

# Performance of somatic cell score and differential somatic cell count in identifying quarters with subclinical mastitis using Gaussian finite mixture model



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## Background

- Somatic cell count (SCC) has been widely used as an indicator of udder inflammation, assisting in detecting subclinical mastitis.
- Differential somatic cell count (DSCC) represents the combined proportion of lymphocytes and neutrophils in a milk sample.
- DSCC has become available for routine screening of dairy milk.

## Objectives

- Identify reference values for SCS and DSCC and differentiate healthy quarters from those with subclinical mastitis.
- Estimate the predictive probability of subclinical mastitis as a function of SCS or DSCC.

## Material and Methods

### Herd and cow selection

- Convenience sample of five dairy farms using AMS.
- Cows were systematically selected – approximately 600 cows.

### Milk sample collection

- 50mL of cisternal milk from each quarter every other week.
- SCC and DSCC determined by CombiFoss 7 DC instrument.

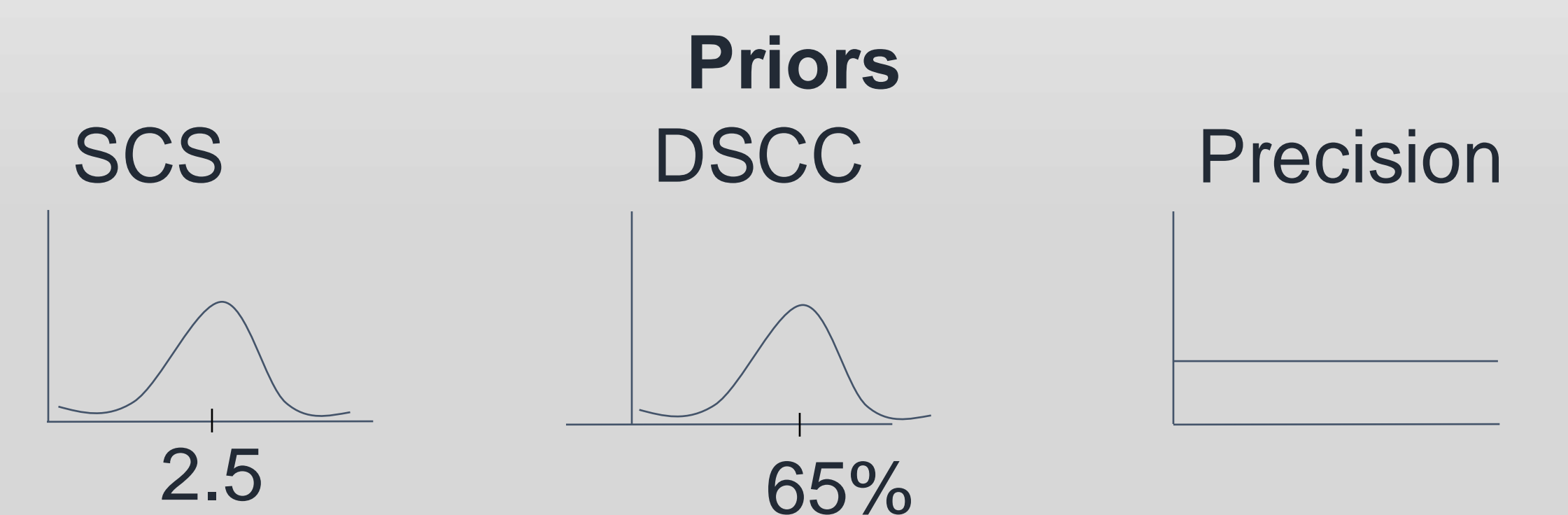
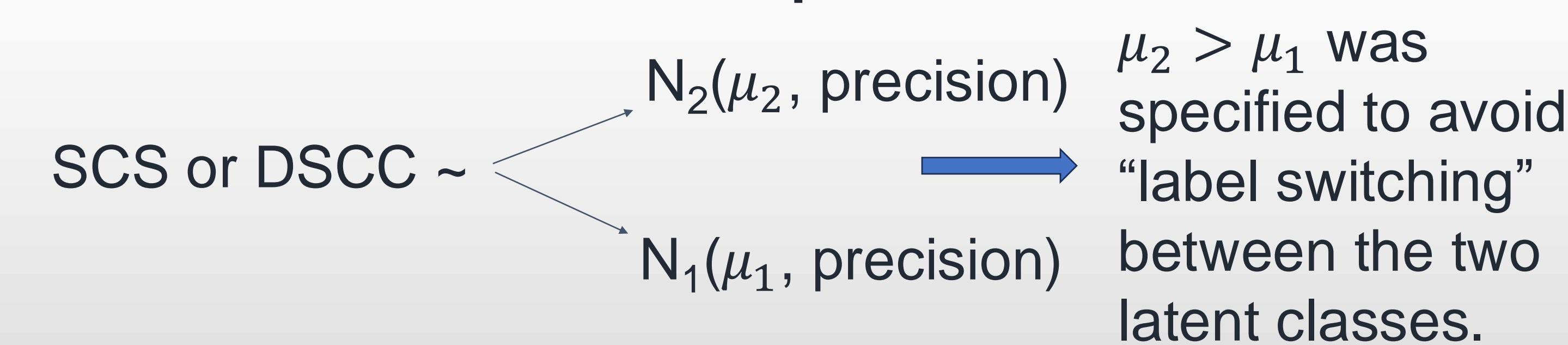
### Data (two datasets)

