

FETPV 1ST MODULE: BASIC EPIDEMIOLOGY AND SURVEILLANCE DATA ANALYSIS
19 APRIL 2021

ANIMAL HEALTH SURVEILLANCE

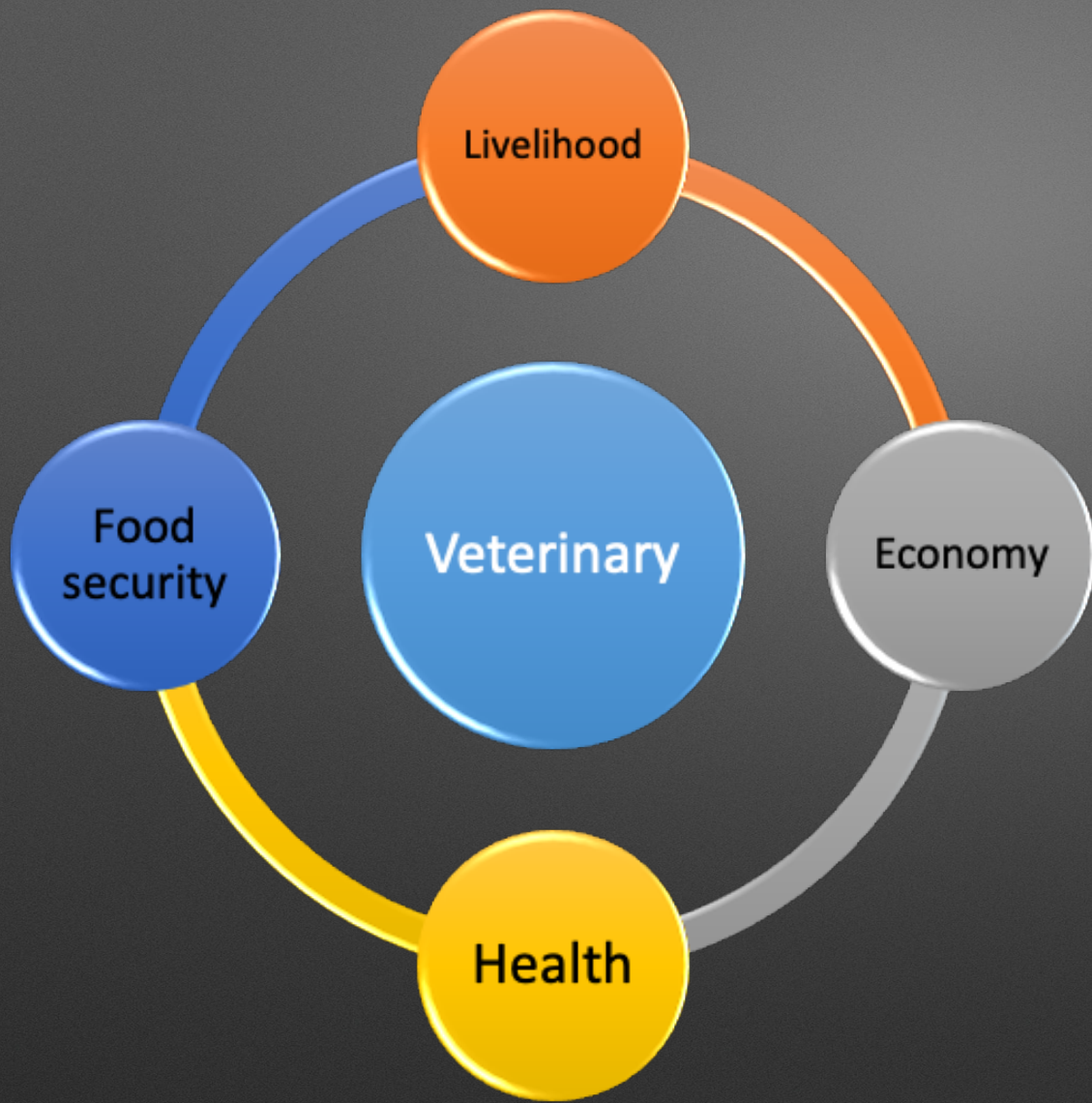


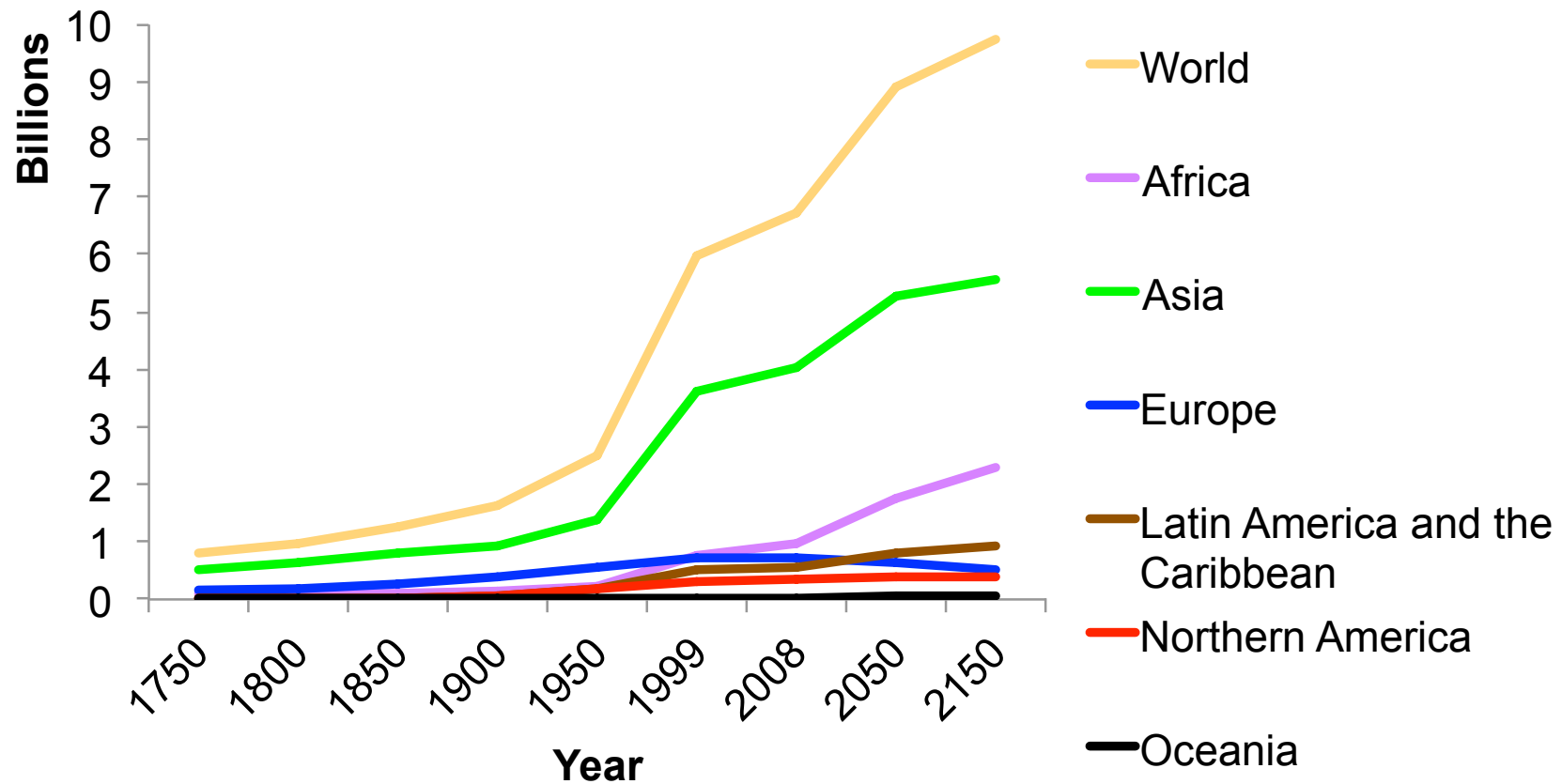
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Content

