large-scale immunization programmes.

- Follow-up epidemiological and laboratory studies are often indicated, particularly to establish long-term cost-effectiveness.

Monitor and evaluate the control measures..

- ***The control measures will vary depending on the agent and mode of transmission***

- ***but may include isolation procedures or improvements in patient care Hand hygiene Cohorting or environmental cleaning.***

- ***In some outbreaks, you would direct control measures at reducing the susceptibility of the host.***

Examples

- ***Immunization against rubella***
- ***Malaria chemoprophylaxis for travelers.***

Refine the control measures

- ***additional control measures may be added if needed example;***

- ***Destroying contaminated foods and fluids***

- ***An infectious staff or food handler could be removed from the work and treated.***

- ***Close the unit***

The Descriptive Analysis

This includes identifying a potential exposure type ,source and route of infection for the outbreak .

and

testing this hypothesis using statistical methods.

Special epidemiologic studies may be needed

Analytic Epidemiology

- *which allows you to test your hypotheses.*

- *Use rates to identify high-risk groups*
  - *Numerator = number of case*
  - *Denominator = number of people at risk*

The nature of the outbreak determines which of these studies you will use.

- *Cohort studies*
- *Case-control studies*

Cohort Studies

- ***Small, well defined population***
- ***Contact each attendee and ask a series of questions***
- ***Ill Vs not ill Look for source exposure.***

  - ***Attack rate is high among those exposed***
  - ***Attack rate is low among those not exposed***
  - ***Most of the cases were exposed.***
  - ***Relative risk = mathematical measure of association between exposure and disease .***

Case-Control Studies

- ***Case-control***
  - ***Population not well defined***
  - ***Case patients and comparison group (controls) questioned about exposure(s)***
  - ***Compute measure of association = Odds Ratio***

Is a mathematical measure of association OR relationship between exposure and disease

A case-control study is the most common approach

To test hypothesis .

Measures Of Outcomes

- **Morbidity: Refers to the presence of disease in a population**
- **Mortality: Refers to the occurrence of death in a population**

Compute Disease Rate

Number of persons at risk = 5,595,211

Number of persons with disease = 17,382

$$\textit{Rate} = \frac{\textit{17,382 persons with heart disease}}{\textit{5,595,211 persons}}$$

= .003107 heart disease / resident / year

Example (Incidence Rate)

During a six-month time period, a total of 53 nosocomial infections were recorded by an infection control nurse at a community hospital. During this time, there were 832 patients with a total of 1,290 patient days. What is the rate of nosocomial infections per 100 patient days?

IR= 53 X 100 = 4.1 infections/100 pt.days
1,290 pt days

Calculation of Relative Risk

$$RR = \frac{\text{incidence rate among exposed}}{\text{incidence rate among non-exposed}}$$

Calculation of Relative Risk

	Outcome		
Exposure	Present	Absent	TOTAL
Present	a	b	a+b
Absent	c	d	c+d
TOTAL	a+c	b+d	a+b+c+d

$$\frac{\left(\frac{a}{a+b}\right)}{\left(\frac{c}{c+d}\right)}$$

Communication and Conclusions

During the investigation of an outbreak, timely up to date information must be communicated to the hospital administration, public health authorities, and, in some cases, to the public.

- ***Based on all evidence and the results of an outbreak investigation.***
- ***A final report describing all aspects of the investigation should be prepared.***

Prepare and disseminate a final report

A final report on the outbreak investigation should:-

- ***describe the outbreak interventions, and effectiveness,***
- ***summarize the contribution of each team member participating in the investigation.***
- ***should also make recommendations to prevent future occurrence.***
- ***Make the final report.***
- ***As detailed as possible.***

Final Report

should also be a written report that follows the usual scientific format of

- ✓ ***introduction***
- ✓ ***background***
- ✓ ***methods***
- ✓ ***results, discussion***
- ✓ ***and recommendations.***

- **By formally presenting recommendations, the report provides a blueprint for action.**

