

Aquatic animal disease surveillance: definitions, principles and application

**Project Inception Workshop of GCP/RAF/510/MUL:
Enhancing capacity/risk reduction of emerging Tilapia Lake Virus (TiLV) to African tilapia aquaculture
Southern Sun Myfair Hotel, 23-24 October 2018, Nairobi, Kenya**

Presentation outline

- * **Definitions**
- * Purpose and aims of AAD surveillance
- * Main principles of different types of surveillance
- * Surveillance standards
- * Surveillance planning

Development of Aquatic animal disease surveillance

- * Membership in OIE promoted need for development of international standards
- * SPS agreement of WTO gave importance and legal status (disputes) to international standards
- * Surveillance – tools for decision making
- * Surveillance system will produce/result in disease and health event reporting (international requirements and domestic need)
- * Surveillance is an economic activity

Link between OIE standards and the WTO SPS Agreement

- * **World Trade Organization Sanitary and Phytosanitary Agreement (1995)**

- * **SPS Agreement - Art 2: Basic right**

‘Members have the right to take sanitary and phytosanitary measures necessary for the protection of human, animal or plant life or health, provided that such measures are not inconsistent with the provisions of this Agreement’

Common understanding of our tasks and activities

- * Monitoring
- * Surveillance
- * Survey
- * Disease control program (DCP)
- * Disease eradication program (DEP)
- * Disease notification and reporting

Definition of animal disease surveillance

- * Often interchangeably with monitoring – NOT THE SAME
- * Can use same tools
 - * distinction more in objectives than techniques
- * Monitoring can be part of surveillance (not visa versa)

Definition of animal disease surveillance

Surveillance is:

All regular activities aimed at ascertaining the health status of a given population with the aim of early detection and control of animal diseases of importance to national economies, food security and trade

FAO Manual of livestock disease surveillance and information system

<http://www.fao.org/docrep/004/x3331e/X3331E00.htm>

Definition of animal disease surveillance

Monitoring is:

All activities aimed at detecting changes in the epidemiological parameters of a specified disease

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Definitions

Textbook	Monitoring	Surveillance
Martin et al. 1986	Animal disease monitoring describes the ongoing efforts directed to assessing the health and disease status of a given population	The term "disease surveillance" is used to describe a more active system and implies that some form of directed action will be taken if the data indicate a disease level above a certain threshold.
Thrusfield, 1995	Monitoring is the making of routine observations on health, productivity, and environmental factors and the recording and transmission of those observations.	Surveillance is a more intensive form of data recording than monitoring
Thrusfield, 1995	The routine collection of information on disease, productivity, and other characteristics possibly related to them in population	An intensive form of monitoring. Designed so that action can be taken to improve the health status of a population; therefore, it is frequently used in disease control campaigns.
Noordhuizen et al. 1997	Monitoring refers to a continuous, dynamic process of collecting data about health and disease and their determinants in a given population over a defined time period (descriptive epidemiology)	Surveillance refers to a specific extension of monitoring where obtained information is used and measures are taken if certain threshold values related to disease status have been passed. It, therefore, is part of disease control programs.

Surveillance versus monitoring

- * Surveillance means the continuous investigation of a given population **to detect occurrence of disease for control purposes**, which may involve testing of a part of population
- * Monitoring constitutes on-going programmes directed at **detection of changes in the prevalence** of disease in a given population and its environment

Surveillance and surveys

- * **Passive** surveillance is a system in which CA make no active efforts to collect disease information; they just wait for disease report to come to them. Statutory case reporting is the most broadly used passive surveillance.
- * **Active** surveillance uses structured disease **surveys** to collect high quality disease information quickly and inexpensively. CA make active efforts to collect the information needed.
- * Surveillance system typically involves a number of data collection approaches, and also incorporates data management, analysis and reporting system.
- * Structured survey may be one component of a surveillance system.