- Why is animal health surveillance needed for veterinary authority?
- What is animal health surveillance?
- How is animal health surveillance carried out?

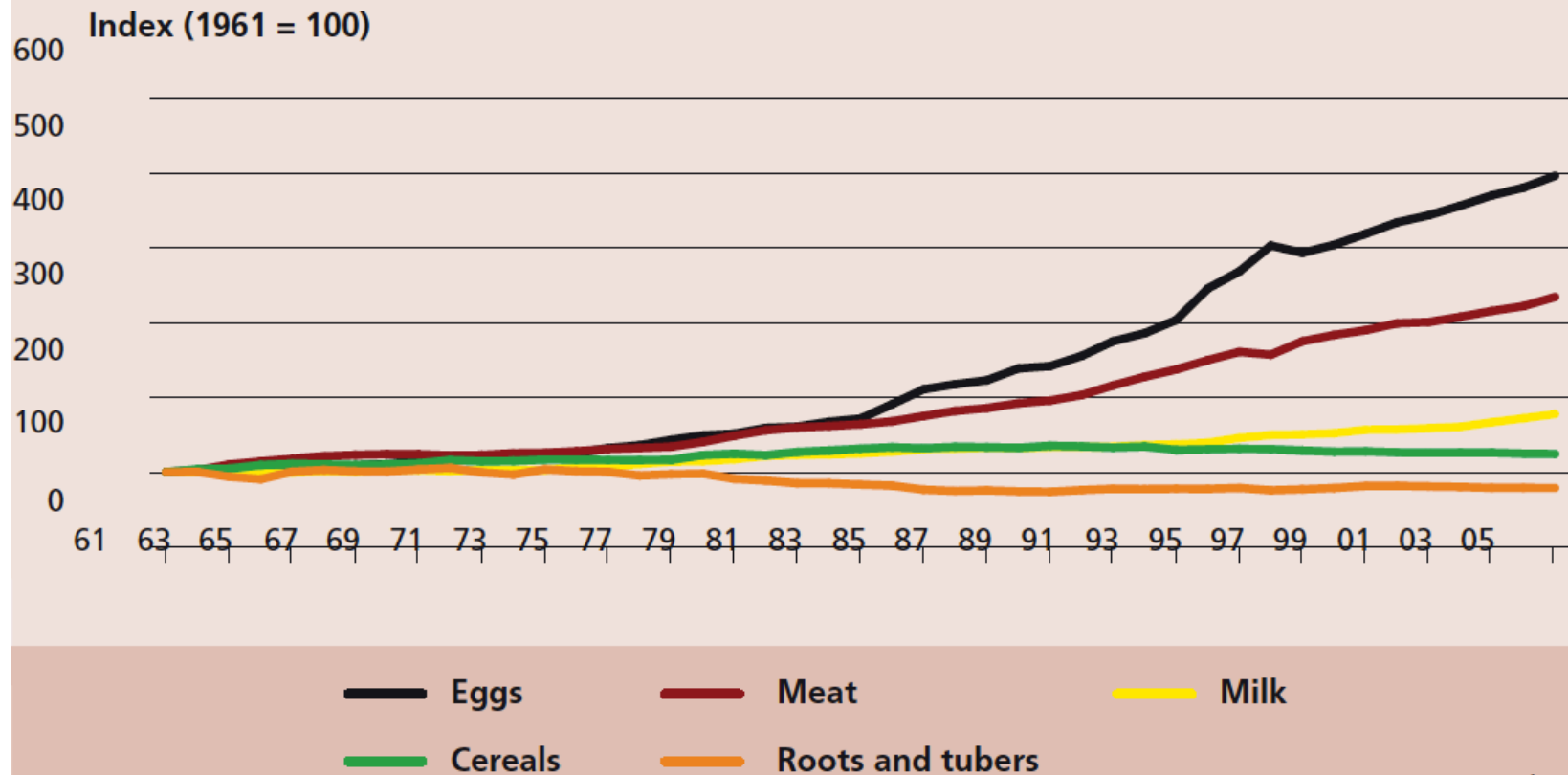
**Why is animal health surveillance
needed for veterinary authority?**





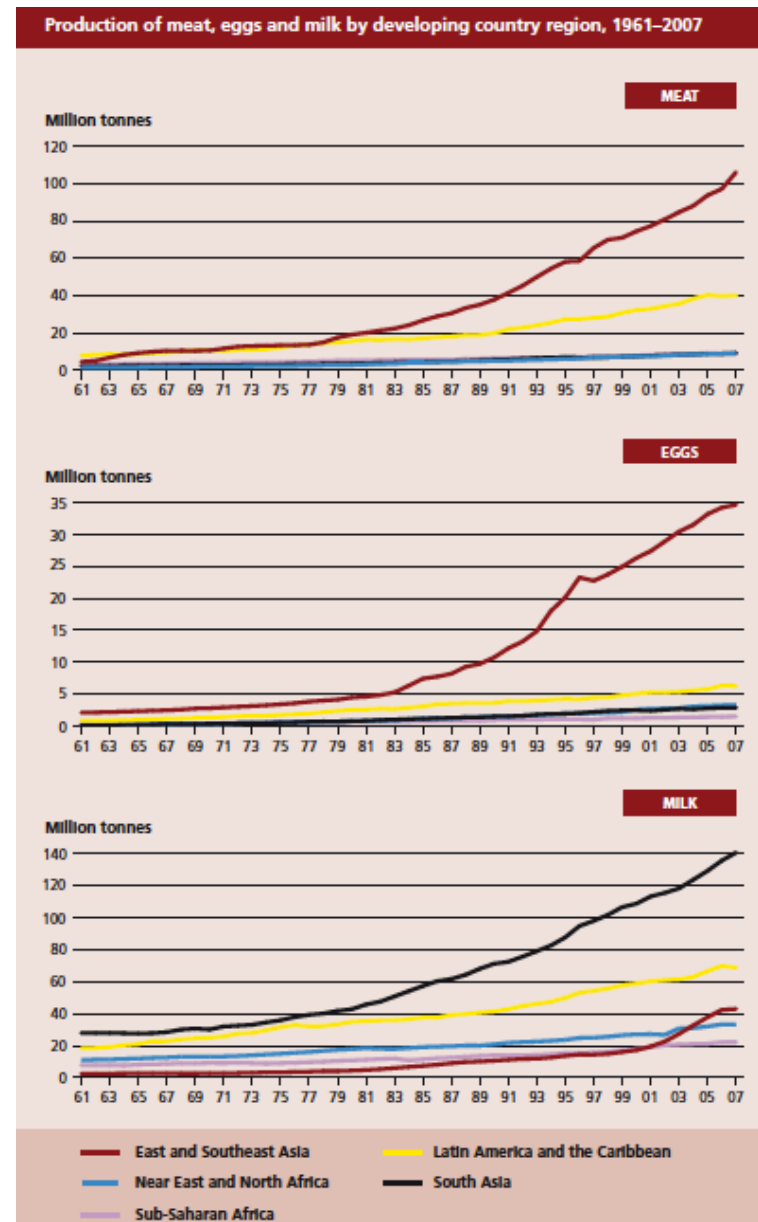
Increasing world population has resulted in increasing demand for animal protein consumption

Per capita consumption of major food items in developing countries, 1961–2005



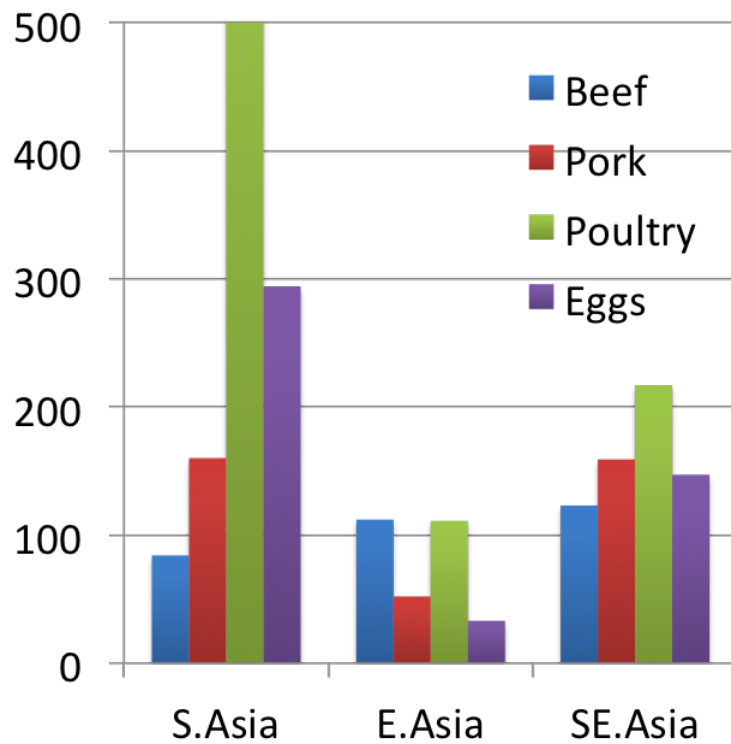
Source: FAO, 2009b.