Example: **SARS**

Although minor from the perspectives of mortality or burden of disease,

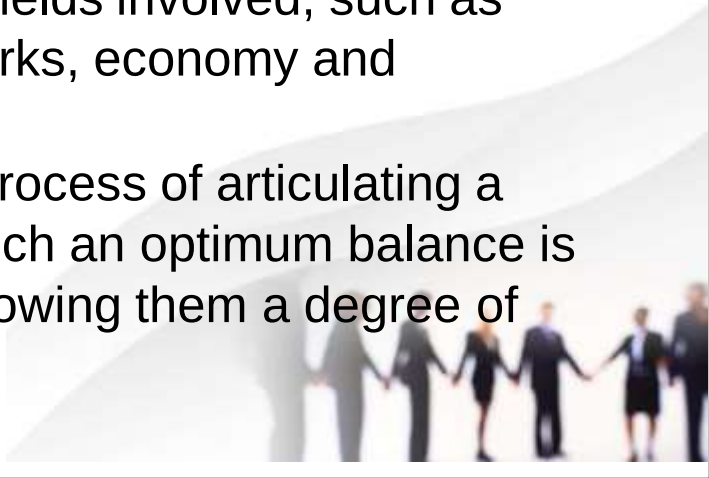
The outbreak vulnerability to new infections. It also highlighted the weakened state of essential of severe acute respiratory syndrome (SARS) reminded the world of the shared vulnerability to new infections. It also highlighted the weakened state of essential public health services, not only in Asia but also in high-income countries such as Canada.

- SARS first appeared in November 2002 in southern China with two patients with atypical pneumonia of unknown cause. The spread – facilitated by air travel of highly infectious people – was rapid over the following months, causing more than 8000 cases and approximately 900 deaths in 12 countries.

- Death rates were lower in places where SARS was acquired in the community and higher in hospitals, where health workers had close or repeated contact with infected people.

Multi-Agency Planning

- One source of complexity in emergency planning is the need to integrate several dimensions into the programmed emergency response. Hierarchical divisions refer to the tiers of government—from national, through regional, to local.
- Geographical divisions indicate the spatial jurisdictions to which plans refer, and possibly also to questions of mutual assistance.
- Organizational divisions refer to the different agencies that participate in emergency responses, such as the “blue light” services (police, fire, and ambulance), technical groups, and volunteer organizations.
- Lastly, functional divisions indicate the different fields involved, such as government, health care, public order, public works, economy and employment, finance, and the private sector.
- The emergency plan is one contribution to the process of articulating a system of response to civil contingencies, in which an optimum balance is sought between integrating these forces and allowing them a degree of autonomy and freedom of action.



Networked coordination

A successful response to a crisis or a disaster is marked by rapid support, participation and cooperation from mission-critical stakeholders (the public, private organizations, interest groups, international partners, etc.).

Some type of coordinative effort is needed to orchestrate, synchronize and adjust cooperation between organizations that may have never worked with each other before.

To accomplish such a degree of coordination under conditions of uncertainty, urgency and stress
– without clearly defined authority relations is a difficult task under the best of circumstances.

The term sense making refers to a range of informational and cognitive tasks that runs from crisis detection and tracking, through interpretation and analysis, to decision-making. Institutional features required for transboundary sense making would include:

