Request for comments

RFC20100907KF: Detection

1st draft: K. Forde-Folle, September 7, 2010
2nd draft: K. Forde-Folle, September 7, 2010
3rd draft: K. Forde-Folle, October 15, 2010
4th draft: A. Reeves, October 25, 2010

Applies to: Model description v. 1.1.1 and 1.2.0

Type of change: Clarification of text and figures

Summary: This RFC proposes clarifying the text and figures describing detection in the model description.

Justification: The text describing detection represented by the model description can be confusing. As such it is recommended that the text in the model description more closely match that which is found in the User's Guide for *NAADSM* 3.0.

Change: This change applies to section A5 (Detection). Proposed new text is highlighted:

The simulation of detection works as follows:

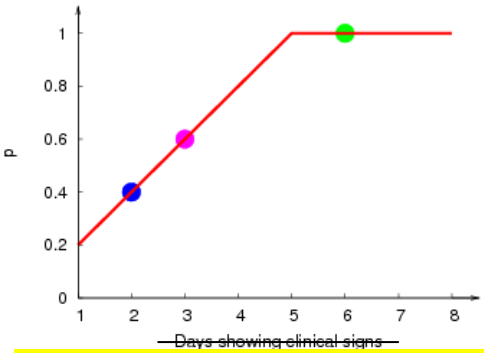
On each day,

1. Look up the probability that a farmer or attending veterinarian, for example, will report signs of disease to authorities based on the number of days since the first detection in the population. A nonzero static probability represents the baseline before the first detection.
2. For each Infectious Clinical unit,
   (a) Look up the probability of ~~detecting signs of disease~~ observing clinical signs of disease based on the number of days the unit has been Infectious Clinical.
   (b) If the unit is not inside a zone focus,
      i. Compute the probability of ~~detection~~ observing clinical signs and reporting as P = (probability of ~~detecting~~ observing clinical signs of disease) × (probability of reporting)
      Go to step d.
   (c) If the unit is inside a zone focus,
      i. Compute the probability of ~~detection~~ observing clinical signs and reporting as P = (probability of ~~detecting~~ observing clinical signs of disease) × (zone multiplier)
      Note that the probability of reporting is assumed to be 1 inside a zone focus, so that value drops out of the calculation.
   (d) Generate a random number r in [0,1).
   (e) If $r < P$, the disease is ~~detected~~ observed and reported.

There are no false-positive detections.

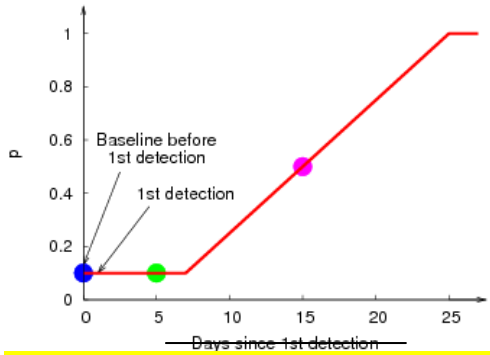
A report is immediately known to the authorities.

~~*On-farm awareness*~~
~~*(Probability of detecting disease)*~~
observing clinical signs



Days that the unit has been showing clinical signs

~~*Overall awareness*~~
~~*(Probability of reporting to authorities)*~~
units with observed clinical signs



Days since first detection of disease in any unit in the population

Figure A5-1. Probability of ~~detection~~ observing clinical signs and reporting units with observed clinical signs is found by two charts. In this example,

- **before 1st detection, 2nd day of clinical signs, ~~P~~ *overall probability of detection* = 0.4 × 0.1 = 0.04**
- **5 days since 1st detection, 6th day of clinical signs, ~~P~~ *overall probability of detection* = 1 × 0.1 = 0.1**
- **15 days since 1st detection, 3rd day of clinical signs, ~~P~~ *overall probability of detection* = 0.6 × 0.5 = 0.3**

Detection parameters

Parameters for each production type:

- probability of ~~detection~~ observing clinical signs vs. days the unit has been Infectious Clinical
- probability of reporting detected units vs. days since the first detection

Parameters for each combination of production type and zone:

- multiplier for probability of ~~detection~~ observing clinical signs

The parameters are given separately for each production type, to account for the possibility that clinical signs of disease may be more obvious in animals of certain production-types, e.g., clinical signs may be reported more rapidly in intensive swine production systems versus cow-calf operations on pastures. The multiplier for ~~detection~~ the probability of observing clinical signs ~~of units~~ inside a zone focus allows for the simulation of greater vigilance in higher-level zones (see section A7.4. Zones).

Change: This change applies to section A6.1. (Trace Surveillance). Proposed new text is highlighted:

When an Infectious Clinical unit is identified by a trace investigation, it can be detected by the following method:

1. Compute the probability of ~~detection~~ observing clinical signs and reporting as P = (probability of ~~detecting~~ observing clinical signs of disease) × (multiplier)
2. Note that the probability of reporting is assumed to be 1 when a unit is identified by tracing, so that value drops out of the calculation.

3. Generate a random number r in [0,1).
4. If r < P, the disease is ~~detected~~ observed and reported.

If a unit is not detected based on clinical signs, it may still be detected by a diagnostic test. When a unit is tested for disease, the sensitivity and specificity of the test and a random number r in [0,1) are used to determine the test result as follows: