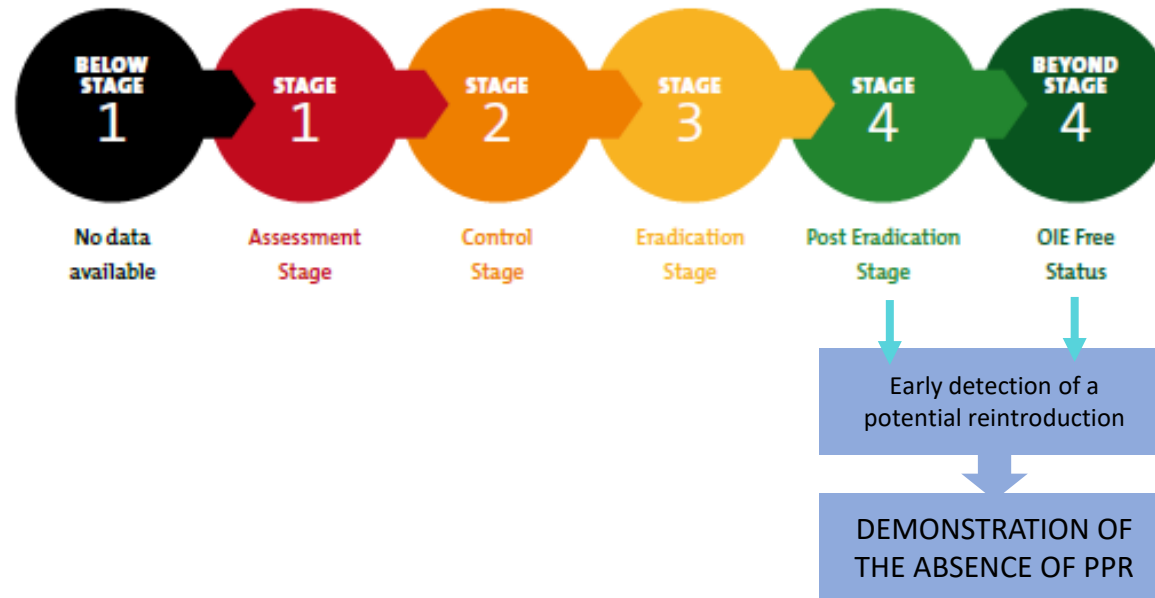