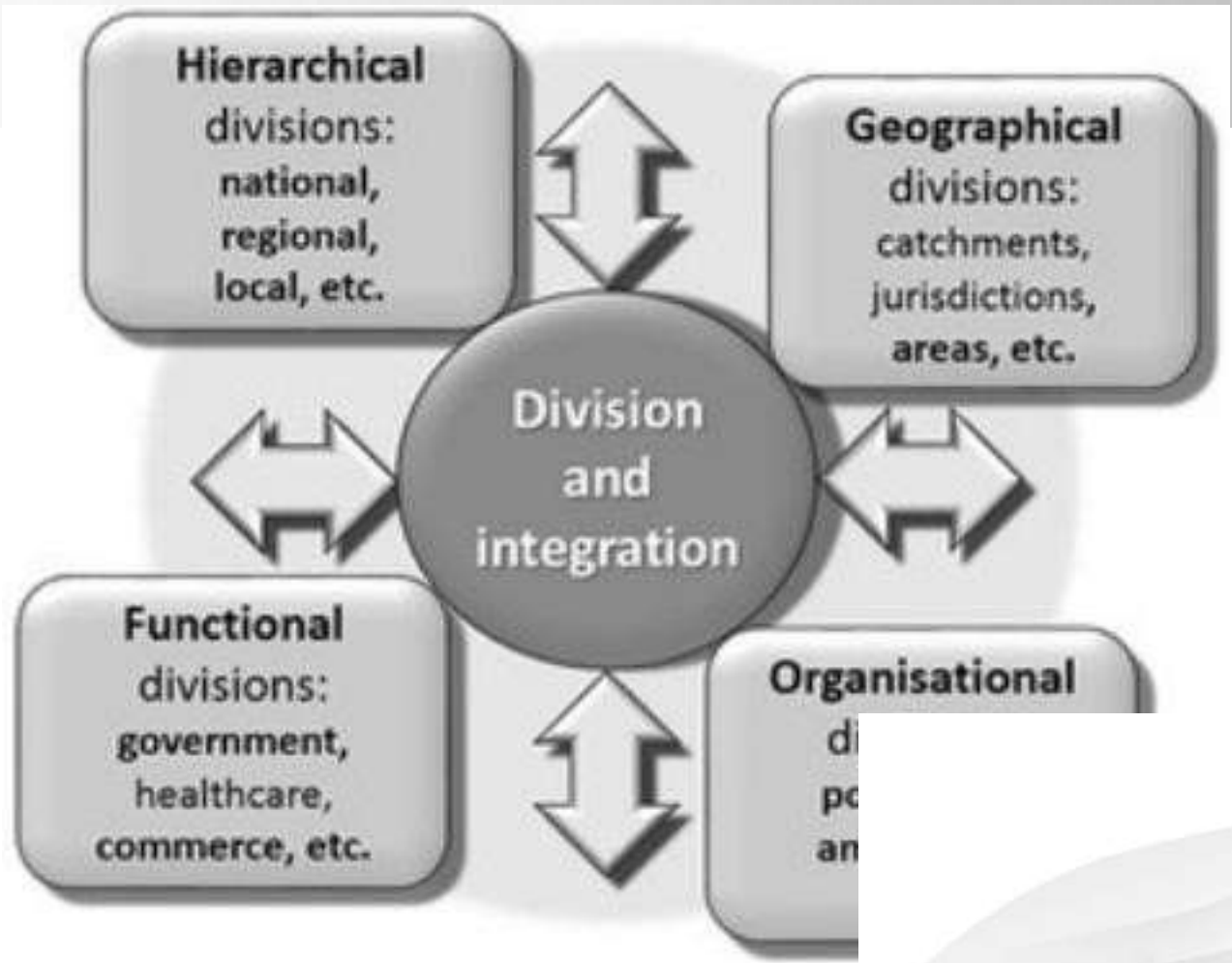
(1)Detection and surveillance systems that collect basicdata about the origins, distribution and intensity of crisis events.

(2)Analytical capacity (ranging from experts to the use of laboratories) in order to analyse incoming data. The art of sense making is discovering patterns in a deluge of raw data (and an absence of 'hard' information). This requires a combination of human intellect and sophisticated hardware, a combination that is rarely available under the best of circumstances.

(3)Real-time communications to collect and verify information about the unfolding threat and the damages caused. This is to a considerable extent simply a hardware problem: it is often impossible to communicate properly in the heat of crisis.

(4)Decision support systems to overcome inherent human limitations (Simon, 1997) and to facilitate rapid yet informed decision-making. In theory, a decision support system helps assess information, suggests decision options and offers scenarios.

- **The World Health Organization's (WHO) response to the SARS outbreak provides a good example of distributed sense making working well during a transboundary crisis. WHO used the Global Outbreak Alert and Response Network (GOARN) to provide decision support to responders globally.**


Hierarchical divisions: national, regional, local, etc.
Geographical divisions: catchments, jurisdictions, areas, etc.
Division and integration
Functional divisions: government, healthcare, commerce, etc.
Organisational

The warning process

Precise ←

Supply chains are essential to humanitarian operations and emergency responses.