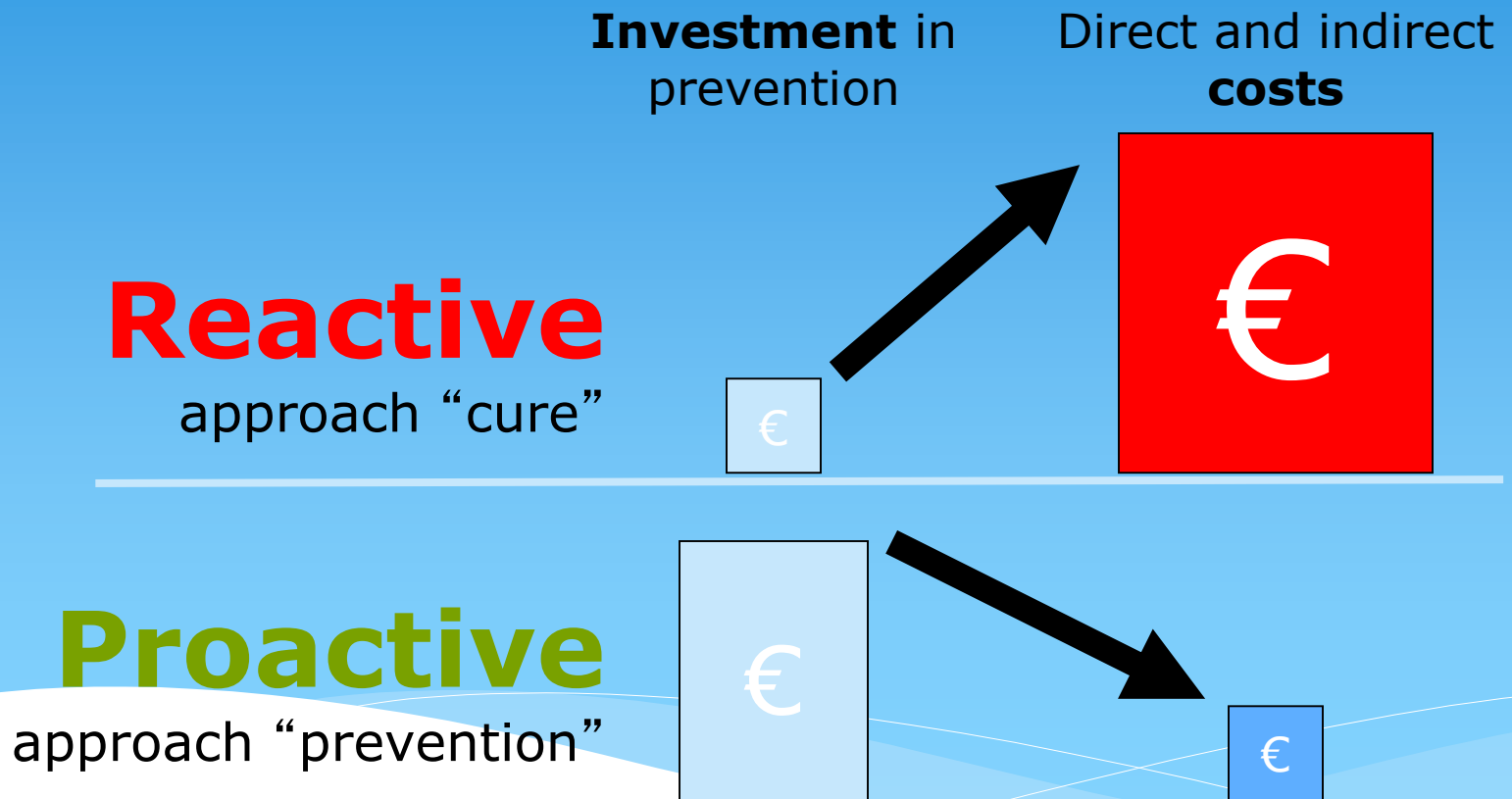
Risk based surveillance

- * **Risk based** surveillance: A surveillance programme in the design of which exposure and risk assessment methods have been applied together with traditional design approaches in order to assure appropriate and cost effective data collection
- * RBS similar with **targeted** surveillance (OIE: selected sections of the population in which disease is more likely to be introduced or found)

Surveillance in our case

The systematic, continuous or repeated, **measurement, collection, analysis, interpretation** and **timely dissemination** of animal health and welfare related data from defined populations. These data are then used to describe health hazard occurrence and to contribute to the planning, implementation and evaluation of risk mitigation action. (Hoinville et al, 2013)

“Prevention is better than cure”