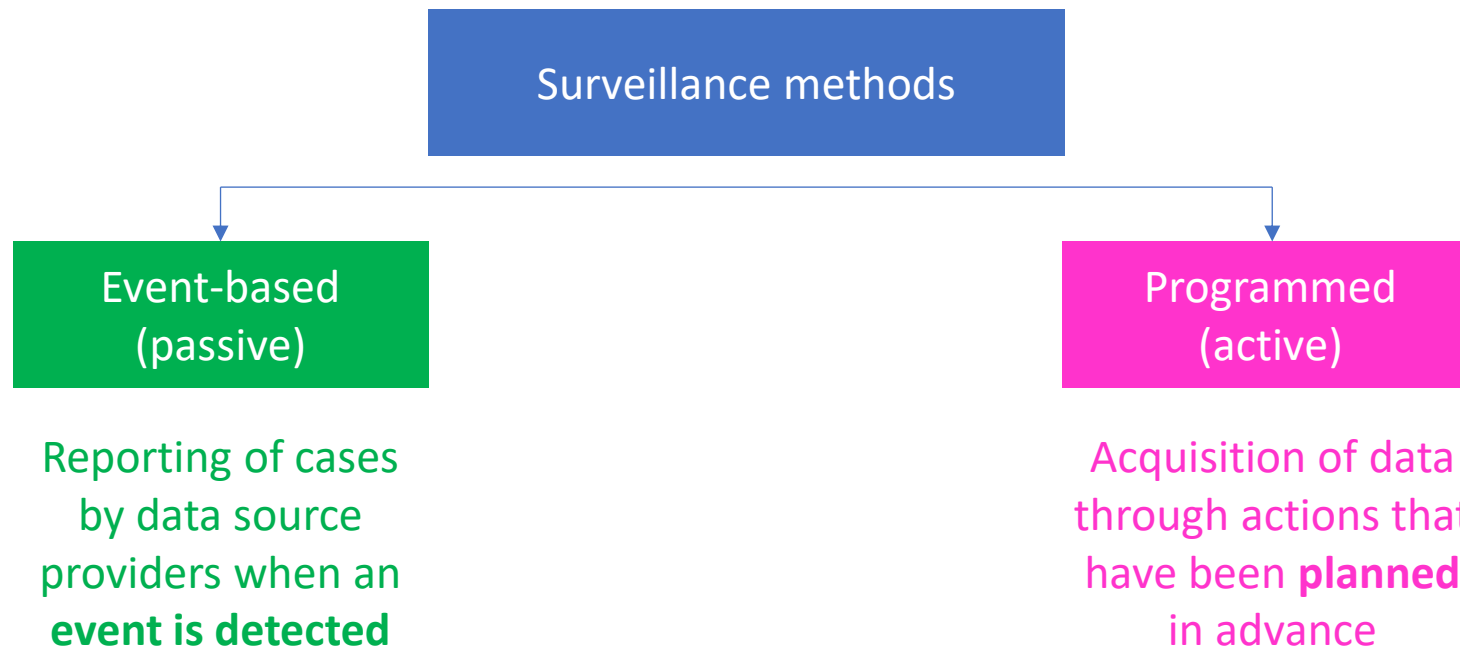
# Who is concerned?