- Emergency planning for them has two aspects.
- The first is an element of business continuity.
- It seeks alternative ways to ensure supplies of goods or services, in order to keep productivity from falling as a result of interruption of normal business.
- It thus depends on redundancy, which is potentially an expensive quality, as it may require the duplication of assets.
- This requires planners to determine which assets are critical, and where the destruction or failure of assets may have a critical effect on the whole production cycle.
- The second aspect of supply chain planning involves ensuring efficiency in humanitarian supply, such that the forces on the ground are not left bereft of the equipment, goods, and manpower that are needed to tackle the emergency effectively.

In epidemics response and recovery operations, the ratio of demand for assistance to capacity to provide resources varies over time.

- In the initial stages of the crisis, immediate demands involve actions to protect lives and provide assistance to persons.
- First-response organizations such as fire departments, emergency medical services, and police departments seek to meet urgent demands of victims under tight time constraints.
- During the recovery period, issues of unemployment, sustainable business operations, housing, and medical care for victims and their families emerge that require long-term consideration.
- Households and community organizations need appropriate resources to meet different needs in the following distinct phases of disaster management: **mitigation, preparedness, response, and recovery.**

Parallel forms of planning in the sequence of response to and recovery

- Emergency planning now has to face up to the challenges of the information age, in which there is much more immediacy to the means of communication.
- Social media can be used to warn people, collect information from the field, manage public response, answer the public's questions, and devise new ways of managing the emergency.

For example,

- social media have begun to have an important role in accounting for missing people in disaster.
- Crowd sourcing and cooperative efforts can be powerful tools in the response to crises and emergency situations.
- Hence, social media and Internet communications need to be taken into account in emergency planning.

The Uses and Abuses of Emergency Plans

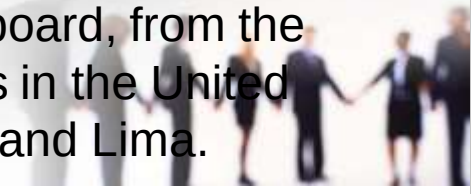
- One way of extending the emergency plan into the crisis phase, and adapting it to rapidly changing needs, is to continue the planning process during the emergency.
- Strategic planning is essentially about finding resources and ensuring that the assemblage of response units, plans, and initiatives is generally going in the right direction, so that it will meet the needs of the population affected by Epidemic or disaster.
- Tactical planning is largely about apportioning resources so that they can be used on the ground by operational units.
- Operational planning is about assigning tasks, constituting task forces, and monitoring the evolution of the situation so that tasks are set and accomplished.
- At all three levels, the permanent emergency plan is a backdrop to activities. It should neither be slavishly and rigidly followed nor ignored.
- One hopes that it will ensure that fundamental tasks are apportioned, responsibilities are clear, and appropriate action is stimulated.

Emergency Planning and Ordinary Citizens

- A significant portion of a good emergency plan will provide instructions on how to relay information to the general public.
- The role of and tasks allotted to a spokesperson may need to be defined.
- In democratic countries, the mass media are expected to have a role that is independent of government, but also to bear a sense of responsibility that induces them to provide public service information in times of crisis.
- Generally, emergency plans can specify the arrangements for working with the media, but they cannot fully co-opt the media as if they were public servants.
- In news services, a degree of editorial independence is necessary, in order to draw attention to any abuses of office committed by members of a government, or, for that matter, emergency responders.
- Increasingly, response to the threat and impact of epidemic's and Natural disaster is a matter of human rights.

In the modern world, disasters and epidemics have been occasion for forced migration, the imposition of restrictive ideologies, the persecution of minorities, and discrimination against marginalized groups.