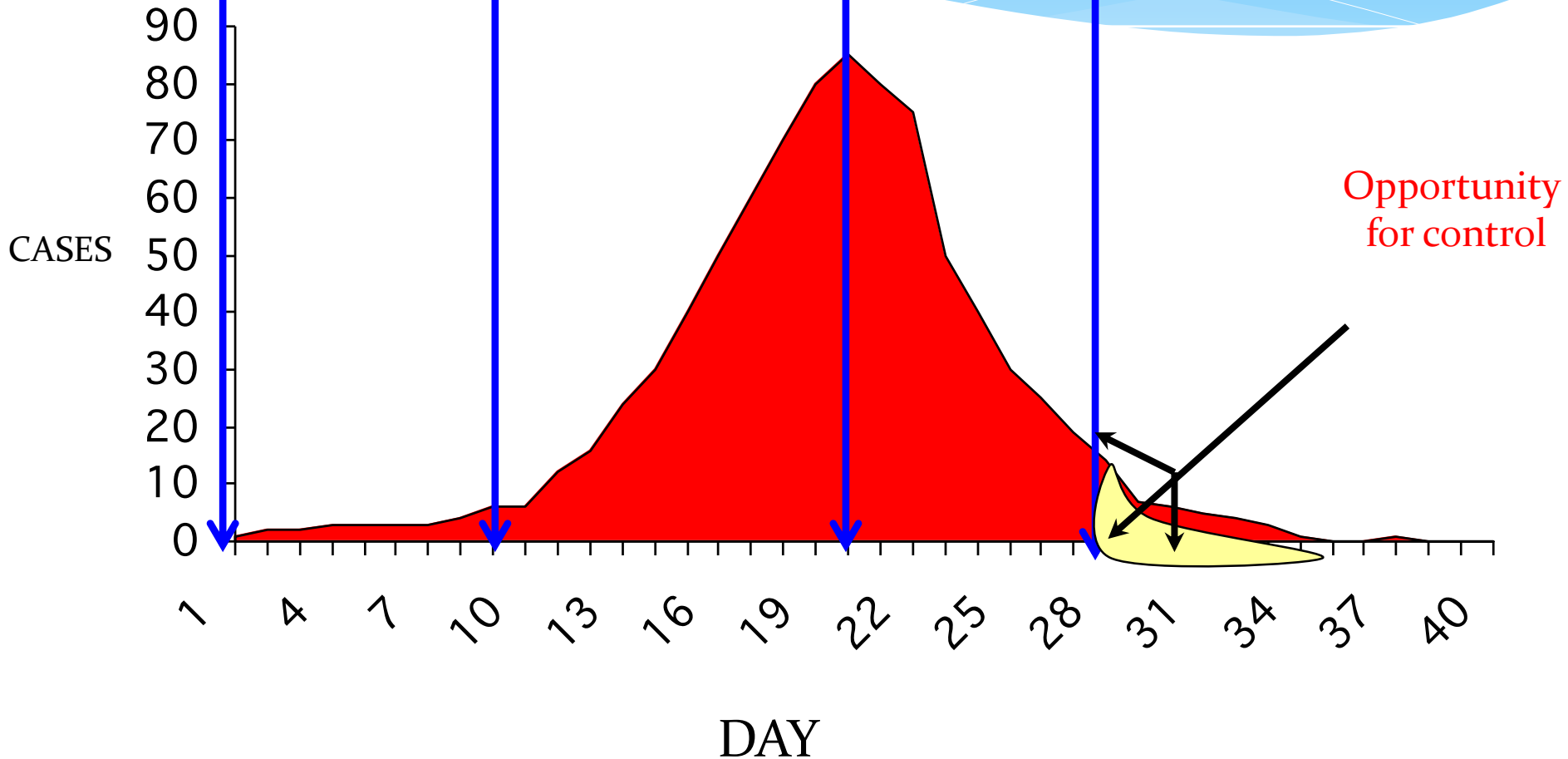
Outbreak of disease (without surveillance)

