Probability based approaches to animal health surveillance

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Aaron Scott, DVM PhD DACVPM (epi)
Center Director, NSU
National Surveillance Unit

“Building Partnerships and Leading Change”

Safeguarding Animal Health
Using risk factors and probability to get the most information at the lowest cost
Why?
Federal/State budgets
What is surveillance?

Find disease

if its not there...

Prove it!!!
Surveillance is evidence!
Reverend Thomas Bayes
Evidence may be combination of sample testing and other knowledge about risk factors
Risk-based versus probability

“Risk” = likelihood * consequence

= animals more likely to get disease?
= animals more likely to have disease?
= animals more likely to be detected?
= more dangerous to people???
Inference ...

...is drawing a conclusion about the population from one or more pieces of evidence
Sampling and inference

Convenience

Random

Representative
Random Selection

• Inference is based on random sampling
• Listing of all subjects (sample frame)
• Each has equal chance of selection
• Is always representative
Random Sample size

“n” = 3X when 1:X

3,000,000 samples to detect 1 in 1,000,000
Representative – non-biased

A representative sample could be just anybody!
Population representativeness
Geographic representation
Representative

If not random, must be other supporting evidence for representativeness...
Targeted ("risk based") sampling

Concept: Every sample gives information

Corollary: Some are worth more than others

Targeted = intentional bias!
Targeting and inference

- Must clearly define sub populations
- Must have knowledge of risk factors
- Must know magnitude of risk factors
- Targeting represents sub-populations
- Must know relationship
Clear risk factor
Clear risk factor
What is “n”?

40 H-risk * value 3 = 120
10 L-risk * value 0.5 = 5

50 tests = 125 “virtual” samples
What are the risk factors?

Intentionally biased sample + other information
PRV Targeting

- Sows and boars (value = 2.5x to 5x)
- Exposure to feral pigs (10x ? 100x ?)
- Non-confinement (??)

- Some samples from all populations
- Market swine (< 1x)
Slaughter sampling

From 3 herds: 5,000, 30, 10

Need “n” of 30/farm for inference
30 + 30 + 10 = 70 samples

Without additional info,
n = 5,040!!!
Current PRV

- Collect all with traceable ID
- Send to lab and sort
- Only knowledge is State of origin
- Discard all but 5% from each State
Collaboration:
- NPB, AASV, industry reps
- 6 State Veterinarians
- Veterinary Services
PIN Pilot

- High value (feral swine exposure)
- Limit to number needed
- Collect “pink tag”, scan ID, combine zip with feral risk, target # needed
- Other tags
- Spend the money on other diseases
national.surveillance.unit@aphis.usda.gov

http://www.aphis.usda.gov/vs/ceah/ncahs/nsu/

Thanks!!