- ▶ Increased production in response to higher demand of animal protein source
- ▶ Drastic increase has been observed in Asia; East and SE Asia for meat and egg, and South Asia for milk

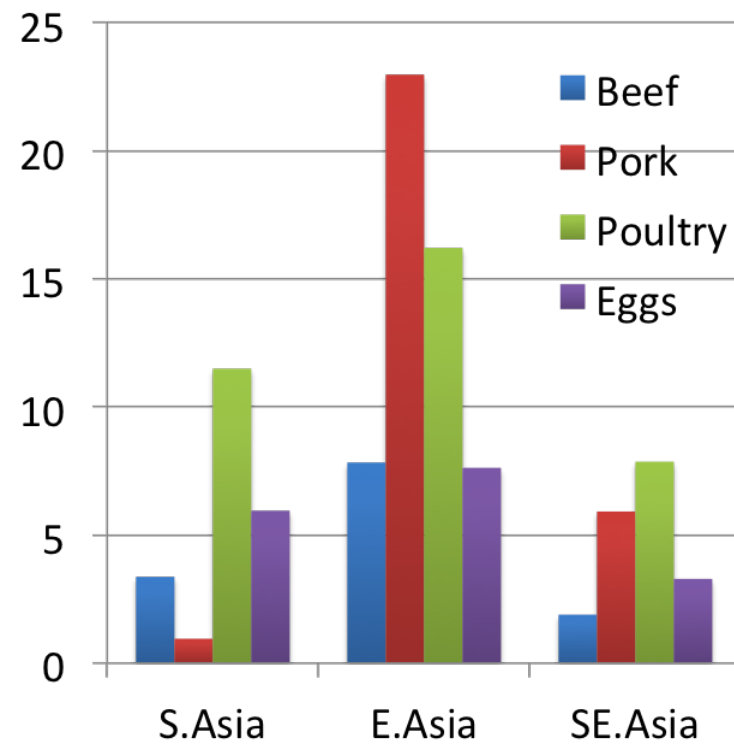


Demand Growth 2000 - 2030

Relative Growth (%)



Absolute Growth (mil tons)



40%

Demand for **animal** products per head increased over the last 30 years

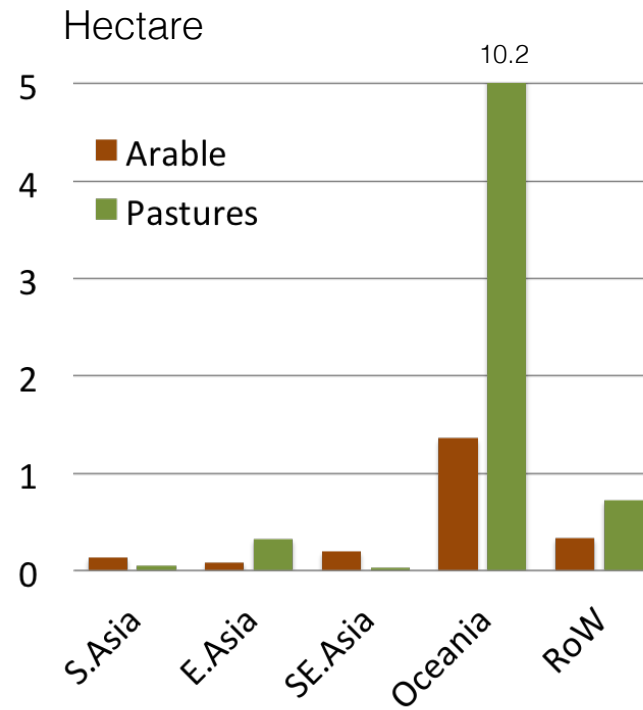
10%

Demand for **vegetable** products increased worldwide

half of the 900 million
people living below
the poverty line
depend on livestock



Agricultural land per person



Distribution of Pig Farm Sizes in China in 2016

Farms (no. of pigs)	Number	Percent
1 - 99	41,634,230	97.7%
100 - 499	718,590	1.7%
500 - 999	167,224	0.4%
1,000 - 4,999	77,737	0.2%
5,000 - 9,999	7,079	0.02%
$\geq 10,000$	4,572	0.01%