First Case

Detection/
Reporting

Lab
Confirmation

Response



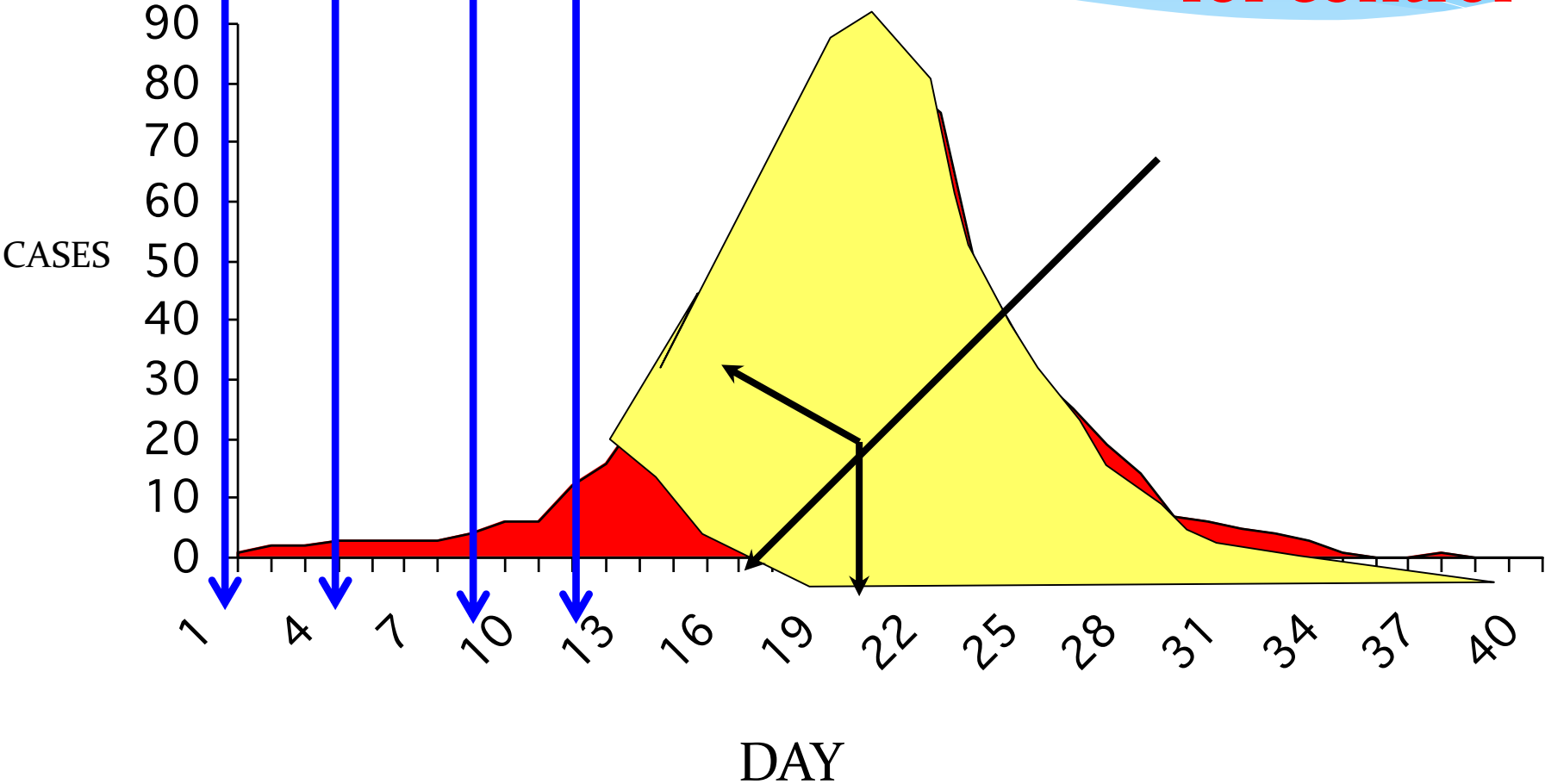
Detection of disease

Final
Cases

Detection/
Confirmation

Invest
Response

Opportunity
for control



Presentation outline

- * Definition of animal disease surveillance
- * **Purpose and aims of disease surveillance**
- * Main characteristic of different types of surveillance
- * Surveillance standards
- * Surveillance planning

Purpose/objective of AAD surveillance

- * The objective of a surveillance system is the most influential in determining suitable design, so it should be considered before planning
- * The objective of surveillance is closely related with disease mitigation, and can be in one of three stages:
 - * Sustainment (to sustain free or low prevalence status)
 - * Investigation (estimation of the level of occurrence)
 - * Implementation

