

# Output-based assessment of herd-level freedom from BVDV

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## Background

Output-based assessment of heterogeneous disease control programmes (CPs)



Uniform output: Freedom from infection

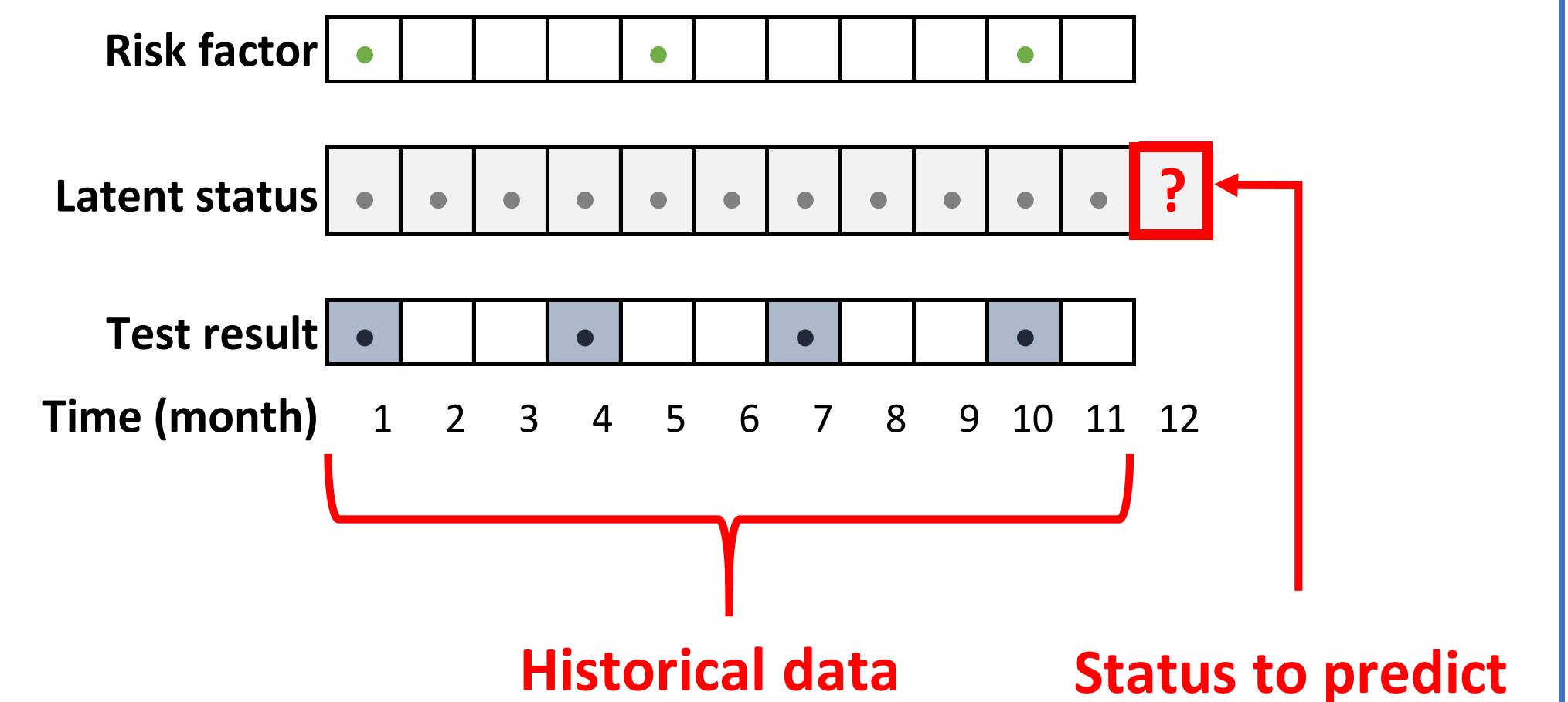
## Methods

Longitudinal test data on herd-month level in 2019

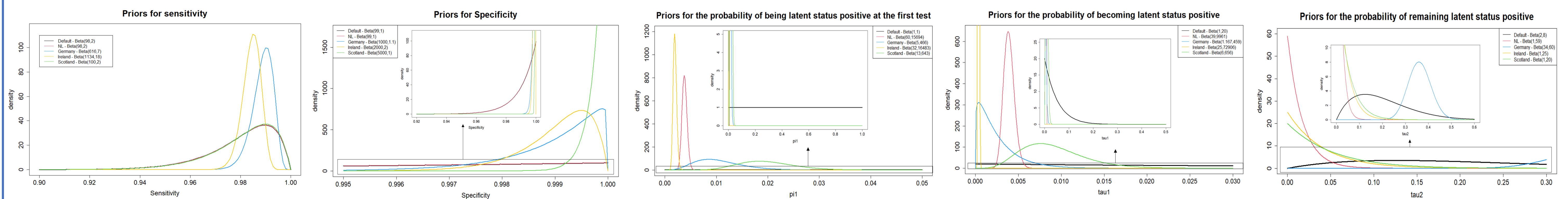
Herd(s)-Type	NL		DE (Paderborn)		IE		SCO	
	Dairy	Combination	Dairy	Beef	Dairy	Beef	Dairy	Beef
Number	1,642	361	16,097	49,685	559	1,796		
≥ 1 positive test result	161	11	231	267	64	77		
Total test months	12,566	2,475	78,884	180,604	3,724	6,413		
Positive test months	270	25	316	340	111	117		
Free according to CP	486	319	14,743	45,989	332	1,713		