- These are human rights abuses that need to be counteracted.
- Forced migration has occurred in the wake of epidemics or disasters in countries as diverse as Myanmar (formerly Burma), Indonesia, and the United States.
- In this, the upheaval caused by epidemic's and disaster, and in particular the destruction of housing and livelihoods, has been used as an opportunity to achieve a form of social engineering, by moving people to settle areas deemed less hazardous.
- A darker form of this is the persecution of minorities, possibly by propelling them into “ghettos” and enclaves. Concurrently, recovery from epidemics / disaster has occasionally become the opportunity to impose ideologies, as was the case with the introduction of Islamic Sharia law, after both the 2004 tsunami in Banda Aceh and the 2009 Padang earthquake in Indonesia.
- There is little doubt, moreover, that Cyclone Nargis, in 2008 in Myanmar, did nothing to alleviate the persecution of the Muslim Rohingya people by the Burmese junta. Generally, disasters have been associated with the occurrence, and possibly intensification, of marginalization right across the board, from the homeless in Tokyo to rural communities in Zimbabwe, minorities in the United States, and the poor of Latin American cities such as Managua and Lima.



When Can We Lift the Coronavirus Pandemic Restrictions? Not Before Taking These Steps

- **The first phase**—which the U.S. is currently in—involves slowing the spread of new infections with physical distancing measures, such as closing schools and having people work from home.
- **In the second step**, individual states can reopen when they have the capacity to identify, test and isolate most people with COVID-19 and their close contacts—but some distancing will still be required.
- **In the third,** remaining restrictions can be lifted when an effective therapy or vaccine becomes available or when data show widespread immunity.
- **The final stage**, after the current pandemic is over, will be to invest heavily in research and health care to prepare for the next one.

- **Number one**: any given state that's considering relaxing social distancing should have a demonstrated downward trend in cases over the two weeks prior.
- And we need to get better at being able to evaluate trend data across the country.
- Ultimately it would be good to have more data that would allow decision makers to be able to look at neighboring states and make sure they're congruent with others in the region.

- **The second** thing is extensive diagnostic testing capability. Right now we're focused on the sickest patients—as we should be—in hospitals and long-term care facilities and health care workers.
- But we need to get to a point where anybody who's got symptoms consistent with COVID-19 can get a test and have results in the same day.
- We should also be developing a serology initiative. [Editor's Note: Serological, or antibody-based, tests could reveal whether a person has previously been infected with COVID-19 and may have some immunity.]

- **Number three** is having personal protective equipment in sufficient quantities within your state to cover current and anticipated needs so that doctors and nurses and hospital staff are ready for the potential rise in patients that could follow a relaxation of social distancing.
- So the health care system should be prepared in terms of equipment, but, also, we need to have more capacity to care for very sick people.

- **And finally,** the last important element is the capacity for a state to do very rapid case finding: isolation, contact tracing and case management.
- That is what officials and health care workers have been doing very intensely in Asia in the past couple of months.
- Those are the kinds of conditions, I think, that would make it safer for states to begin to relax social distancing.
- You try to, perhaps, lift one set of measures, see what the impact is, see if we can continue to keep control of the outbreak in the provision.
- And if things collapse, and cases start to go up substantially, then you need to go back to the earlier phase.

In terms of the trend in cases, are you talking about a significant decrease over a period of two weeks in a state's number of new reported infections?

- Yes. So basically, you know, if the state has 500 new cases at its peak in a day, then the target should be that, for two weeks in a row, new cases drop daily—450, 400, 350, 300.
- You know, basically getting down to hopefully small numbers of cases, right? We didn't put an absolute number in there—it would be too difficult to know, because the states vary largely in size.
- But it ideally should be absolute numbers that are pretty low from the start so that there's not a high chance for a major reeruption in cases.

Given the shortage of testing and data, how would we know that those trends are actually real? Maybe we would just see what looks like a downward trend because fewer people are getting tested.

- Yeah, that's a really important point, which is why we really need to have rapid testing in place for people who have outpatient-level symptoms that could be COVID-19.
- And because COVID-19 can look like the run-of-the-mill flu, a test has to be available in a way that it is not for flu testing.
- With flu, we don't need to know when people have very mild symptoms. In this case, we really do need to know. You should get tested.
- And right now we're far away from that. But it's imaginable. There are rapid tests that are coming online.
- **The Abbott test takes five minutes.**

One of the other rapid tests takes 45 minutes.

Could this type of test tell us if people have had the illness and are immune—and could go back to work safely, for instance?