Purpose/objective of AAD surveillance

- * AAD surveillance objectives:
 - * Early detection of disease
 - * Demonstrating freedom of disease
 - * **Control/eradication of disease**
 - * AAD monitoring – detection of disease trends
 - * DEALS with endemic diseases
- } DEALS with Exotic diseases

Purpose and aims of disease surveillance

- * Reduce impact of diseases
- * Reduce disease spread – prevent new outbreaks
- * Support to animal production
- * Ensure food safety and quality
- * Comply with international standards and requirements
- * Establish communication between stakeholders regarding animal health
- * Understand epidemiology of disease
- * Improve veterinary service

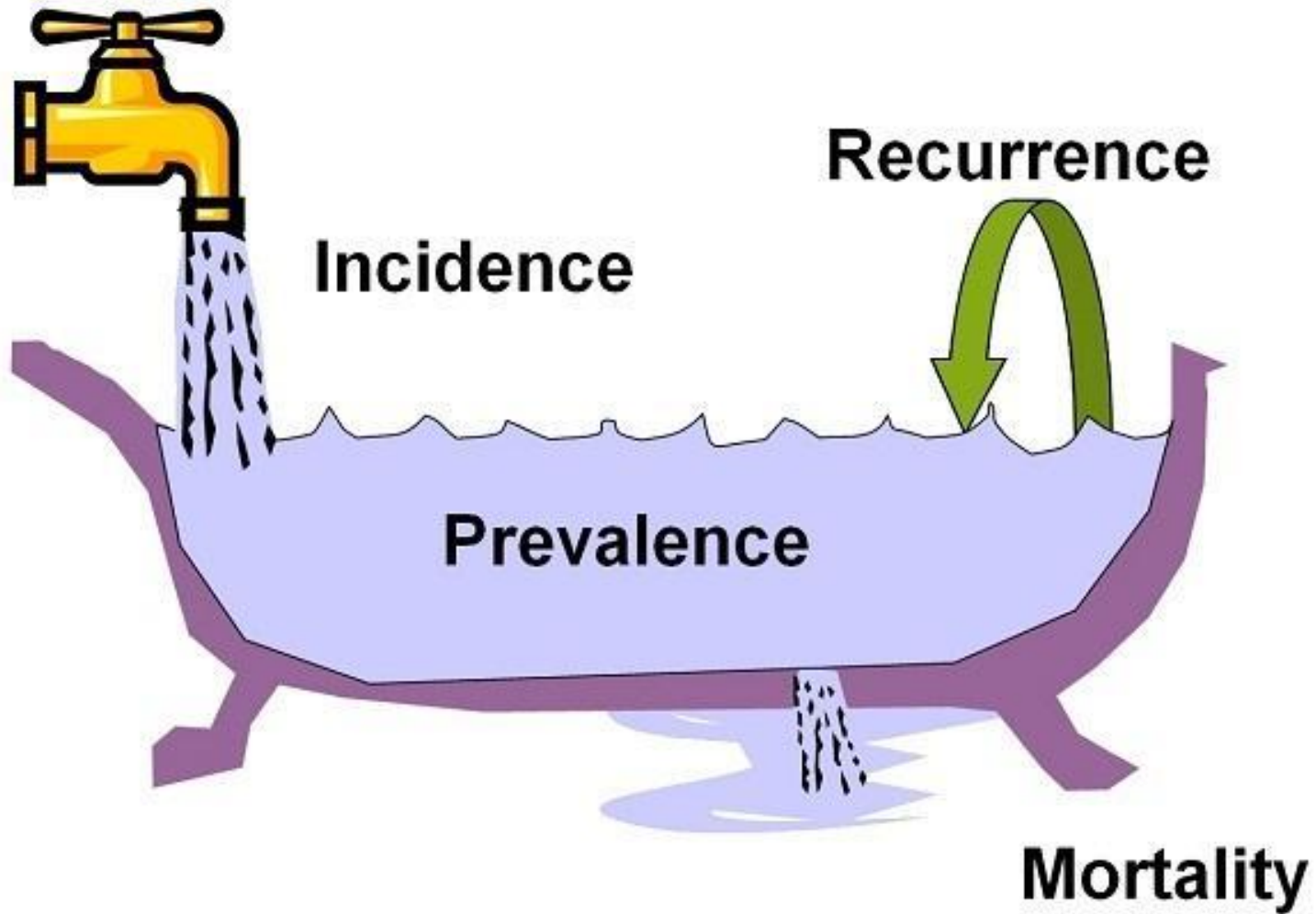
Purpose and aims of disease surveillance