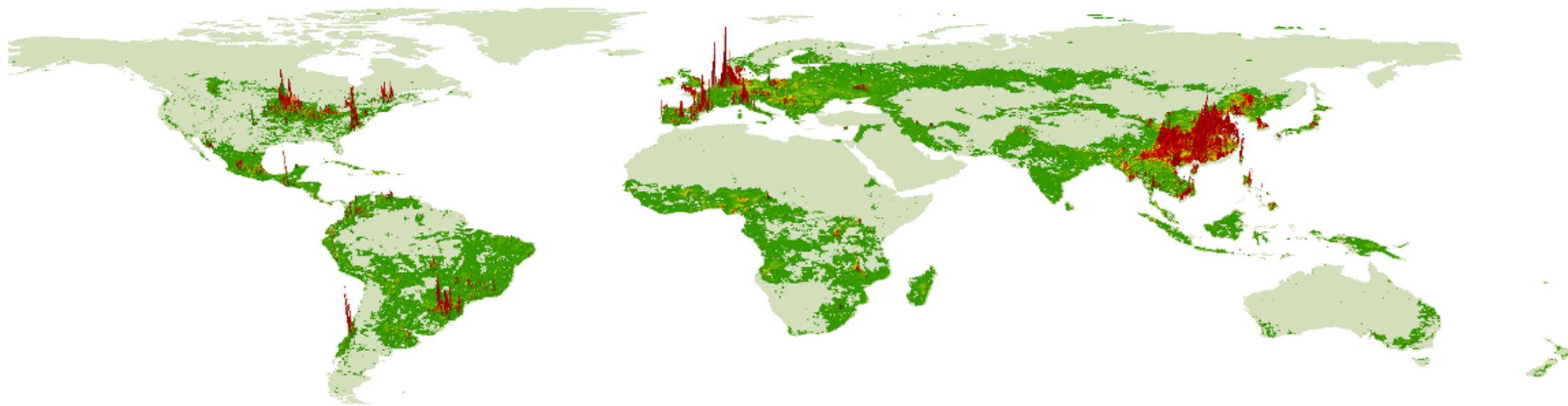
Global Mega Producers

- **Smithfield Foods/WH Group**, Smithfield, Va.
- **Triumph Foods**, St. Joseph, Mo.
- **The Maschhoffs**, Carlyle, Ill.
- **Seaboard Foods**, Shawnee, Kan.
- **JBS**, Greeley, Colo.
- **Pipestone System**, Pipestone, Minn.
- **Prestage Farms**, Clinton, N.C.
- **Iowa Select Farms**, Iowa Falls, Iowa
- **Carthage System**, Carthage, Ill.
- **AMVC Management Services**, Audubon, Iowa
- **Maxwell Farms**, Goldsboro, N.C.
- **Cooperl**, Lamballe, France
- **Miratorg**, Moscow



The industrialised countries make up only **20%** of the world population, they consume **80%** of all meat and milk in the world

The **80%** of the world's people in less-developed countries raise **60%** of the 3 billion domestic ruminants and 6 billion poultry in the world, but consume only **20%** of all animal products



Pig density data from: Gilbert,M., Cinardi,G., Zhao,Q., Tago,D., Robinson,T. 2019: New global pig data in support of the African Swine Fever epidemics. <https://doi.org/10.7910/DVN/JEV3WA>, Harvard Dataverse, V1