- Countries seeking for the maintenance of the PPR free status
- Countries seeking for the reestablishment of the PPR free status following an outbreak
- Countries at post-eradication stage of the GSCE that seek for the PPR free status



# Which surveillance objective and strategy?

- To provide evidence that no PPR virus is circulating during the preceding 24 months
- In compliance with Terrestrial Animal Health code Chapter 14.7 29-33
- Combination of two surveillance methods



# Event-based surveillance in the context of disease freedom

Event-based  
(passive)

- Spontaneous reporting of suspected cases (herds, abattoirs, markets, parks, border inspection posts, etc.) by field actors (farmers, CAHWs, paravets, private vets, field agents in slaughterhouses, in parks, etc.)

Early  
warning  
system

- Suspected case definition as sensitive as possible (less specific) to increase the probability to capture all positive cases
- Efficient if effective reporting by all field actors -> animation of the surveillance network, initial and continuous trainings, awareness campaigns, appropriate reporting tools, etc.

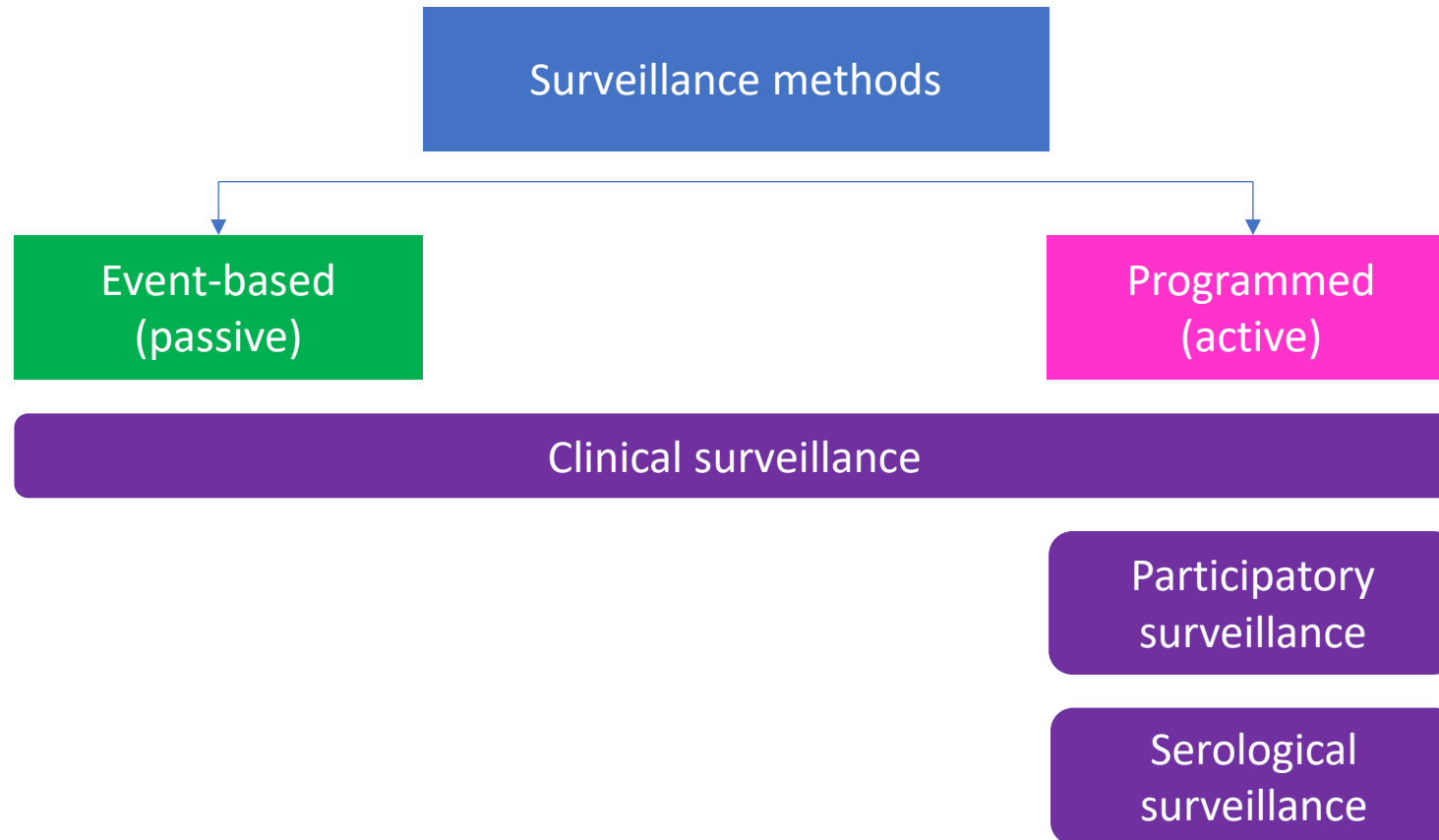
# Programmed surveillance in the context of disease freedom

## Programmed (active)

- Two main types:
  - Conventional surveillance: focus on the whole population of interest
  - Risk-based surveillance: focus on the population more likely to be infected (robust prior risk assessment study)
- Two investigation approaches:
  - Exhaustive : the entire target population is sampled  
Costly, only in specific eradication context
  - Sampling : a sub-set of the population
    - Random sampling: representative sample of the population
    - Targeted sampling: sample targeted to herds/individuals with a higher risk of infection or of being infected to increase the level of detection
    - Sentinels: repeated collection of samples in specific herds or individuals

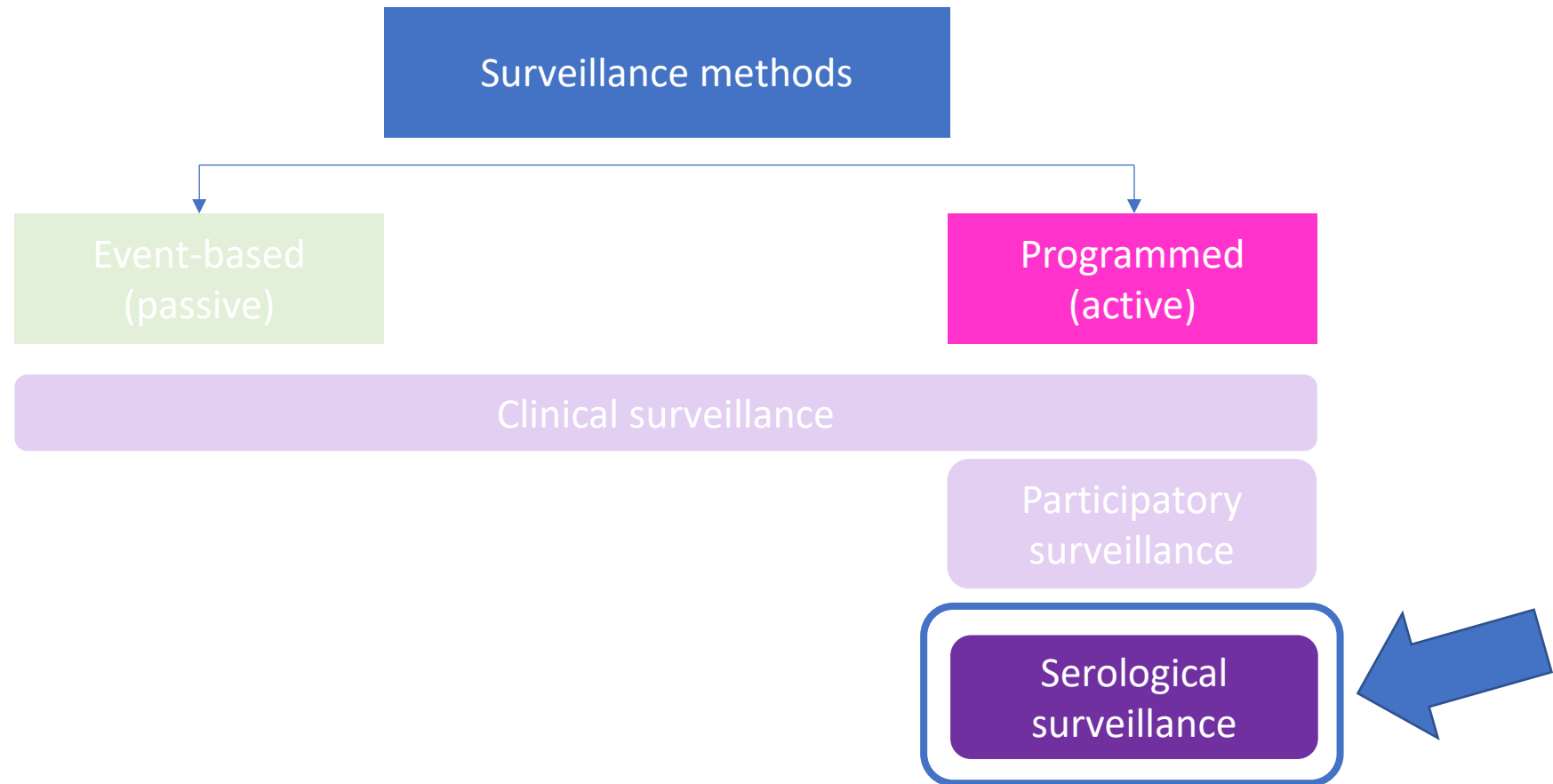
# Surveillance measurement method

Several methods to detect and count (suspected and confirmed) cases defined for the surveillance of the disease



# Surveillance measurement method

Several methods to detect and count (suspected and confirmed) cases defined for the surveillance of the disease



# Serological surveillance in the context of disease freedom

- Repeated sample collection of blood for serological testing in a given population
- Possible surveillance strategies
  - Risk-based surveillance, if reliable prior risk assessment analysis
  - Conventional surveillance
- Possible sampling strategies
  - Random
  - Targeted
  - Sentinel



# Surveillance methods

## Programmed (active)

### Random sampling:

- A representative sample of the population
- To follow trends or to prove freedom (prevalence)
- Detection of sub-clinic cases but inefficient for early warning

### Sentinel:

- Repeated collection of samples in specific herds or individuals
- For early warning (incidence)
- Costly surveillance – issue with animal mobility

### Targeted:

- Sample targeted to herds/individuals with a higher risk of infection or of being infected (farms with no biosecurity, etc.)
- Increasing the level of detection
- No extrapolation to the entire population

# Serological surveillance in the context of disease freedom

- Based on ELISA test
  - Consideration of the test sensitivity and specificity for result interpretation
  - Consideration of the lab proficiency and measure uncertainty
- Population of interest
  - unvaccinated small ruminant herds in absence of DIVA vaccines
  - atypical hosts? Interesting for countries at post-eradication (persistence of vaccinated animals) but no validated test kits
- Investigation of positive tests: vaccination history of positive animals, recent introduction/origin of the animal, confirmation of lab results with a more specific test, etc.