Measuring disease frequency

- * By absolute and relative numbers
- * Absolute numbers – number of cases
- * Relative numbers – proportions, rates, odds

Purpose and aims of disease surveillance

- * Disease prevalence – proportion of diseased animals in a population
- * Static measure
- * Good for common, low contagious, chronic diseases
- * Disease incidence – rate of new cases of disease in a population
- * Dynamic measure
- * Good for acute, highly contagious diseases
- * Measure of disease risk



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Main principles of different types of surveillance

- ❖ Clear purpose/aims
- ❖ Justification – priority diseases, scientifically based, international standards
- ❖ Population definition
- ❖ Methodology
- ❖ Administrative structure/hierarchy
- ❖ Financial support
- ❖ Timeframe
- ❖ Output orientated

Main principles of different types of surveillance

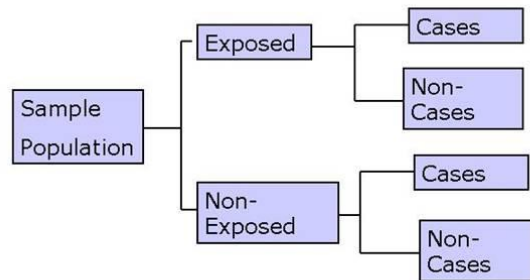
- * Surveys – surveillance / studies – epi research
 - * Descriptive and explanatory
 - * Experimental and observational
 - * Retrospective and prospective
 - * Cross section and longitudinal
 - * Case – control and cohort

Main principles of different types of surveillance

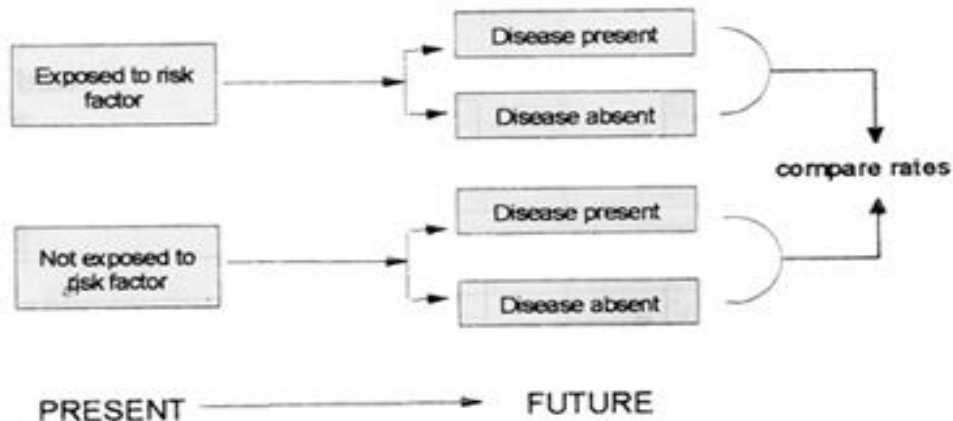
- * Cross sectional survey – prevalence study/outbreak investigation
- * Case control survey
- * Cohort survey

