UTF/077/ZAM: Technical Assistance to the Zambia Aquaculture Enterprise Development Project (ZAEDP)

Session 3
Checklist 9
Data analysis and methodology

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Training Course on Development of an Active Surveillance for Epizootic ulcerative syndrome (EUS) and Tilapia lake virus (TiLV) using the FAO 12-point surveillance checklist (for non –specialist) and its implementation

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9	Data analysis methodology	Survey design described Risk assessment used and described Methods of data analysis described

Analysis/interpretation/reporting

- According to surveillance objective and purpose, EUS/TiLV surveillance data analysis will give answer on different questions: If EUS/TiLV is present or absent, prevalence of disease if present and confirmation of disease free status of zone/country.
- Analysis and interpretation of data collected through this surveillance will give results in accordance with surveillance aims/purposes, survey design applied, sampling methodology/type applied, with prescribed sample/epi unit level (individual animals, ponds, farms, zones, etc) and restrictions of applied methodology.
- If **measurements of risk exposures are reported** – interpretation will be dependent on type of risk measure (AR, OR, RR) and relevant for restrictions of survey design applied, (i.e. for OR interpretation based on threshold 1 (no relation between disease and risk exposure), <1 (more exposure resulted in less disease) >1 (more exposure resulted in more disease),

- **Null hypotesis: disease is present** at a level equal to or grater than that specified by the design prevalence
- If we reject null hypotesis and accept **alternative hypotesis disease is not present** at the level equal to or greater then that specified by the design prevalence.
- **The required level of confidence** in the surveillance system must be greater than or equal to **95 %**

- **Reject Ho= disaease free**
- Probability of rejecting true null hypothesis = alfa (α) (disease present country declare free)
- Consequence: the spread of infection between countries
- 1-α = strength of evidence confirming null hypothesis – measure of confidence ≥95% (account for test characteristics)

- **Accept false Ho**: country determines infected, in fact free (type II error)
- **Power** of the analysis is probability of avoiding a type II error
- No international standards
- Consequence: loss of trade opportunity, however no increased risk for spreading of disease, more samples
- In practice, many test system involve one confirmatory testthat is considered for all intents and purposes to have a specificity of 100 %

Analysis of results:

- Account for **survey design**
- Account for **diagnostic test imperfection**
- Account for **design prevalence(s)**

Measuring disease frequency

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

Measuring disease frequency

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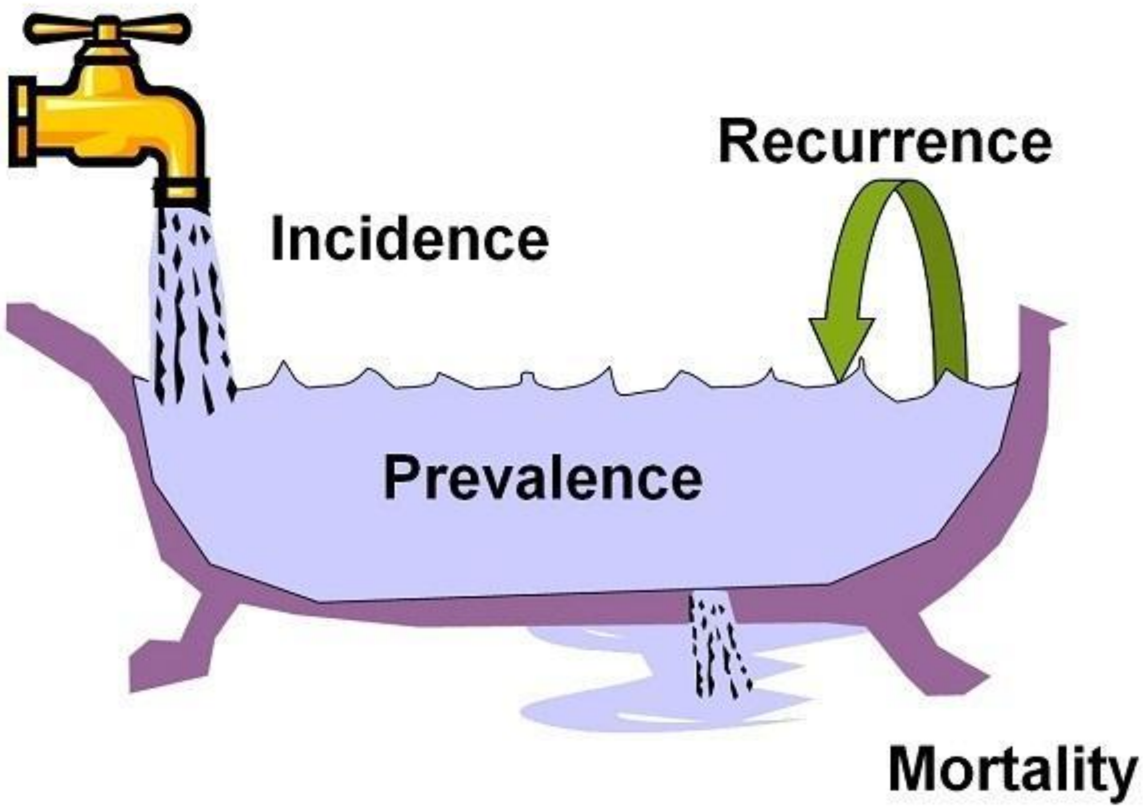