Pig density in 2015

Of the 1,461 diseases now recognised in humans, approximately

60%

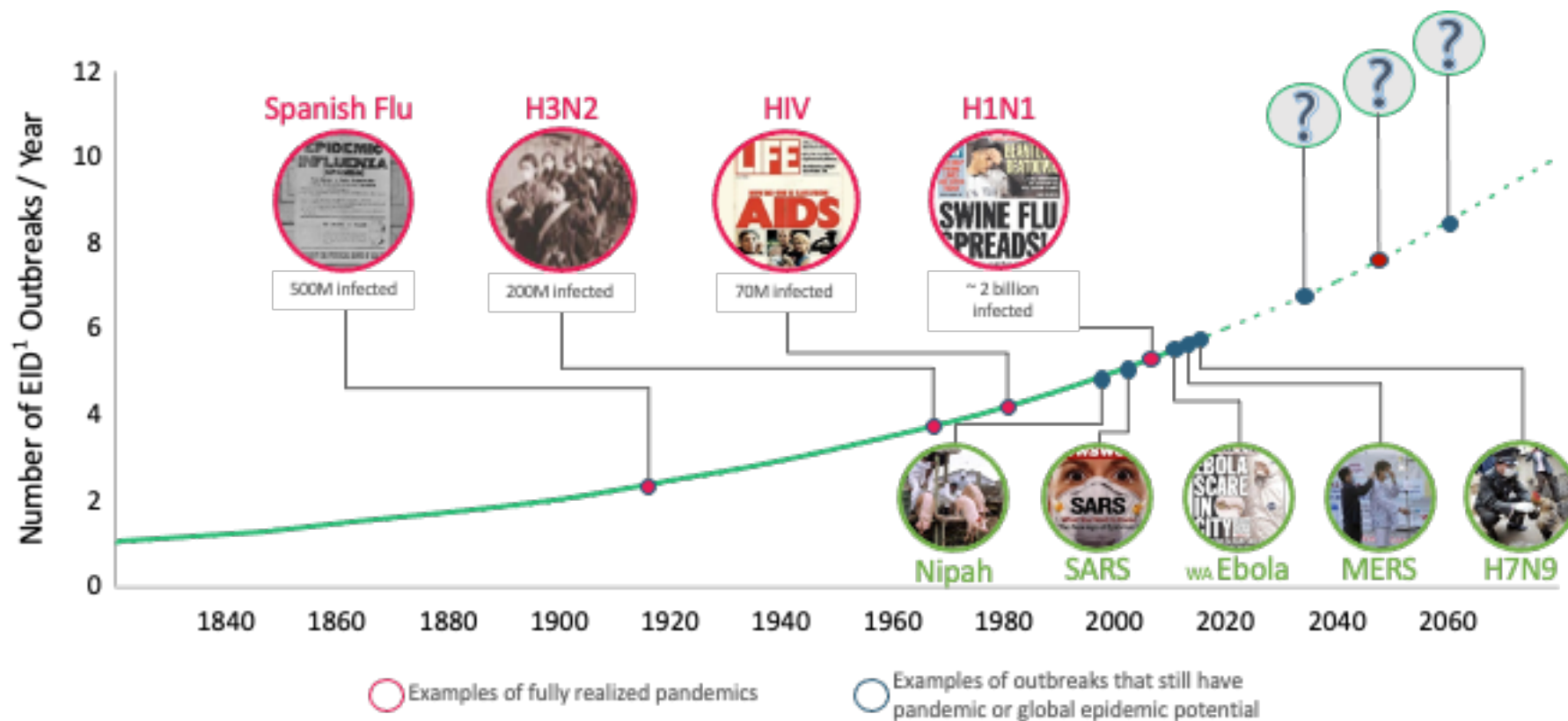
are due to multi-host pathogens

Approximately

75%

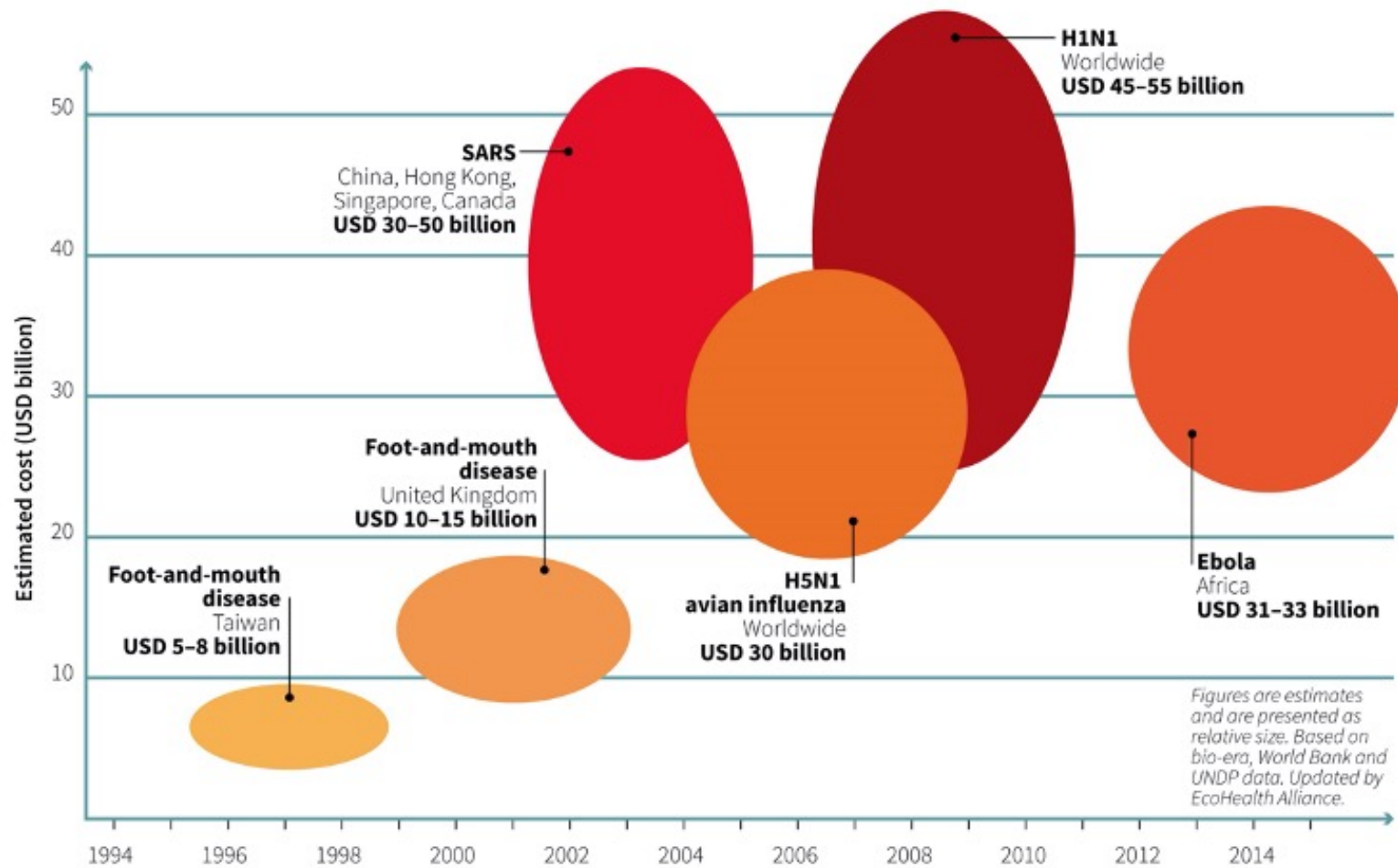
of recently emerging infectious diseases affecting human are of animal origin





1. EID: emerging infectious disease; only diseases with zoonotic emergence are included; Reference for graph: Allen et al. (2017) Nature Communications

Economic impact of selected infectious disease outbreaks



Needs for AH information

- Identify what diseases exist in the country
- Determine the level and location of the diseases
- Determine the importance of different diseases
- Set priorities for the use of resources for disease control activities
- Plan, implement, and monitor disease control programs
- Respond to disease outbreaks
- Meet reporting requirements of international organisations (e.g. OIE)
- Demonstrate disease status to trading partners

What is animal health surveillance?

What is AH surveillance?

Definition

- ▶ French: “to watch over”
- ▶ Close observation (Oxford.P.D,1992)
- ▶ A **continuous** and **systematic** process of collection, analysis, interpretation, and dissemination of descriptive information for monitoring health problems (Rothman, 1998)

What is AH surveillance?

Definition

- ▶ 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)
- ▶ Surveillance is the systematic ongoing **collection**, **collation** and **analysis** of data and the timely **dissemination** of information to those who need to know so that **action** can be taken (OIE Terrestrial Animal Health Code)