Main principles of different types of surveillance

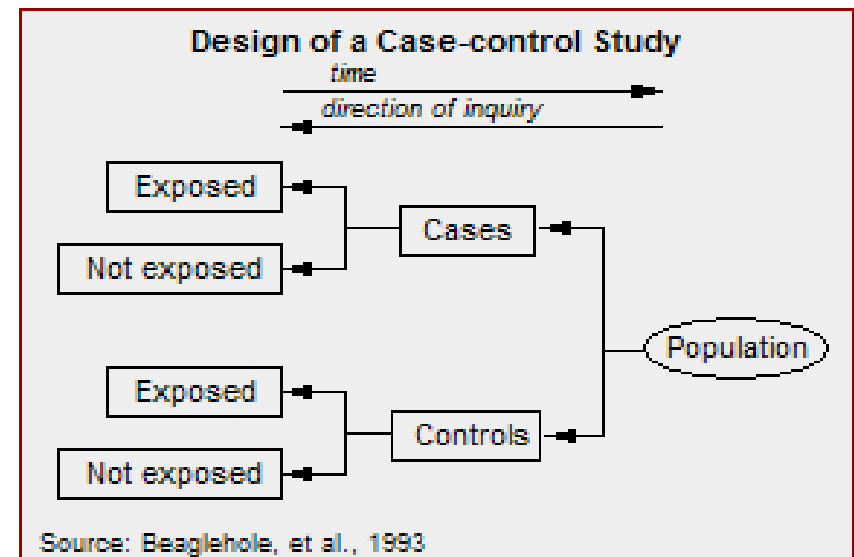
Cross-Sectional Study Design



Cohort study



Design of a Case-control Study



Main principles of different types of surveillance

- * **Targeted surveillance** – Risk based surveillance
 - * More disease burden – less resources
 - * Combines epidemiology, public health, economy, trade consequences
 - * Looks for disease where is expected – risk assessment
 - * Higher benefits-cost ratio
 - * Estimation of effectiveness!?

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- * **Surveillance standards**
- * Surveillance planning

Surveillance standards

- * National requirements
- * International standards
 - * OIE
 - * FAO
 - * EU
 - * Other

Surveillance standards

- * Defining appropriate level of protection – ALOP
 - * Minimum level - international requirement
 - * Higher than – for exotic diseases + scientific justification
 - * Consistent
 - * Transparent
 - * Equivalency

Surveillance standards

- * Move from input to output based standards
- * Ideally, country is free from disease if every member of the population is examined simultaneously with a perfect test with both S_n and S_p equal to 100 %
- * Demonstration of freedom from disease meet a defined level of confidence (95%)

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- * **Surveillance planning**

Surveillance planning

- * Planned and managed activities
 - * **Not hap-hazard action**
- * Transparency
- * Agreed objectives
- * Targets and responsibilities
- * Human resources and time frames
- * Check list

Key answers needed for planning monitoring and surveillance system (MOSS)

- * Why are disease surveillance and monitoring needed?
- * Which diseases should be considered?
- * What type of data should be collected?
- * Who is going to use the information?
- * What will be the uses of that information?
- * Will the system have national or local coverage?
- * How is the system going to be financed?
- * Is the existing infrastructure adequate?
- * How will the system's efficacy be assessed?
- * What is the legal basis for implementing such a system?

Surveillance planning

- * Sources of disease data
 - * Samples
 - * Aquatic animal information
 - * Nutrition
 - * Husbandry
 - * Use
 - * Farmer information
 - * Environment information
 - * Auxiliary information

Surveillance planning

- * Population
 - * Targeted vs. Study population
 - * Sampling frame, method, size
 - * Time frame for sampling
 - * Level of extrapolating conclusions

Surveillance planning

- * Passive data collection
 - * Routine reporting of disease
 - * No investigation efforts
 - * Difference between passive collection (surveillance) and monitoring?
- * Active data collection
 - * Purposive collection data on disease
 - * Mainly through survey
 - * Sample size – confidence in results

Surveillance planning

- * Administration
 - * Defined responsibilities beforehand
 - * Methods of data gathering, analysis and distribution
 - * Intervention – when, by whom
 - * Hierarchy of decision making

Surveillance planning

- * Financing
 - * By who, and how
 - * Partial vs full public financing
 - * Public – private partnership

Surveillance planning

Measurables

- * Not workload, used funds/resources
- * Relevant to diseases and set objectives
 - * **RELEVANT and RELIABLE DATA!!!**
 - * Mortality/morbidity
 - * Prevalence/incidence
 - * Costs and benefits

Surveillance planning

- * Surveillance activities according to true need/resources/possibilities
- * No single activity will be enough
- * Combating diseases requires knowing diseases and lot more

Our objectives

- *To satisfy/balance international standards and requirements for AAH (TiLV) with national needs and available resources
- *Planning and implementation of scientifically based monitoring and surveillance systems (MOSSs) for TiLV
- *To support decision making processes

Thank you for your attention
Nihad.Fejzic@vfs.unsa.ba

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