

Request for comments

RFC-20090429ARb: Vaccination of detected, infected units

1st draft, Aaron Reeves, 29 April, 2009

Applies to: Model document 1.1.1.

Summary: This RFC proposes a change to the way detected infected units are currently handled when vaccination is used as a disease control strategy. These changes are proposed for NAADSM 3.2.

Justification:

In NAADSM 3.0 – 3.1, units that are infected and detected are subject to vaccination. For example, when a detection of an infected unit triggers ring vaccination, the detected unit itself will be vaccinated if its production type is included in a simulated vaccination campaign. This model behavior is probably not realistic.

This RFC proposes that the vaccination of detected infected units be made optional. Such a change would provide users with more complete control over their vaccination model parameters, may better reflect a vaccination strategy as it would actually be applied, and could be made in such a way that is completely backward-compatible with existing NAADSM scenarios.

Changes to specification:

Change 1. A new paragraph would be added to section 7.3 (Vaccination) of the model specification as shown below:

When the disease is detected, authorities may also initiate a vaccination campaign. This consists of vaccinating units within a specified distance of the detected units – in circles or rings around detected units. A production-type-specific parameter determines whether detection of an infected unit of a particular production type will trigger the formation of a vaccination ring or not: for example, detection of an infected swine unit might lead to the vaccination of surrounding units of various production types, while detection of an infected sheep unit might not trigger vaccination of surrounding units.

A production-type-specific parameter also governs whether units of a particular production type are included in a vaccination program. For example, dairy cattle units might be vaccinated in response to the detection of a diseased unit nearby, while sheep units might not be vaccinated.

A detected infected unit may or may not be vaccinated, depending on its production type and whether it falls inside a vaccination ring. In order for a detected infected unit to be vaccinated, both of the following conditions must be met:

- Its production type must be vaccinated in response to detection of nearby units
- Its production type must be set to allow vaccination of detected units

Change 2. Production type parameters for vaccination in section 7.3 will be updated as shown:

Parameters set individually for each production type:

- indication of whether detection of units of the production type will trigger a vaccination ring (yes/no)
- radius of vaccination ring (km) , if units of the production type will trigger a vaccination ring
- indication of whether units of the production type will be vaccinated in response to detection of nearby units (yes/no)
- indication of whether detected infected units of the production type will be vaccinated (yes/no)
- minimum time between vaccinations (days) , if units of the production type will be vaccinated (see section A7.3.4 Minimum time between vaccinations)

End of changes.

Discussion

This change would be made in a way that preserves backward compatibility. In the graphical user interface, when an existing scenario is initially opened, the new parameter will automatically be set to “yes” for every production type. By doing so, existing scenarios will continue to run as they always have: it would be the responsibility of the user to explicitly change this behavior if s/he wishes to re-run an existing scenario with the new model. A similar change could be made in the supercomputer version to implicitly assume that this parameter is set to “yes” of not otherwise specified.

With the proposed changes, it will not be possible to specify a different priority for vaccination of detected infected units: vaccination of these units will be given the same priority as any other unit of the same production type. If more complex behavior is required, further changes will be needed.

Is there ever a situation in which vaccination of detected infected units might be used independently of ring vaccination? The proposed scheme allows for ring vaccination without vaccination of detected units, but does not explicitly allow for vaccination of detected units without ring vaccination. In actuality, a user could specify a vaccination ring of 0 km, which would result only in the vaccination of the unit that triggered the vaccination ring (as well as any other units that are located at exactly the same geolocation). If more complex schemes are desired (e.g., a hypothetical disease response plan in which only detected units of production type A should be vaccinated but such detections will not trigger a vaccination ring, while detection of an infected unit of type B leads to a vaccination ring but will not itself be vaccinated) would require further thought and refinement.