Events



Information

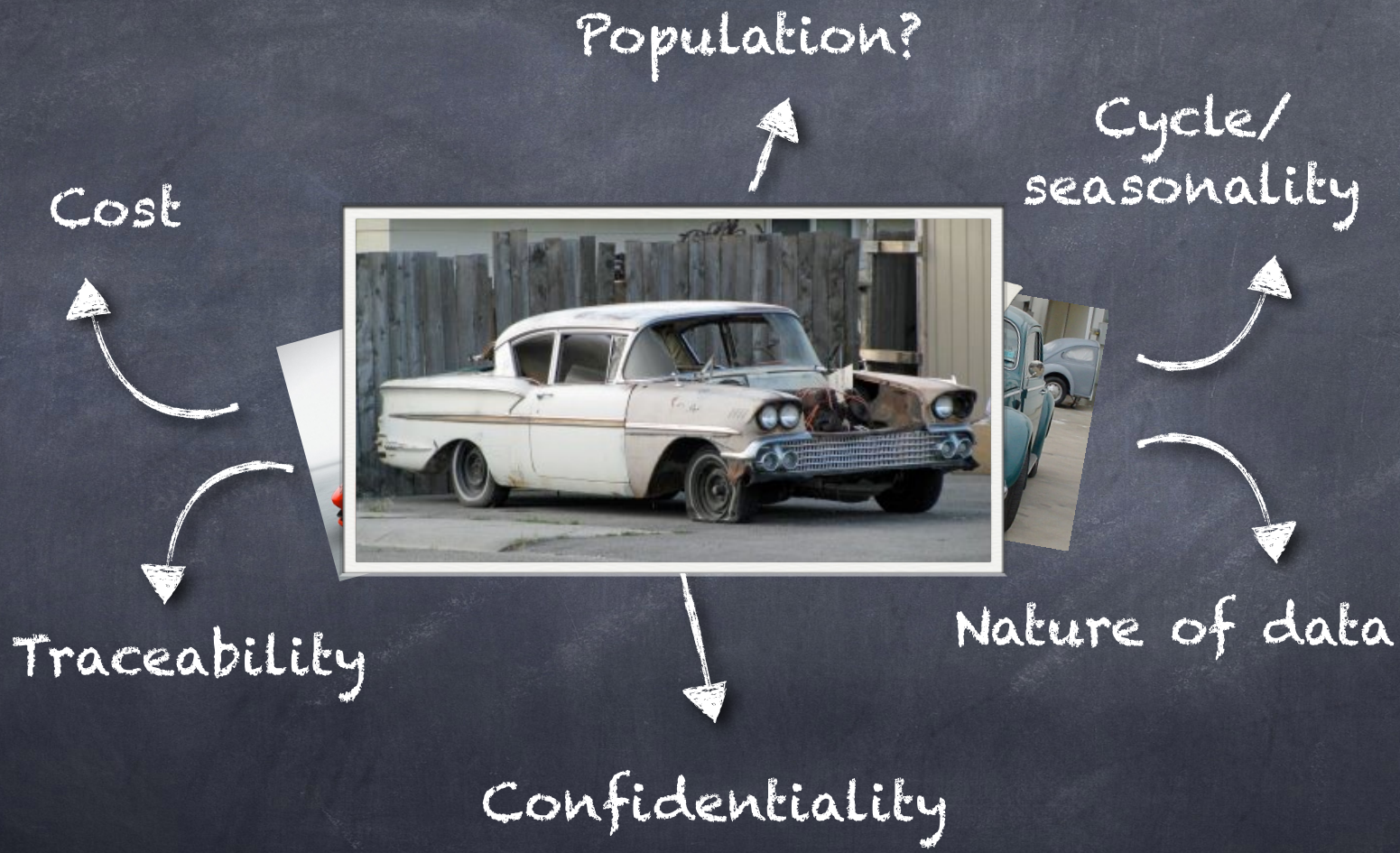


Utilization



**How is animal health surveillance
carried out?**





Setting objectives

Asking yourself what do you want out of your surveillance

- ▶ For early disease detection and response
- ▶ For supporting declaration of disease-free status
- ▶ For estimating magnitude of the problem
- ▶ For describing an event
- ▶ For monitoring changes in epidemiological situation
- ▶ For evaluating progress in disease intervention
- ▶ For disease control and eradication purposes
- ▶ Etc.

Setting objectives

Most common specific objectives

- ▶ Describe disease situation (determine prevalence and identify risk factors)
- ▶ Evidence to support declaration of the presence or absence of a disease

Identifying the population

Population, unit of interest, and samples

- ▶ Example 1: We wish to know more about brucellosis in goat, and decide to conduct a national survey to determine the level of the disease.
 - ✓ What would be the population, unit of interest, and samples
 - ✓ What are the factors for consideration

Identifying the population

Population, unit of interest, and samples

- ▶ Example 2: A provincial livestock officer is interested to know about the underlying situation of FMD in village cattle, which usually share a common grazing areas. The officer decide to conduct a survey within the province where he/she works.
 - ✓ What would be the population, unit of interest, and samples
 - ✓ What are the factors for consideration

Choose the right design

- ▶ Active vs Passive surveillance
- ▶ Scanning vs Targeted (probability-based) surveillance
- ▶ Clinical vs Laboratory-based surveillance
- ▶ Special types of surveillance
- ▶ Sentinel-based surveillance
- ▶ Participatory approach to surveillance

Active vs. passive surveillance

- ▶ **Passive surveillance:** The term passive is used to convey the idea that authorities take no action while waiting for diseases to be reported (e.g. disease reporting system, TADInfo, etc.)
- ▶ **Active surveillance:** Active surveillance involves outreach by authorities for disease information, such as regular visits to farms or hospitals (e.g. active collection of samples for HPAI)