Information on protocols, reference material, training available from the WOAHP network of reference laboratories for PPR

<https://www.ppr-labs-oie-network.org/>



# Example of serological surveillance protocol in the context of disease freedom

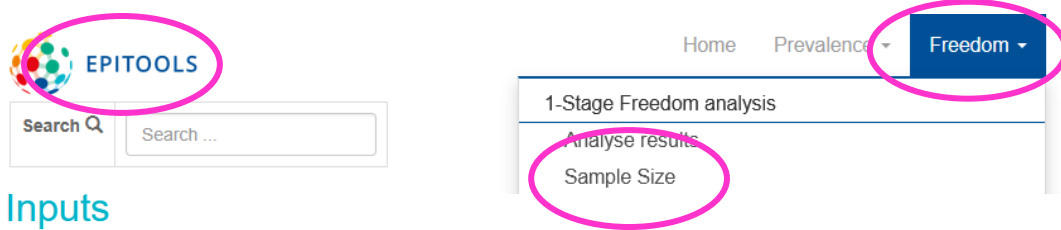
- Definition of the target population
  - all susceptible small ruminants in the territory of interest (conventional surveillance)
  - all susceptible small ruminants in predetermined at-risk areas (risk-based surveillance)
- Choice of the appropriate epidemiological unit (EU)
  - unit including animals with the same probability of being infected with PPRV
  - balance between the EU size (risk homogeneity), geographical coverage, and data availability (availability of lists for selection)
  - municipalities, villages or herds
- Assumptions to prove absence of disease (context dependant)

Example: 5% of EU with at least one positive animal; animal seroprevalence of at least 30% in infected EU (GSEC)



# Example of serological surveillance for freedom of disease

- Sampling strategy (1/4):
  - Number of EU to be visited: calculated to detect at least 5% of seroprevalence with 95% confidence interval



## Inputs

Test sensitivity	1
Test specificity	1
Population size	1200
Design prevalence	0.05
Diseased elements	60
Analysis method	Modified hypergeometric exact
Target Type I error	0.05
Target Type II error	0.05
Population threshold for infinite probability formula	10000
Maximum sample size	3200

Interpretation:	If a random sample of <b>57</b> units is taken from a population of <b>1200</b> and <b>0</b> or fewer reactors are found, the probability that the population is diseased at a prevalence of <b>0.05</b> is <b>0.05</b> .
Method:	Modified hypergeometric exact

Global strategy for the control and eradication of peste des petits ruminants. Annex 3.5. Surveillance

Number of epi Units	Sample size
0- 25	All
26-30	26
31-40	31
41-50	35
51-70	40
71-100	45
101-200	51
201-1,200	57
>1,200	59

# Example of serological surveillance for freedom of disease

- Sampling strategy (2/4):
  - Allocation of the number of EU across all the territory if conventional surveillance or in predetermined at-risk areas if risk-based surveillance
  - Allocation method of the EU across the territory:
    - using stratification (animal population size, farming system, etc.)
    - based on administrative levels and size (proportional to the population size of EU in the upper administrative unit)
  - Selection
    - Randomly to ensure representativeness
    - Targeted to EU more likely to be infected to increase detection level



# Example of serological surveillance for freedom of disease

- Sampling strategy (3/4):
  - Number of animals to be sampled in each EU: calculated to detect at least 30% of seroprevalence with 95% confidence interval

Parameter	Value
Test sensitivity	1
Test specificity	1
Population size	56
Design prevalence	0.3
Diseased elements	17
Analysis method	Modified hypergeometric exact
Target Type I error	0.05
Target Type II error	0.05
Population threshold for infinite probability formula	10000
Maximum sample size	3200

Global strategy for the control and eradication of peste des petits ruminants. Annex 3.5. Surveillance

Number animals in epi unit	Sample size
1-6	All
7-10	6
11-25	7
26-55	8
>56	9

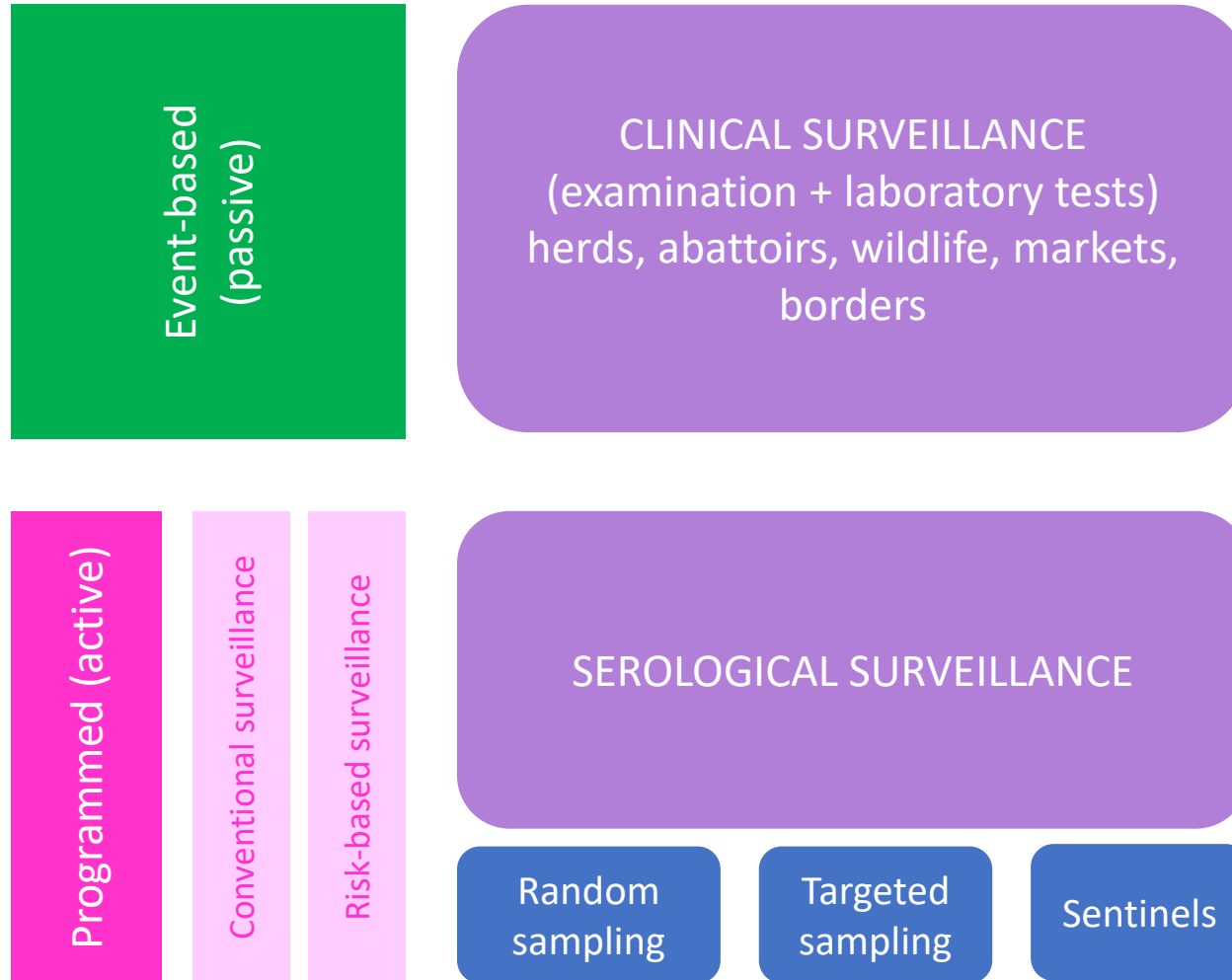
Interpretation:	If a random sample of <b>8</b> units is taken from a population of <b>56</b> and <b>0</b> or fewer reactors are found, the probability that the population is diseased at a prevalence of <b>0.3</b> is <b>0.0433</b> .
Method:	Modified hypergeometric exact

# Example of serological surveillance for freedom of disease

- Sampling strategy (4/4):
  - Selection of the animals:
    - Targeted to animals more likely to be infected
    - Randomly if no suspect animal
    - Animals aged 3 to 12 months (to exclude animals with maternal antibodies, vaccinated animals for countries with vaccination history)
  - 1 blood sample (+ rapid test on suspected cases if possible)



# Conclusion



# Thank you



WOAH Reference Laboratory  
for peste des petits ruminants

Reference Centre



World Organisation  
for Animal Health  
Founded in 1924



**WOAH**

Reference Laboratory  
Network for PPR