

Introduction to epidemiology

Epidemiology training
Animal health cooperation platform
Embassy of France to the OECS States

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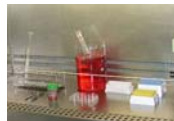
Definition of Epidemiology

- Epidemiology may be defined
 - as the study of the distribution and determinants of health-related states or events - including diseases - in populations
 - and the application of this study to the control of diseases and other health problems
- The word epidemiology consists of the Greek words (epi) = among, (demos) = people (so, population), and (logos) = doctrine.



Epidemiology...

- Focus in medicine is the individual
- Communities, groups, populations replaces the individual in epidemiology
- Integrating science: links to clinical & laboratory medicine, biostatistics, health economics



Background

- Relatively new science – emerged in 19th century
 - John Snow and cholera
 - In strictest terms – study of epidemics
 - Development during the 20th century for chronic diseases (heart diseases, cancer, stroke, etc)
 - Animal health epidemiology since the 1970s
- Today:
 - Concerned with epizootic diseases and all other forms of illness
 - Focus on:
 - Transboundary Animal Diseases = TADs
 - FMD HPAI PPR
 - Zoonoses
 - Vectorial diseases

Emerging diseases

Concerns

- Detecting existence of a disease
- Identifying causes & modes of transmission
- Obtaining information on ecology & natural history
- Defining & quantifying impact and extent
- Planning & evaluating possible disease control strategies
- Monitoring & surveillance to prevent further disease episodes
- Assess economic effects of disease & control programmes

Fundamental Assumptions in Epidemiology



- Disease doesn't occur at random
- Disease has causal and preventive factors
 - Disease is not randomly distributed throughout a population
 - Epidemiology uses systematic approach to study the differences in disease distribution in subgroups
 - Allows for study of causal and preventive factors

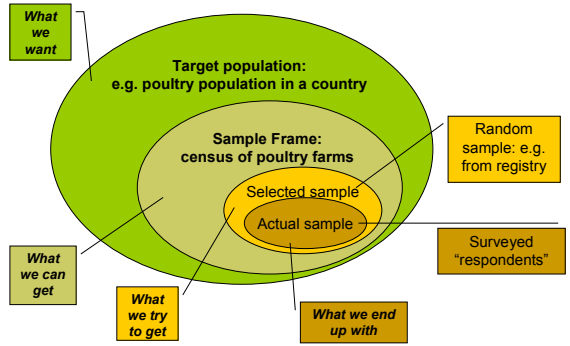
Components of Epidemiology

- Measure of **disease frequency**
 - Quantification of existence or occurrence of disease
- **Distribution** of disease
 - Which animals are getting disease?
 - Where is disease occurring?
 - When is disease occurring?
 - Formulation of hypotheses concerning causal and preventive factors
- **Determinants** of disease
 - Hypothesis are tested using epidemiologic studies



Methods

- Population → Sample
- Statistics, probabilities



Methods (cont)

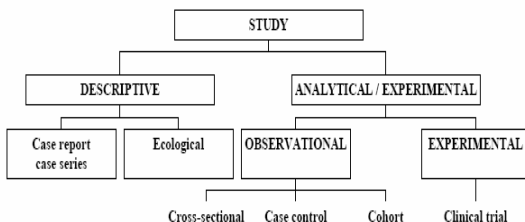
- Different methods are used in carrying out an epidemiological investigation:
 - **surveillance and descriptive** studies are used to study distribution
 - **analytical studies** are used to study determinants: causes, risk factors
 - Risk analysis and modelling for prediction (predictive epidemiology)

Types of epidemiological study

- **Observational**
 - Observation of nature while differences or changes in characteristics of the population are studied without intervention from investigator
- **Intervention studies**
 - Experiments at population level. Experimental units allocated to different groups (treatment, vaccine) and outcome is measured

Also *theoretical studies*: based on mathematical modelling, risk analysis using computer. Answer to "What if" questions

Types of epidemiological study



Descriptive studies

- Descriptive studies may be defined as studies used
 - to define the distribution and frequency of a disease in a population in terms of animal, place and time
- Descriptive studies are often at the origin of analytical studies (hypotheses testing)
 - Example: West Nile in Guadeloupe



Analytic studies

- Analytic studies may be defined as studies used
 - to test hypotheses concerning the relationship between a suspected risk factor and an outcome
 - and to measure the magnitude of the association effect, and its statistical significance.
- An analytic study always implies a comparison among two or more groups

Epidemiological concepts



- **Cause**
 - Event or condition or characteristic that plays an essential role in the occurrence of disease
 - Distinction between:
 - Necessary cause: no FMD if no FMDV
 - Sufficient cause: Streptococcus & mastitis
 - Difficulty: proving causal relationship
 - Cause occurs prior to disease in time
 - Change in cause frequency → change in disease frequency
 - Association not due to correlation to another factor

Epidemiological concepts



- **Risk factors**
 - Characteristics associated with increased risk of disease
- **Bias**
 - Systematic error which results in estimates that depart systematically from the true value
 - Selection bias
 - Measurement bias
 - Confounding bias

Epidemiological concepts



- **Confounding**
 - Situation in which a non-causal association between a given exposure and an outcome is observed as a result of the influence of a third variable (the confounding variable)
 - E.g.: smoking confounding the association between coffee drinking and lung cancer
- **Interaction** (a.k.a effect modification)
 - Situation when 2 or more risk factors modify the effect of each other with regard to the occurrence or level of a given outcome
 - E.g.: *Bordetella bronchiseptica* and Parainfluenza virus with regards to kennel cough