Optimising targeted surveillance for bovine virus diarrhoea virus

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BVDV in Norway

- 1986: 28% Norwegian cattle herds

  (Løken et al., 1991)

- 1992: control programme starts

  (Løken and Nyberg, 2013)

- 2007: not detected since

- 2011: probability of freedom 99.6%

  (Norström et al., 2014)

Surveillance of BVDV in cattle in Norway

- Dairy herds
  - Population 8771 herds (2015)
  - ~1,200 herds sampled yearly
  - random selection
  - BVDV-antibodies in bulk milk

- Beef suckler herds
  - Population 4131 herds (2015)
  - ~1,200 herds sampled yearly
    - ~ 3,000 – 5,000 blood samples
  - BVDV-antibodies in blood

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Aims

- To compare risk-based sampling approaches in dairy cattle to the present sampling scheme for BVDV
- Use registry data to differentiate herds
- 2012 data

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Risk-based sampling

- Differences in the probability of
  - having the infection or being infected
  - detecting the infection

- How to differentiate herds?
  - Divide into subpopulations
    - herd characteristics and management (herd size, purchase patterns, contacts, age at first calving)
    - disease registrations
    - mortality
    - production performance (milk yield, slaughter weight, slaughter classification, reproduction performance)
    - other unspecific indicators (calf health, veterinary treatments)

Finding the sub-populations

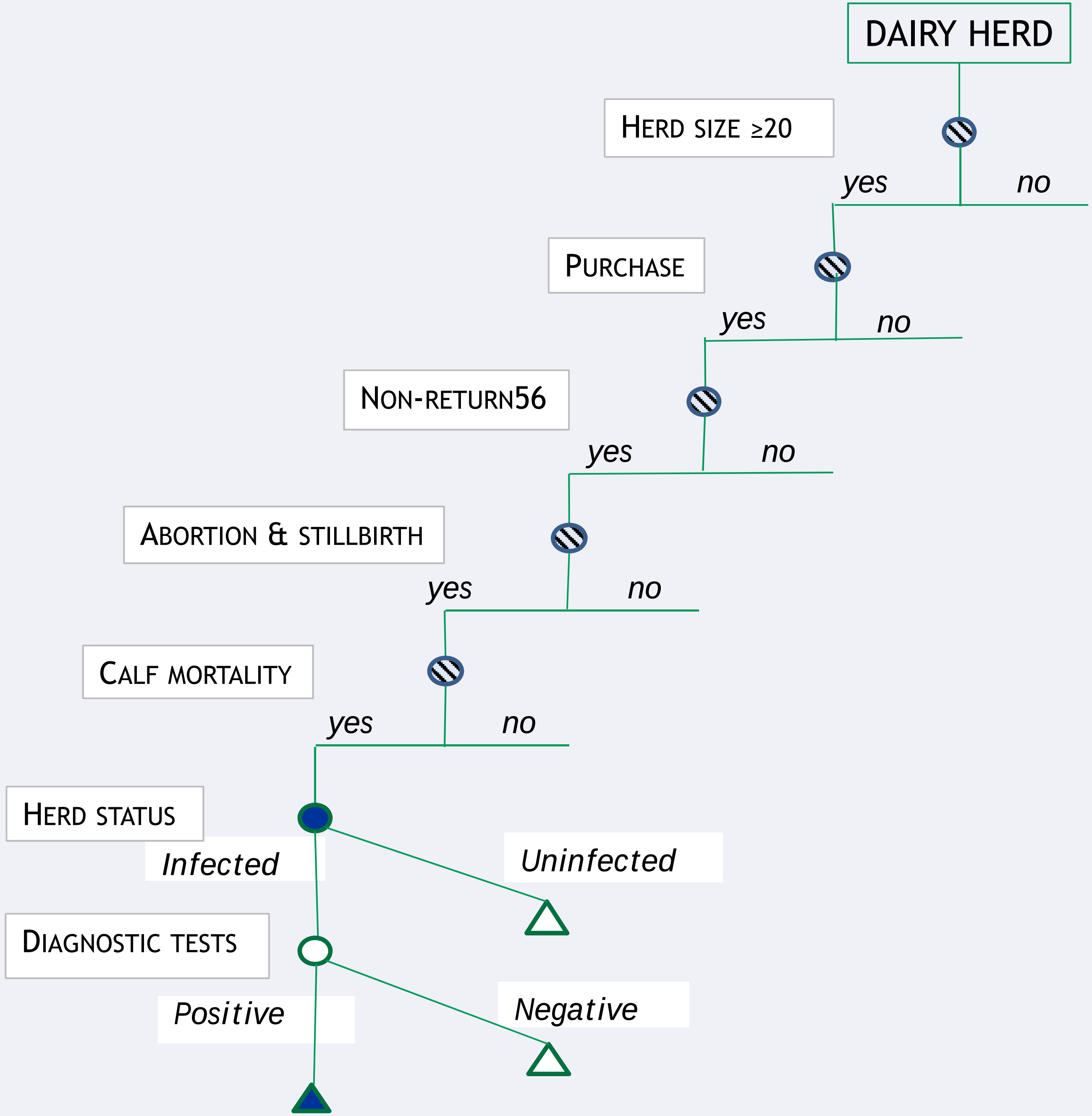
- Historical data

- 1996
- All dairy herds tested (n=16,856)
- 2.7% BVDV positive

- Variables from the National Dairy Herd Recording System (kukontrollen)
- Univariable logistic regression to obtain *herd-level risk-indicators*
- Outcome BVDV +/- herd

Selection of risk-indicators

Risk-indicator	Relative risk
Herd size ≥20	3.9
Purchase (≥2 animals)	2.1
Non-return56 (≥2 animals)	1.9
Abortion (≥2 animals)	2.3
Calf-mortality (≥2 animals)	1.9



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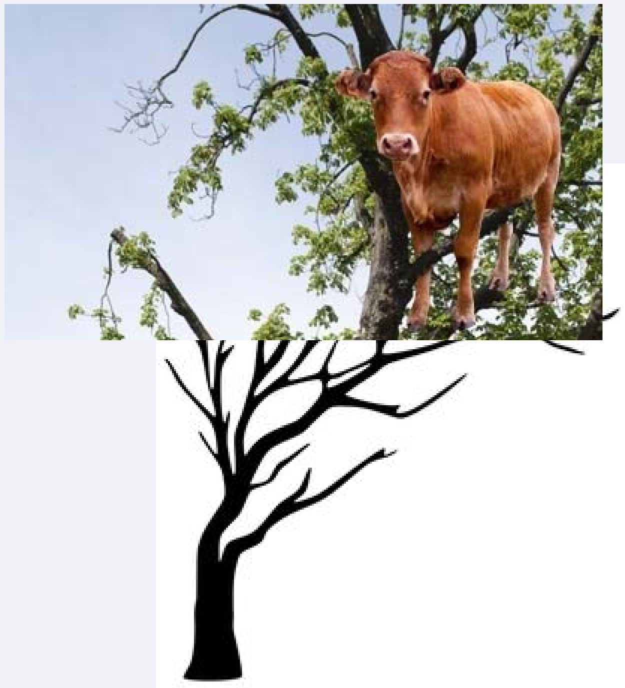
Surveillance sensitivity calculated in a scenario tree

Scenario tree:

- Divide the population into subpopulations (branches of a tree) that have the same probabilities



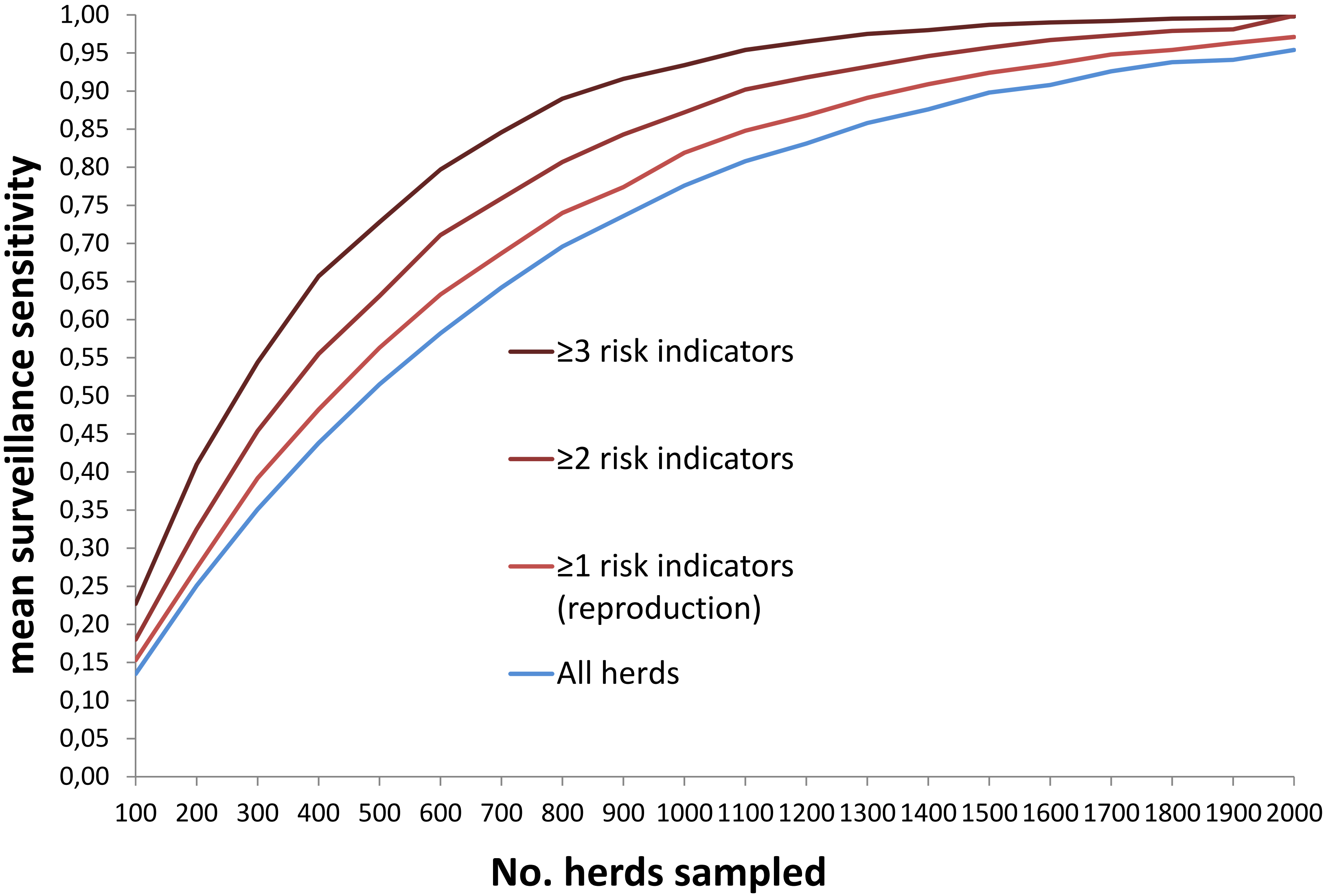
- Surveillance sensitivity

Sampling from the subpopulations

- Scenario tree model programmed in R

- Surveillance sensitivity estimated in the model for
  - sampling scenarios
  - different sample sizes

Sampling scenarios	% of herds 2012
≥ 2 risk indicators	68
≥ 3 risk indicators	45
≥ 1 reproduction risk indicator	85
All herds	100



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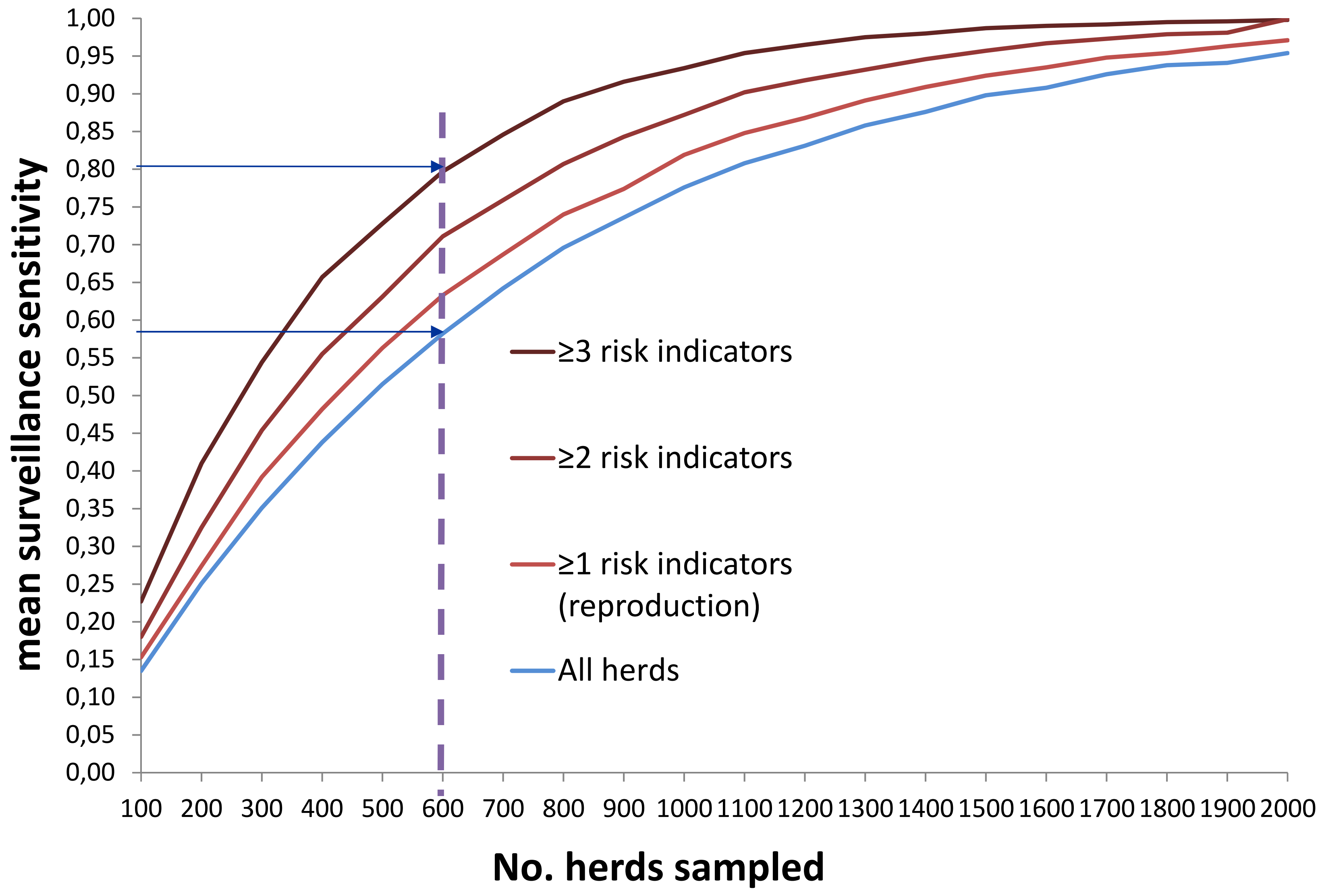

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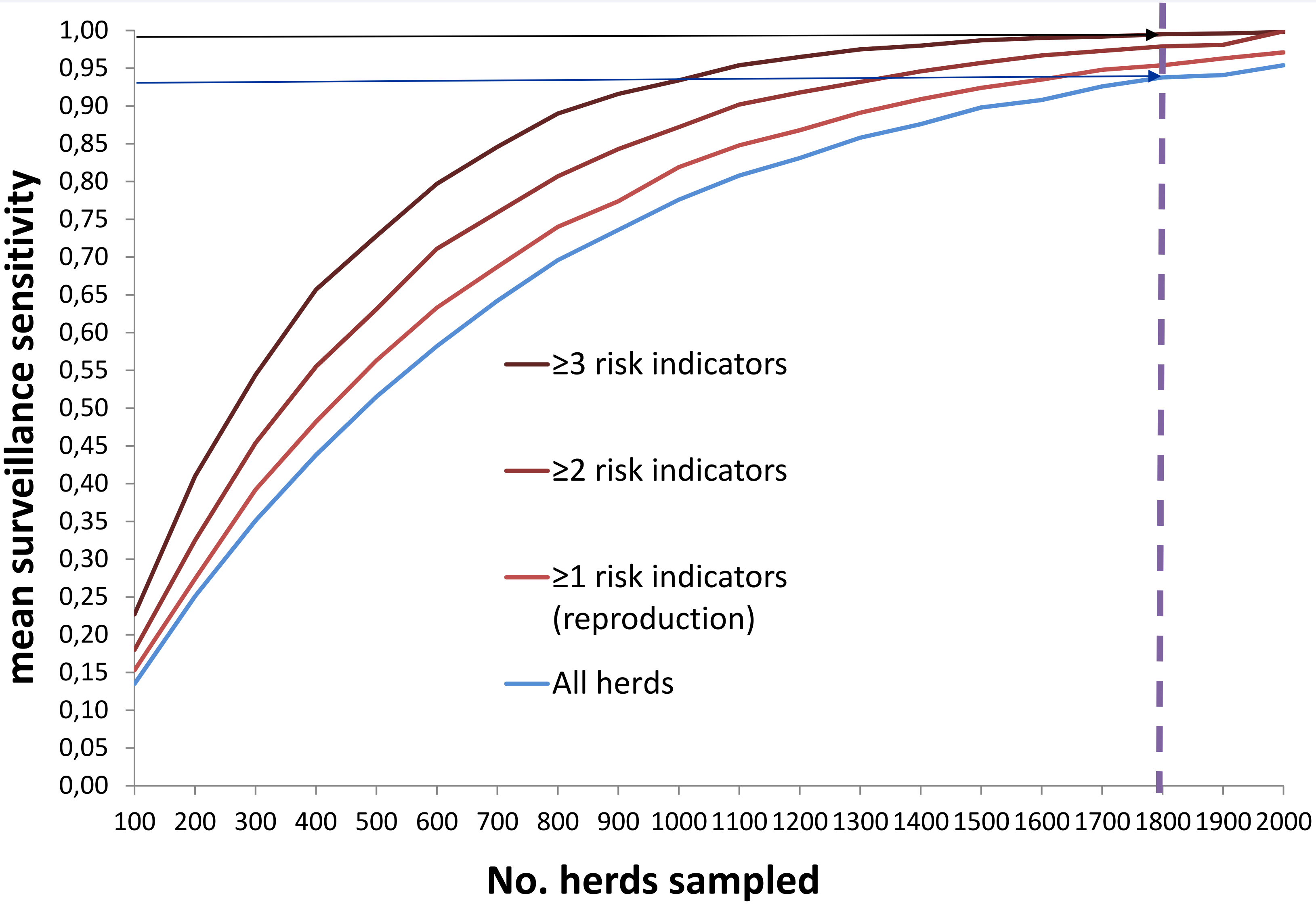
mean surveillance sensitivity
1,00
0,95
0,90
0,85
0,80
0,75
0,70
0,65
0,60
0,55
0,50
0,45
0,40
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0,00
100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000
No. herds sampled
≥3 risk indicators
≥2 risk indicators
≥1 risk indicators (reproduction)
All herds

Summary and discussion

- Risk-based sampling by differentiating herds
- Historical data
- Surveillance sensitivity measure on effectiveness
- Risk-based sampling more effective than traditional sampling when sampling up to15% of the population
- The programme could be optimised taking sample sizes into account
- Timeliness, coverage and cost effeciency may be used to get a more complete picture
- Risk for decreased coverage

Thank you

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