

# Request for comments

## RFC20100907KF: Detection

1<sup>st</sup> draft: K. Forde-Folle, September 7, 2010

2<sup>nd</sup> draft: K. Forde-Folle, September 7, 2010

3<sup>rd</sup> draft: K. Forde-Folle, October 15, 2010

4<sup>th</sup> 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:

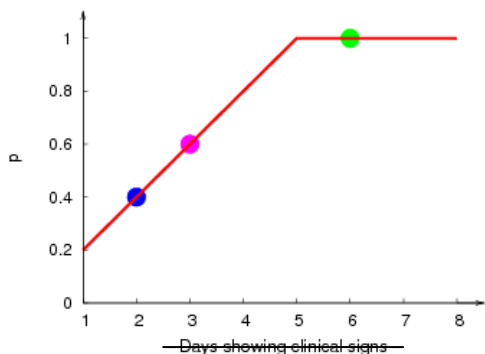
On each day,

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  $P = (\text{probability of } \text{detecting } \text{observing clinical signs of disease}) \times (\text{probability of reporting})$   
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  $P = (\text{probability of } \text{detecting } \text{observing clinical signs of disease}) \times (\text{zone multiplier})$   
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.

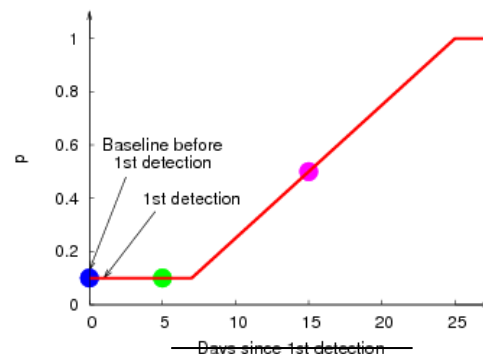
A report is immediately known to the authorities.

**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 1<sup>st</sup> detection, 2<sup>nd</sup> day of clinical signs,  $P_{\text{overall probability of detection}} = 0.4 \times 0.1 = 0.04$
- 5 days since 1<sup>st</sup> detection, 6<sup>th</sup> day of clinical signs,  $P_{\text{overall probability of detection}} = 1 \times 0.1 = 0.1$
- 15 days since 1<sup>st</sup> detection, 3<sup>rd</sup> day of clinical signs,  $P_{\text{overall probability of detection}} = 0.6 \times 0.5 = 0.3$

### 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  $P = (\text{probability of detecting observing clinical signs of disease}) \times (\text{multiplier})$
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: