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Classical Swine Fever in wild boar: Evaluation of different surveillance strategies in times of disease freedom

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Insel Riems, 14.09.2015

Case study:

- Classical Swine Fever (CSF) is a highly contagious viral disease
- Wild boar play role in disease introduction into commercial pig holdings
- CSF outbreak may have a huge economic impact
- Last case in wild boar in Germany in 2009
- Vaccination stopped in 2012
- Since 2012 => Germany officially free of CSF

Surveillance:

- Council directive (2002/106/EG)
  - To demonstrate freedom from disease
  - 5% prevalence to be detected at 95% confidence
  - i.e. 59 samples/year at district level
  - Currently examined serologically and virologically (usually PCR)
  - Recommendation: sampling all “passive” animals
- Implementation depended on federal states

Objective:

- Development of alternative (risk-based) surveillance strategies for CSF in wild boar
- Evaluation of the current and the alternative surveillance systems

Design tool: development of alternative strategies based on risk

- Sensitivity:

Sensitivity can possibly be increased by targeting for example areas with high population densities, complex movement patterns, special geographical features or other population level risks and high-risk periods that may affect the risk of infection

Sampling in
- defined age groups
- in districts with higher population densities
- in hunting season

Risk-based targeting can increase sensitivity

The use of tests in series (screening and then confirmatory) reduces sensitivity. If screening is needed (due to costs) consider the tests with high sensitivity. Two tests can also be used in parallel (samples positive in any of the two tests are considered positive) in order to increase sensitivity

Sensitivity is higher when simulating the performance of virological and serological tests at the same time

Design tool:

- Timeliness:

Consider simple, rapid methods of reporting to ensure notifications are received quickly e.g. phone, email vs postal methods of reporting will speed up the process and minimize the potential for further spread of disease before risk mitigation procedures are put in place

Improvement of acceptability
Incentives for hunters

To improve timeliness between different steps of the surveillance system, you can aim to reduce the time of getting the samples from the field to the laboratory, time needed to start and carry out diagnostic testing, data management, report generation and dissemination of findings

Increased sampling frequency will reduce the time to detection

The more samples were taken within one year, the better the timeliness

Surveillance strategies:

- 69 strategies incl. conventional strategy (59 serological samples/year/district) => **reference strategy**

Age	Population density	Season	Passive	Extra
Adults	Only districts with pop density above a defined threshold	Hunting season (NDJ)	Combined with active surveillance strategies	Change in the sample size
Sub-adults	Sample size dependent on pop density	Quarterly (JAJO; FMAN; MJSD)	All passive	50; 40; 30; 20; 10
Piglets			50% passive	120 NDJ

EVA Tool

- Evaluation questions:
  - ➢ Assess the costs and effectiveness of surveillance components (out of two or more) to determine which achieves a defined effectiveness target at least cost, the effectiveness needs to be determined
- Evaluation attributes

a) Performance criteria	b) Economic criteria
Sensitivity	Cost-effectiveness
Timeliness	
Acceptability	

- Economic evaluation
  - Cost-effectiveness
- Evaluation of the alternative surveillance components

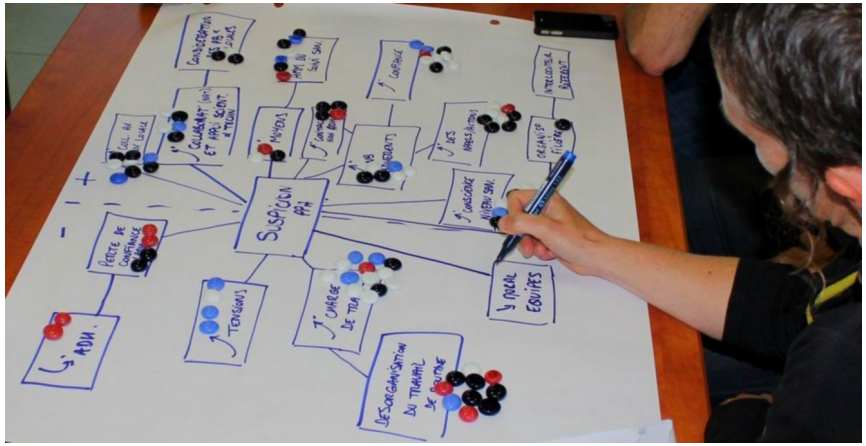
Simulation model:

- Investigation of **sensitivity** and **timeliness**
- Simulation of the introduction of CSF virus into an unvaccinated wild boar population, which is free from disease
- Model data resulted from data of three different federal states of Germany

1. Generation of the wild boar population
2. Simulation of infection
3. Simulation of hunting
4. Simulation of different surveillance strategies
   (1) Sampling a. randomly distributed; b. on the basis of real data
   (2) Testing a. only serologically; b. only virologically; c. both

Acceptability: ACCEPT method

'**Willingness** of persons / organisations **to participate** in the surveillance system and to the degree to which each of these users is involved in the surveillance' (Drewe et al, 2012)



Acceptability of the OBJECTIVE

Acceptability of the OPERATION

TRUST

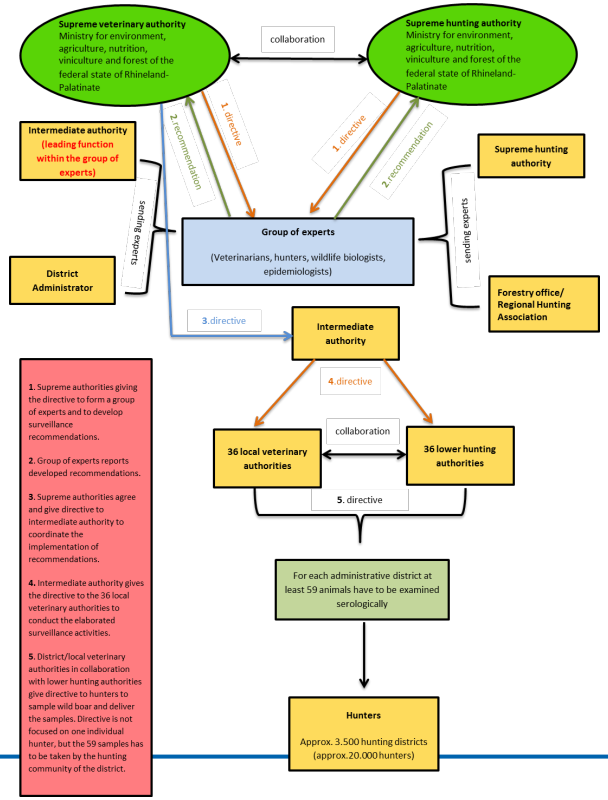
Credit photos: @Calba

Calba C, Antoine-Moussiaux N, Charrier F, Hendrikx P, Saegerman C, Peyre M, Goutard FL. Applying participatory approaches in the evaluation of surveillance systems: A pilot study on African swine fever surveillance in Corsica. Prev Vet Med. 2015 Dec 1;122(4):389-98. doi: 10.1016/j.prevetmed.2015.10.001. Epub 2015 Oct 17. PubMed PMID: 26489602.

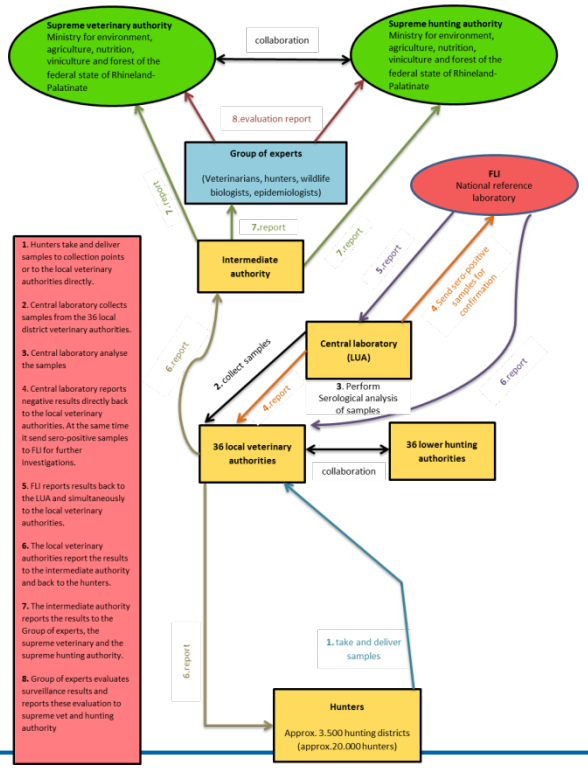
System mapping

- Use of OASIS tool

Down flow



Up flow

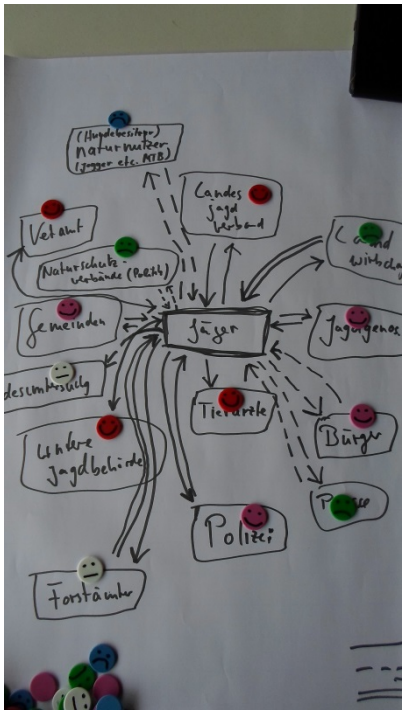


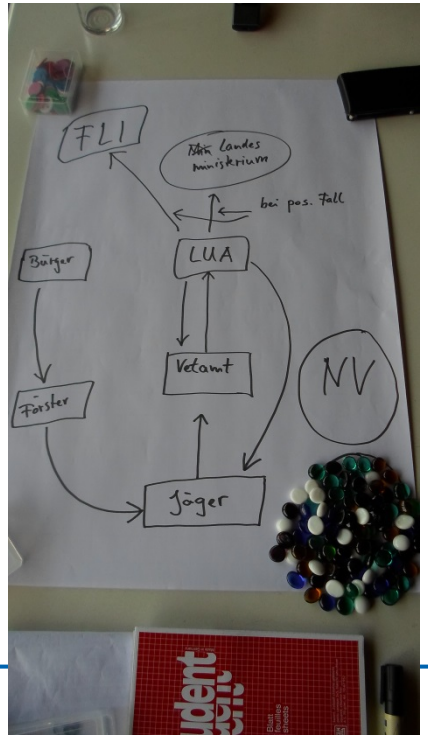
Cost-effectiveness:

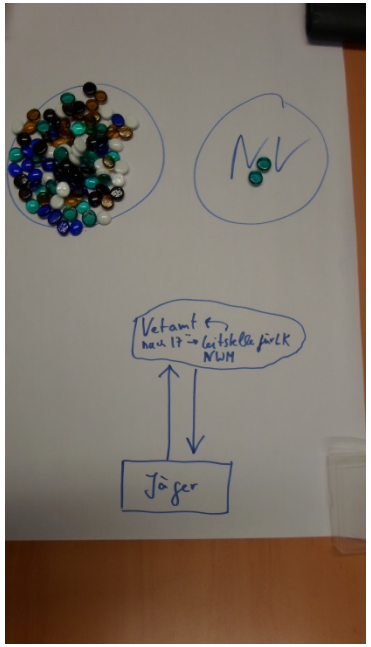
- Final output of the effectiveness measure was a detecting probability of at least 95% (simulation model)
- For all strategies with this performance, cost estimates were calculated
- Only consideration of costs, which change within different strategies
- Costs of conventional strategy => reference value
- Calculation of the difference for each eligible strategy

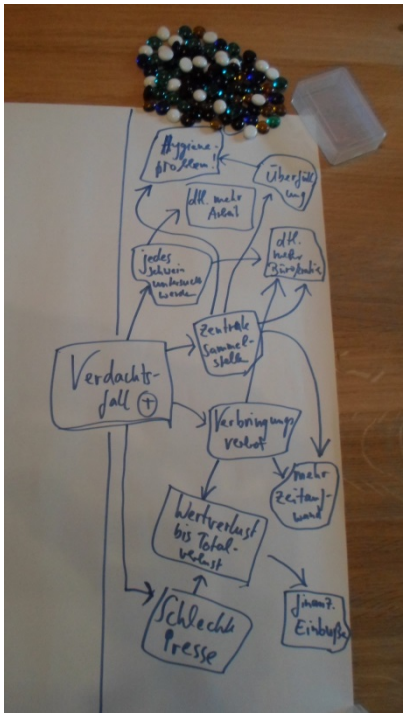
Acceptability:

- Semi-quantitative and -qualitative analysis



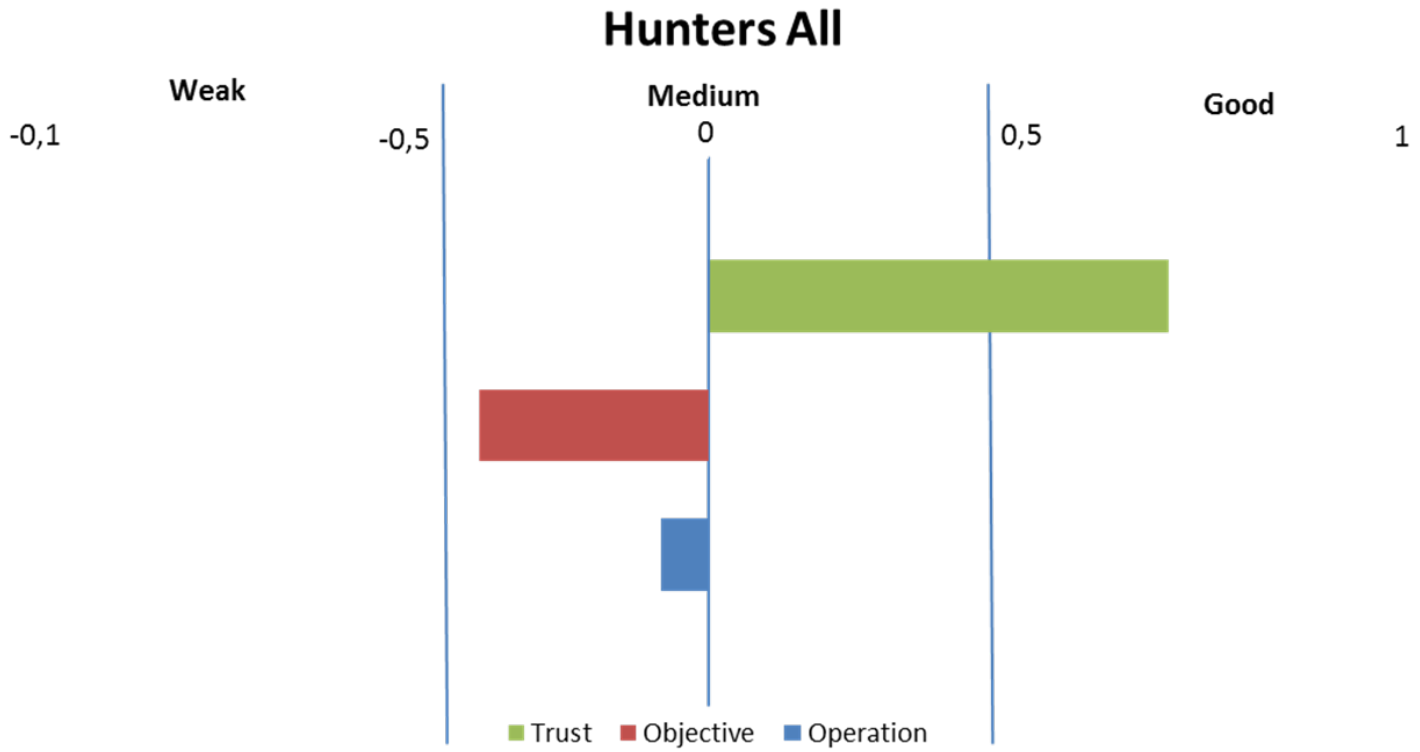




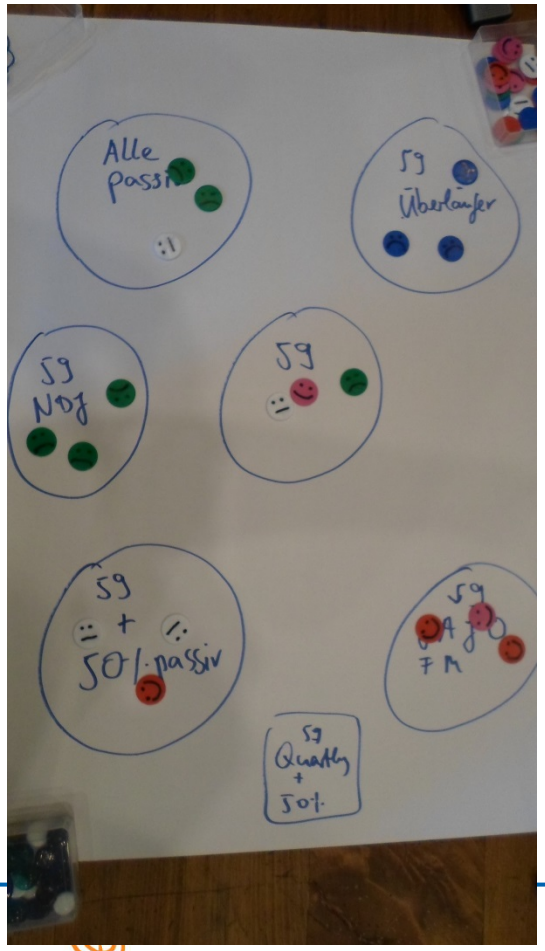


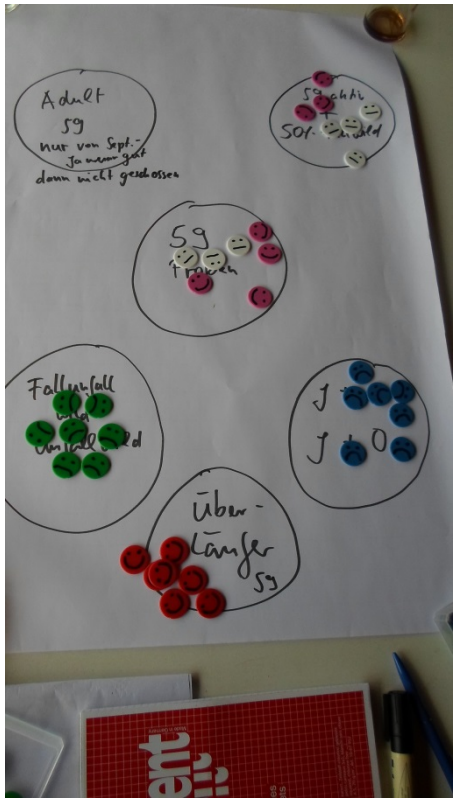
Acceptability of the system:

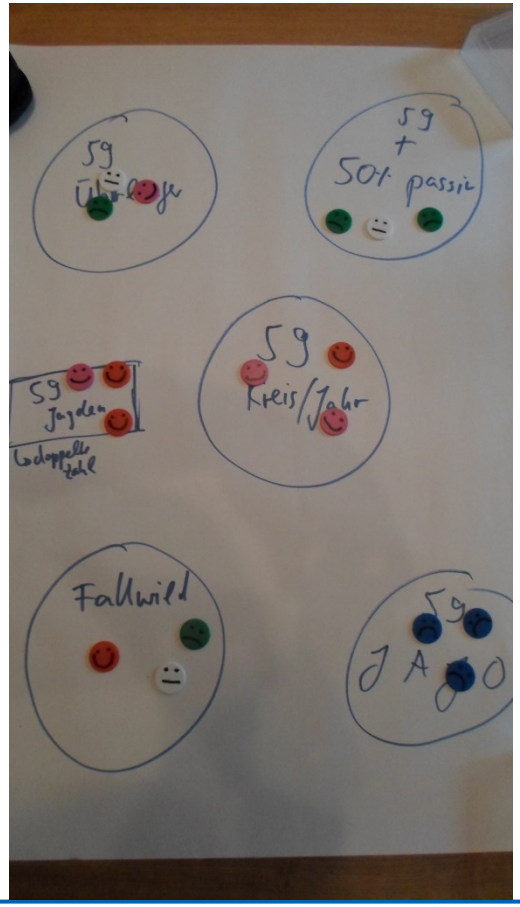
- Analysis done by using assessment tables developed by Calba et al. (2015)



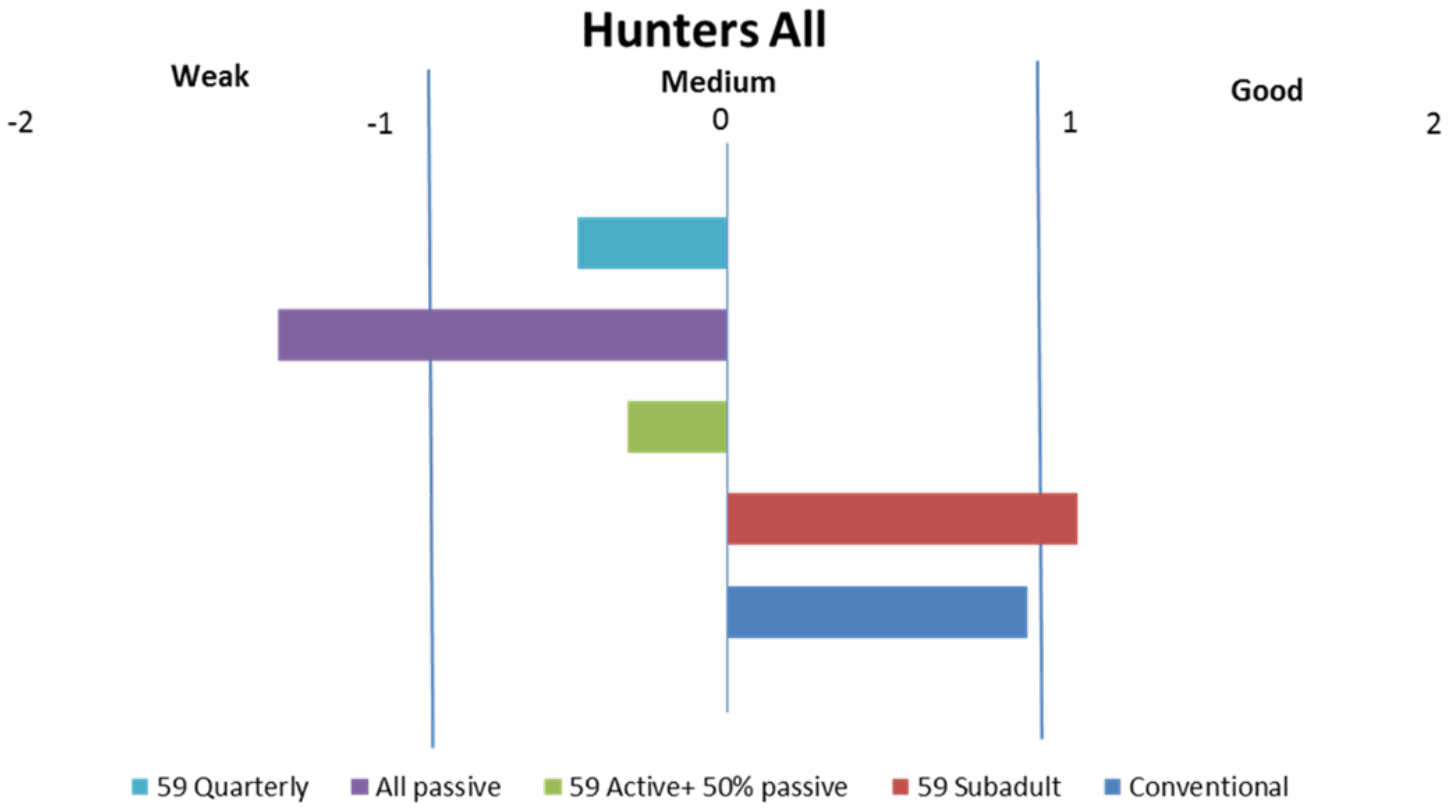
Acceptability of the strategies:







Acceptability of the strategies:



Summarized assessment:

- Block 2: All strategies resulting in a detecting probability of at least 95%, for which acceptability was also investigated (4 evaluation attributes)

Strategy	Sensitivity	Timeliness	Acceptability	Cost-difference	Total
59 sero sub-adults	99.76 (2)	0.123 (1)	1 (1)	0 (2)	1.5
Conventional sero	99,95 (1)	0.117 (2)	0.86 (2)	0 (2)	1.75
59 sero quarterly (MJSD)	99.72 (3)	0.113 (3)	-0.43 (3)	-28,800 (1)	2.5

- Risk-based approaches have the potential to constitute powerful surveillance alternatives
- **The more evaluation attributes included, the better the informative value of evaluation**
- Feasibility and prioritization of evaluation attributes have to be considered

- In times of disease freedom and in an unvaccinated population no need for serological AND virological examination
- Passive surveillance needs improvement

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Surveillance in wild boar - without hunters' acceptability a difficult task. A participatory study.

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Acknowledgement

Thank you very much for your attention

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Any questions?