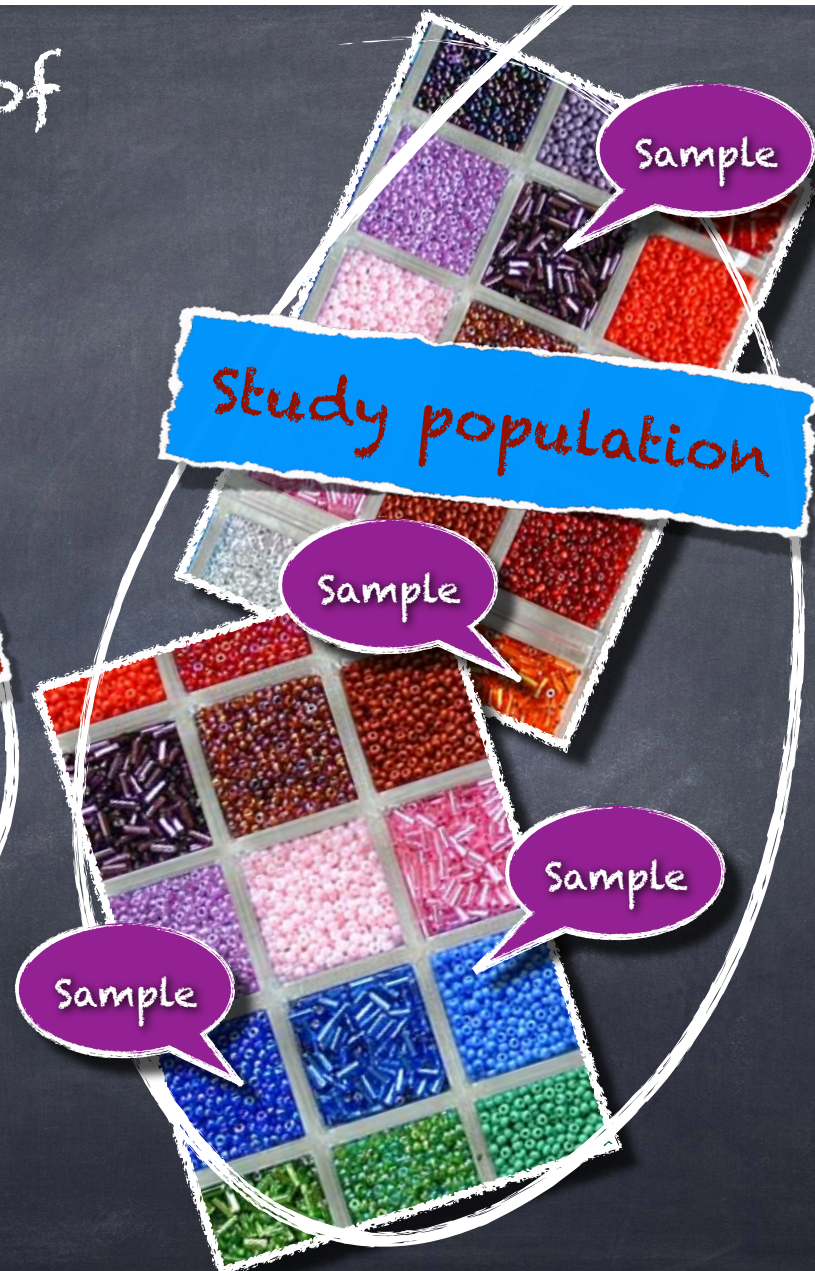
Active vs. passive surveillance

- ▶ While the terms are conceptually useful, they are often insufficient for describing a surveillance method (Rothman, 1998)
- ▶ Thus awkward terminologies; “modified active”, “stimulated passive”, “combined active/passive”, etc.

Active vs. passive surveillance

- ▶ Scanning (screening, random): the consistent and standardized collection of disease information from generalized populations of animals (e.g. Brucellosis surveillance)
- ▶ Targeted (Probability-based): collection of disease information from specifically identified at risk populations (e.g. BSE surveillance, AI surveillance)

Hierarchy (level) of population



Selection

Target population



Study population



Sample



Target population



Study population



Sample

Extrapolation

Sampling frame

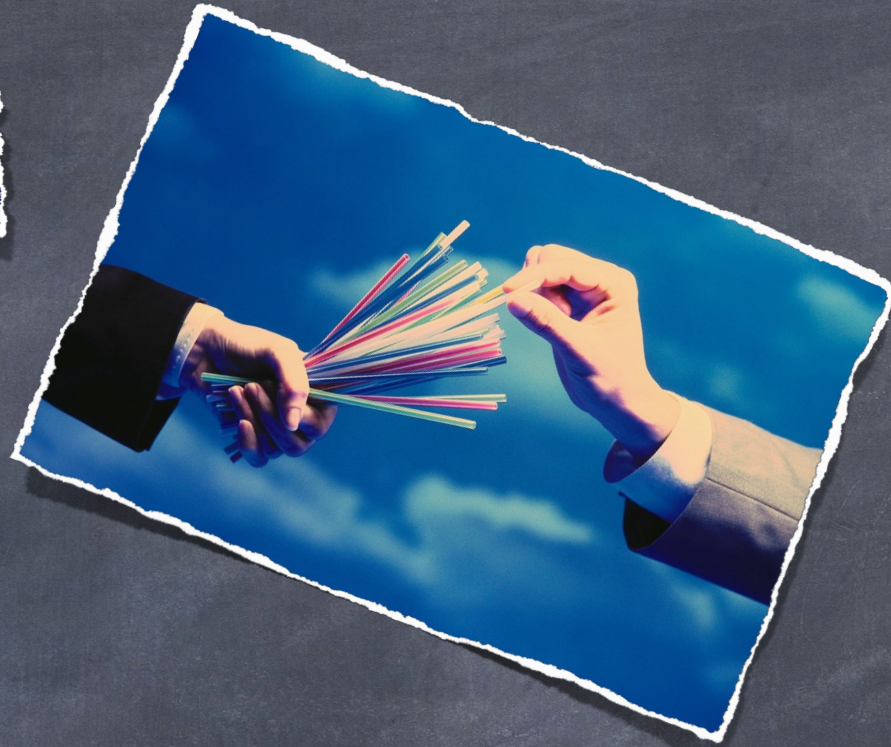
List of all sampling units in the target population

↳ Each individual sampling unit have a unique identification

- Name of all patients admitted to a hospital
- IDs of all animal in a quarantine station
- Geographical coordinates

Probability sampling

Probability of getting a sample can be calculated



Non-probability sampling

Selected samples have an unknown probability

Non-probability sampling

- ↳ Convenient / Haphazard
- ↳ Judgmental / Purposive
- ↳ Snowball

Probability sampling

- ↳ Simple random
- ↳ Systematic random
- ↳ Stratified random
- ↳ Cluster
- ↳ Multi-stage

Determining sample size

- Detect the presence of a disease (prove if a proportion is significantly greater than 0)
- Estimate the population proportion (prevalence)
- Estimate the population mean
- Detect the difference between two proportions
- Detect the difference between two means



Thank
you