Prevalence

- is a measure of the **number of animals/ponds/farms/villages** with the disease (EUS) at one point in the time, as a proportion of the total number of animals/ponds/farms/villages in the population at risk
- Is the number of sick animals, ponds or other units of interest at at single point of time as proportion of the total population at risk at that time
- **P=Number of cases at one point of time/population at risk at the same point of time**

Example

An intensive shrimp farming area with 2000 ponds suffers an outbreak of white spot disease. The first ponds start to show signs of sick shrimp on 3 March. By 29 March many ponds have sick and dead shrimp. The local fisheries officer visits on 30 March. On that day, the officer counts 56 ponds showing signs of disease, and the producers report that a further 143 have already been emergency harvested, and 28 ponds had been diseased, but recovered. There are 1801 apparently unaffected ponds remaining. What is the pond prevalence of white spot disease in the area on 30 March?

The number of ponds with the disease is 56. The total number of ponds in the population is 1857 (2000 – 143 ponds that have already been harvested). The prevalence on 30 March is therefore:

Prevalence = 56 / 1857 = 3%

Prevalence

- National level prevalence
- Province/district/village level prevalence
- Farm level prevalence

Incidence rate

- Is a **measure/rate** of the average speed at which the disease is spreading;
- Incidence rate is the total number of new cases of disease divided by the total time that each animal in the population was at risk of getting the disease.
- Incidence rate measure the number of new cases over period of time

Incidence rate

- Incidence rate=total new cases during a period of time/average number of animals at risk x time period
- Example of incidence rate:
  - Total number of new EUS cases 30
  - Population at risk 100
  - Time period 10 days
- Result:
  - 0,03 cases per pond per day
  - 3 cases per pond per 10 days

Prevalence versus incidence rate

- A disease with a high incidence rate but of very short duration will have a relatively low prevalence
- A disease of relatively low incidence rate with long duration will have a high prevalence.

Measuring disease frequency

- **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

Associations: Relative risk

- The ratio of the disease incidence in individuals exposed to a hypothesised factor to the incidence in individuals not exposed;
- A measure of association commonly used in cohort study
- Example: EUS cases related with biosecurity, pH, Temperature…….

	Diseased	Not diseasesd
Exposed	a	b
Unexposed	c	d

The relative risk is a/a+b / c/c+d

	EUS positive farm	EUS negative farm	
Exposed (using EUS non certified eggs)	10	2	
Unexposed (using EUS certified eggs)	3	5	

Relative risk or risk ratio

- 10/(10+2) = 10/12= 0.83
- 3/(3+5) = 3/8= 0,37
- **RR = 0,83/0,37 = 2,24**
- **Interpretation**:
  - RR less then 1; exposure is **protective**
  - RR = 0; exposure **no effect**
  - RR more than 1; exposure is **positively associated with disease**

Risk

- The likelihood of a health event occurring
- The rate at which new cases are expected to occur during a specified period of time
- Measured using:
  - Incidence rate
  - Attack rate

Documenting Disease Occurrence

		Disease +	Disease -	
Exposure	+	a	b	a+b
	-	c	d	c+d

Counts = a,b,c,d

Risk = $\frac{a}{a+b}$ and $\frac{c}{c+d}$

Example:

		EUS +	EUS -	
Season	A	30	70	100
	B	15	85	100

RR is the ratio od disease in the exposed group to the risk of disease in the non exposed group

Risk ration is also known as Relative risk

RR ranges from 0 to infinity.

RR =(30/100)/(15/100)=0.3/0.15=2

Interpretation: Risk of EUS is 2 times more during season A.

Key points to be noted during implementation of EUS/TILV surveillance:

- After the completion of survey treat data analysis and preparation of report as a **priority.** The user of the information need to know what is happening, report cases of EUS after confirmation and produce reports as soon as possible.
- When analyzing data and producing reports, keep in mind that objective of the survey is to answer one or two questions and that question is usually answered by one number (example prevalence of EUS is 5 % of farms, or there is no disease case confirmed).
- Information should be presented in a way that makes it easy and quick to understand and should be distributed to everybody who may need it, and everybody who participated in generating it. Distribution of the result internationally and neighbouring countries will help in coordinating regional approaches and efforts to EUS control.
- If possible, the results should be publish in international journals. A demonstrated ability to carry out high quality surveillance using internationally recognized standards greatly improves the international reputation of a country's aquatic authorities.

Working group

- What was the prevalence of EUS?
  - Wild fish
  - Farms
- How much you are confident in observed results?
- Did you observe/measure any positive association with EUS?
- Main challenges?

Working group

- How much you are confident in your results?
- What kind of surveillance you will propose for future and why?
- How might you improve TiLV surveillance?
- Main challenges?

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Thank you for your attention