## STOC free MODEL

- Hidden Markov model
- Latent status: the presence of one or more BVDV persistently infected animal(s) (PIs) at foot in the herd
- Freely available with default values for BVDV, that are adaptable to country specific values: *Madouasse, et al. (2022)*



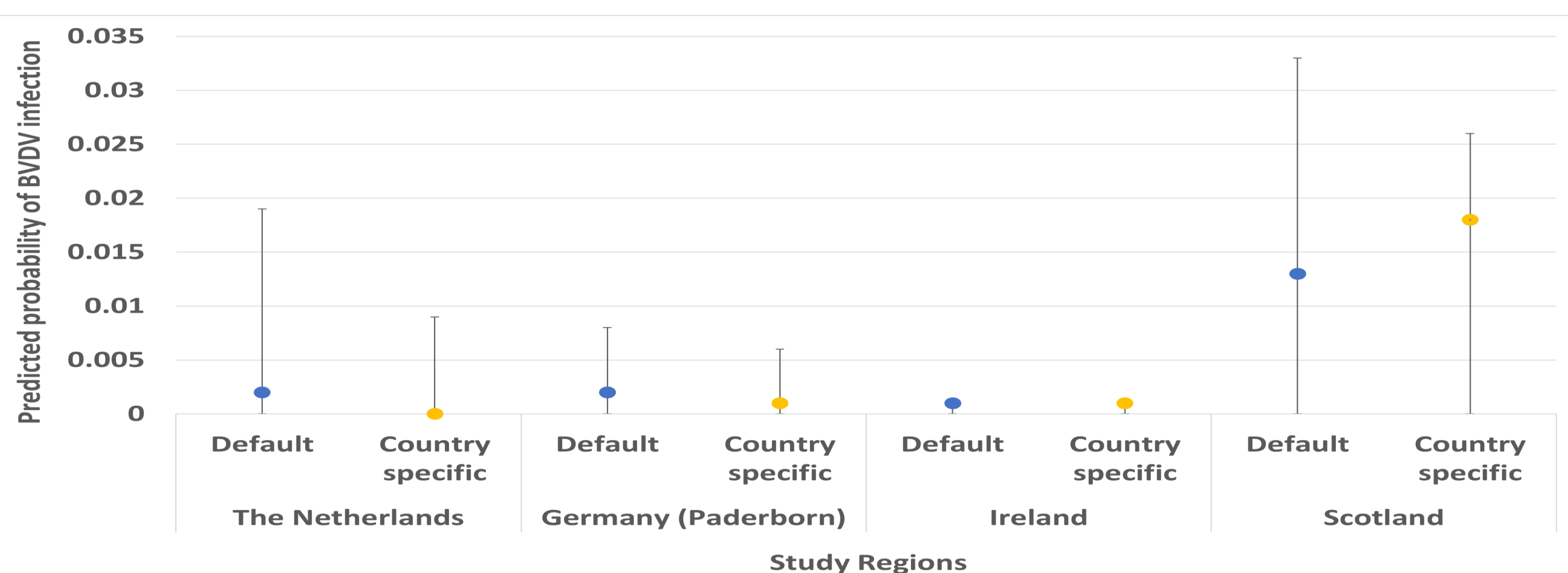
## Prior input: default and country-specific beta distributions



Madouasse et al., 2022. A modelling framework for the prediction of the herd-level probability of infection from longitudinal data. Peer Community Journal, Vol 2, article no. e4. doi : 10.24072/pcjournal.80. <https://peercommunityjournal.org/articles/10.24072/pcjournal.80/>

## Results

Results for dairy herds with a free status on 1 December 2019 according to the BVDV CP based on ear notch testing in each study region



Predicted probability of infection (median with 2.5% and 97.5% credibility interval)

- Probability of infection: 0.02-0.00 and thus a probability of freedom of 0.98-1.00
- Herd-level test sensitivity: 89% - 98%
- Herd-level test specificity: >99%
- Probability of herd becoming positive (incidence): 0.001-0.015
- Probability of herd remaining positive: 0.372-0.624

## Discussion

- High probability of freedom from infection for all four regions, suggesting comparable effectiveness of BVDV CPs based on ear notch sampling.
- A lower predicted probability of freedom can be the result of missing test results i.e. no births.
- Default priors can be used when no country-specific data are available.
- Output-based modelling of BVDV is challenging due to (1) complexity of the infection e.g. time between infection and birth of PI(s), (2) CPs with tests aiming at detection of different latent statuses i.e. virus and antibodies, and (3) estimation of herd-level priors while CPs are based on animal-level testing.
- The STOC free model can be used to evaluate and improve disease CPs, and to determine whether they comply with output-based regulations of the EU. The code is freely available at: <https://github.com/AurMad/STOCfree>.



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