That is the aspiration. I think, at this point, there needs to be a bit more definitive decision-making and scientific judgment by national health authorities—the Centers for Disease Control and Prevention and the National Institutes of Health—about whether we have sufficient evidence to call it immunity.

- But in general, the thought is that it's likely to be an indicator of immunity at some level. We don't know how long that necessarily will last. But at least it's certainly better than if you've not had the disease—that's the hope.
- And once that's definitively called out, then I think it could become the kind of thing where people would have evidence that they could more safely be back in the world without being at risk themselves or endangering others.

You also said states must have enough protective equipment to meet the needs of doctors and nurses. Do you mean we shouldn't lift the restrictions until we have it in place?

I think we owe that to our health care workforce.

- If we lift the restrictions and risk rising cases again without being prepared in our hospitals, we have the potential to expose our doctors and nurses to the same thing that they're going through now—which is basically a crisis.
- In many places, they're not well protected or they're running out of equipment.
- **So we need to make sure that the supply-chain problems have been sorted out before we begin to experiment with lifting social distancing.**

There has been a lot of debate recently about whether members of the public should be wearing face masks, especially given the shortage of medical-grade masks. The CDC is now expected to recommend Americans wear cloth masks in public. Do you think such coverings could provide a benefit?

My view within this debate is that we're at the point where the benefit outweighs the downside. And the reason I say that is because there is sufficient evidence of asymptomatic and early, presymptomatic transmission going on.

We hope that everyone who feels sick, at this point in the country, is staying home. And wearing a mask wouldn't change that direction at all. You should stay home if you're sick.

But for the people who are out there who feel well, the idea of wearing a mask is to cover their cough or sneeze or just their loud talking. And it's not because we have evidence that it protects someone on the receiving end.

But one of the major elements of infection control within a hospital is something called source control. You try to lower the source of the infection by either reducing risky procedures that create aerosols or by other means. And in this case, the masks would be a form of source control at the individual level.

Given their shortage, shouldn't we be reserving medical masks (N95 respirators and surgical masks) for health care workers?

There are not enough masks to go around for the health care workforce. So no medical masks should be used by the public—this should be about people fashioning their own masks out of cloth or fabric.

Either they can find such coverings somewhere online or at a local market, or they can make them out of T-shirts or some other cloth they have at home.

There are designs online. My hope is that the CDC soon comes out with guidance on this, because I think it would be useful for people to see what it says about the design of a mask and about the agency's messages around the subject.

This should not at all substitute for social distancing—maintaining six feet, staying home when you're sick—we should not take any chances.

What are some of the main takeaways of your project?

Our models suggest that beginning interventions early – before the epidemic has grown too large in a given community – is far more important than precisely how much we cut down on social contacts. It makes clear that if we impose social distancing for a short or medium time period – several weeks to months – and then lift restrictions altogether, we expect to see a resurgence of disease transmission because many people will still be susceptible.

- We saw this during the 1918 flu pandemic when many U.S. cities lifted their restrictions after 3-8 weeks and saw large second peaks of flu transmission.
- That pandemic eventually infected about a third of the world population and killed 50 million people. To avoid a resurgence of COVID-19, we need to apply multiple interventions over a long period of time – 12 to 18 months or more – until effective treatments and/or vaccines are widely available.

Did you model any promising alternatives to strict, long-term restrictions?

We don’t need to be totally locked down for a year or more. Adaptive strategies that actively turn on and off interventions – **like a light-switch** – can allow for periods of greater mobility while still keeping the epidemic at levels our healthcare system can manage.

- Improved testing capacity will allow us to use more targeted approaches to identify and isolate infected people and their social contacts.

Conclusion

knowledge of the likely prognosis is helpful in determining the most useful treatment. Prognostic factors are characteristics associated with outcome in patients with the disease in question. For example, in a patient with acute myocardial infarction, the prognosis is directly related to residual heart muscle function.

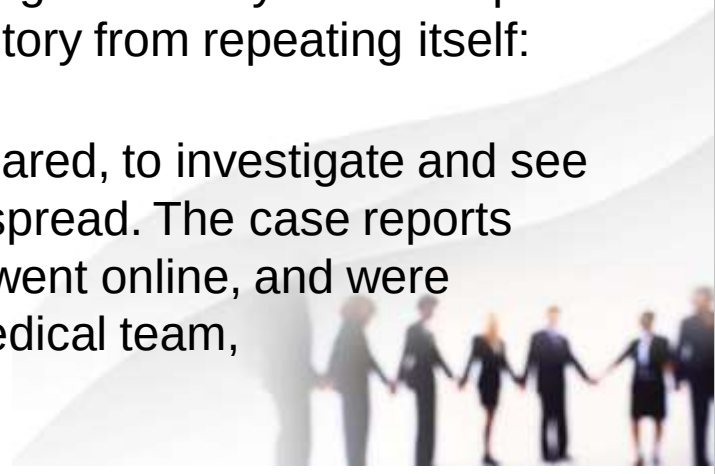
- Epidemiological information from many patients is necessary to provide sound predictions on prognosis and outcome.
- Clinical experience alone is inadequate for this purpose, since it is often based on a limited set of patients and inadequate followup.
- For example, patients who are seen by a doctor are not necessarily representative of all patients with a particular disease.
- Patients may be selected according to severity or other features of their disease, or by demographic, social or personal characteristics of the patients themselves.
- Furthermore, since many doctors do not systematically follow their patients, they have a limited, and often pessimistic, view of the prognosis of disease.
- A clinical observation of improved prognosis over time can be real and due to better treatment, but it can also be an artefact because of an increase in milder cases receiving treatment. Properly designe epidemiological research can produce reliable information about prognosis.

- The reason for this is that we have invested a great deal in nuclear deterrents and natural disasters, but in reality we have invested very little in a system to stop an epidemic's and bio-terrorism.
- We are not ready for the next epidemic. Let's look at Ebola, SARS, H9N1, etc. I'm sure everyone read it in the newspaper, big and complicated challenges.

- I followed it carefully through the case analysis tools we used to track polio eradication and looking at what happened the problem was not that there was a system that was not working well enough the problem was that we did not create a system at all.

- In fact, there are some obvious key pieces missing. to identify some simple steps that should have been taken to prevent history from repeating itself:

- We did not have a group of epidemiologists prepared, to investigate and see what the disease was, to find out how far it had spread. The case reports came in papers, were long overdue before they went online, and were extremely inaccurate. We didn't have a ready medical team,
- we didn't have a way to prepare people.



- Why, in the years since the 2009 H1N1 influenza threat have we not developed artificial intelligence solutions integrated with our electronichealth records that could be giving us real-time information on prognosis and treatment effectiveness?
- Why do we assume that a health care system that must run at maximal efficiency and full occupancy to survive will, without additional support, suddenly be able to meet the needs of all in a crisis?
- Why do we not have caches of inexpensive volume- cycled ventilators with basic alarm systems?
- Because we fail to learn the lessons and dedicate the funding and planning efforts required.
- Because doing so is not prioritized by regulators, payers, or most hospital leaders.
- Because the need is not understood by the public. Because you can’t rely on private sector infrastructure to take on a massive public responsibility in disaster without proper planning and resources.
- No matter how severe the impact of Covid-19 is, the onus is on us all to do better next time, whether that outbreak is 1 year or 20 years hence.
- Let us clearly communicate our limitations and abilities and agree on where we want to be — with agreed-on thresholds, standards, and enterprise- wide capabilities that allow us to say we learned our lessons this time.

International donors also have begun to invest in improving preparedness through refined standards and funding for building health capacity (Wolicki and others 2016).

- Despite these improvements, significant gaps and challenges exist in global pandemic preparedness.
- Progress toward meeting the IHR has been uneven, and many countries have been unable to meet basic requirements for compliance (Fischer and Katz 2013; WHO 2014).
- Multiple outbreaks, notably the 2014 West Africa Ebola epidemic, have exposed gaps related to the timely detection of disease, availability of basic care, tracing of contacts, quarantine and isolation procedures, and preparedness outside the health sector, including global coordination and response mobilization (Moon and others 2015; Pathmanathan and others 2014).
- These gaps are especially evident in resource-limited settings and have posed challenges during relatively localized epidemics, with dire implications for what may happen during a full-fledged global pandemic.

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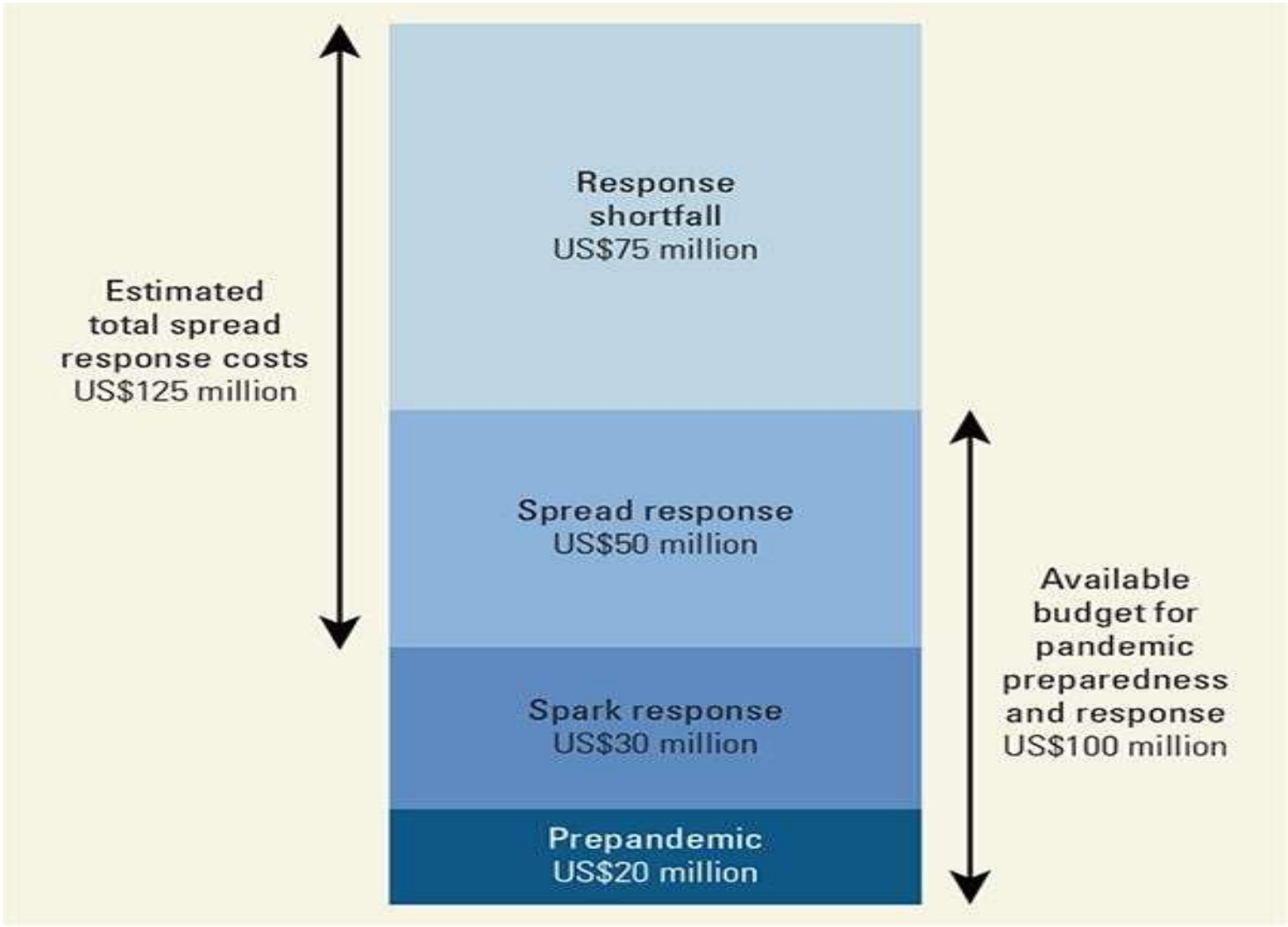

Thank You

HAND WASHING IS AN EASY WAY TO PREVENT INFECTION

HAVE A NICE DAY...