- SCS: cows within 5 to 305 DIM – 5 herds – 412 cows – 1,613 quarters – 18,878 milk records.
- DSCC: cows within 5 to 305 DIM – 5 herds – 380 cows – 1,342 quarters – 8,431 milk records.

### Statistical analysis

- Gaussian finite mixture model: assumes that the observed data are generated from a mixture of two (or more) Gaussian distributions, and each distribution represents a distinct subgroup, e.g. quarters **with** and **without** subclinical mastitis.

### Model specification



### Predictive estimation

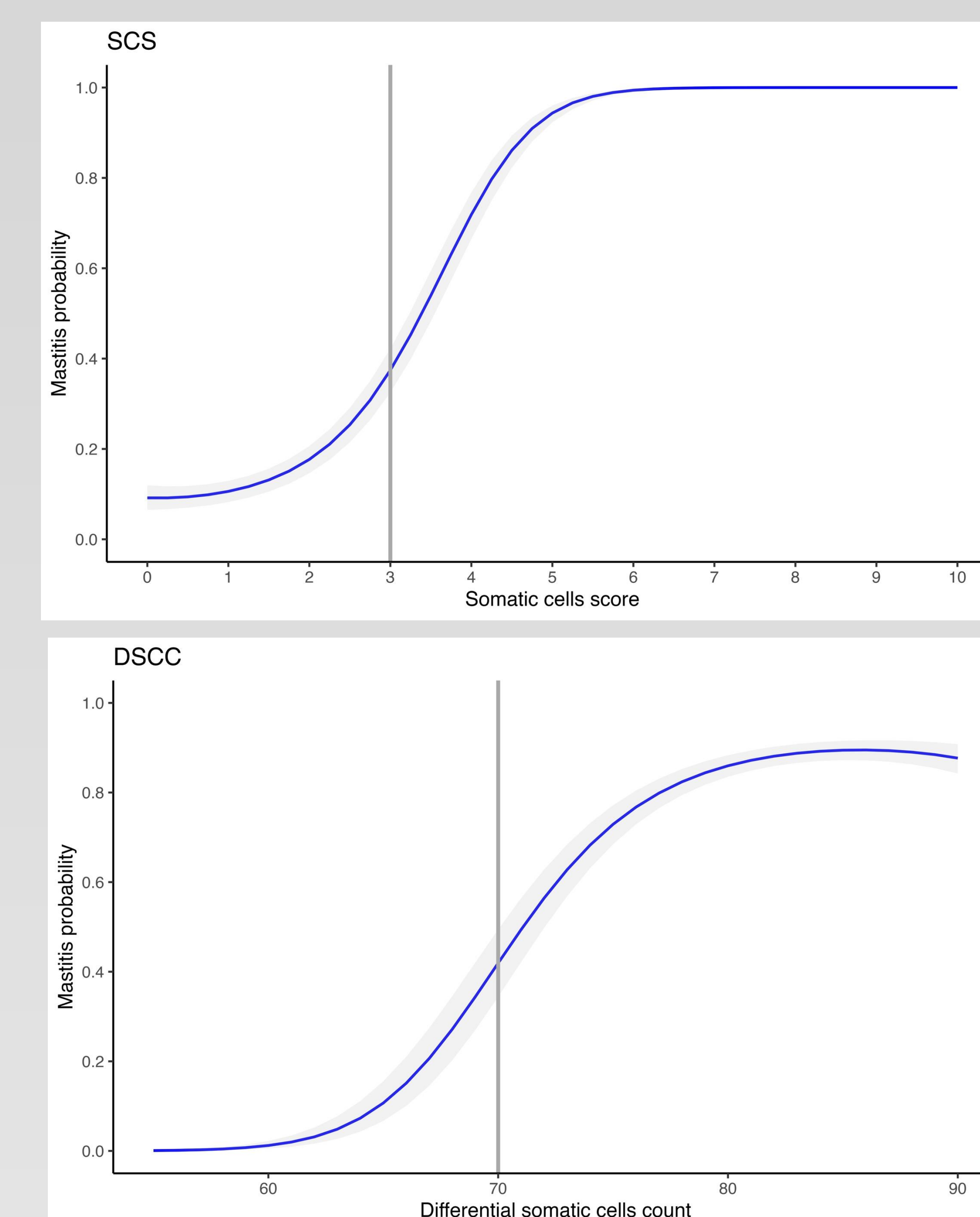
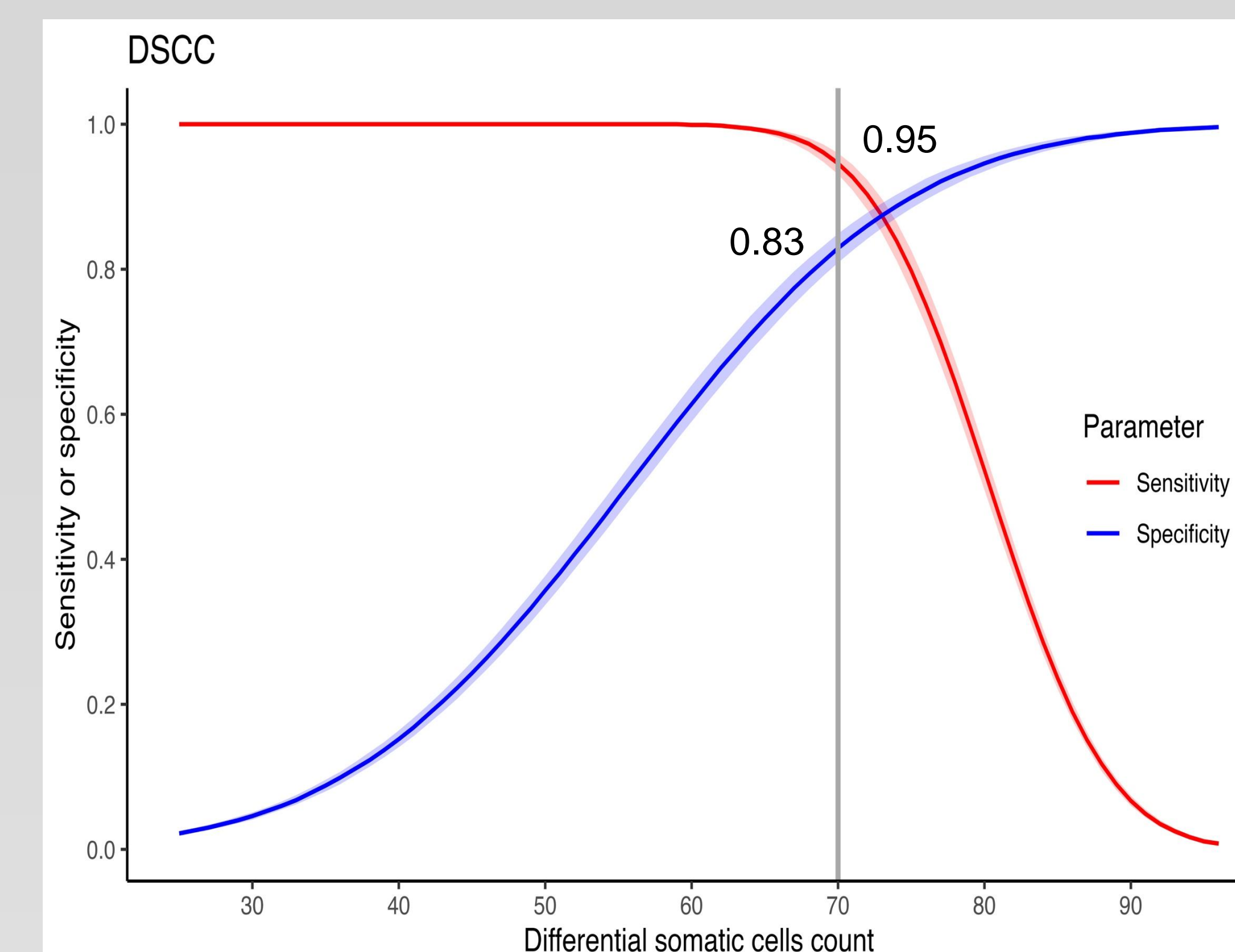
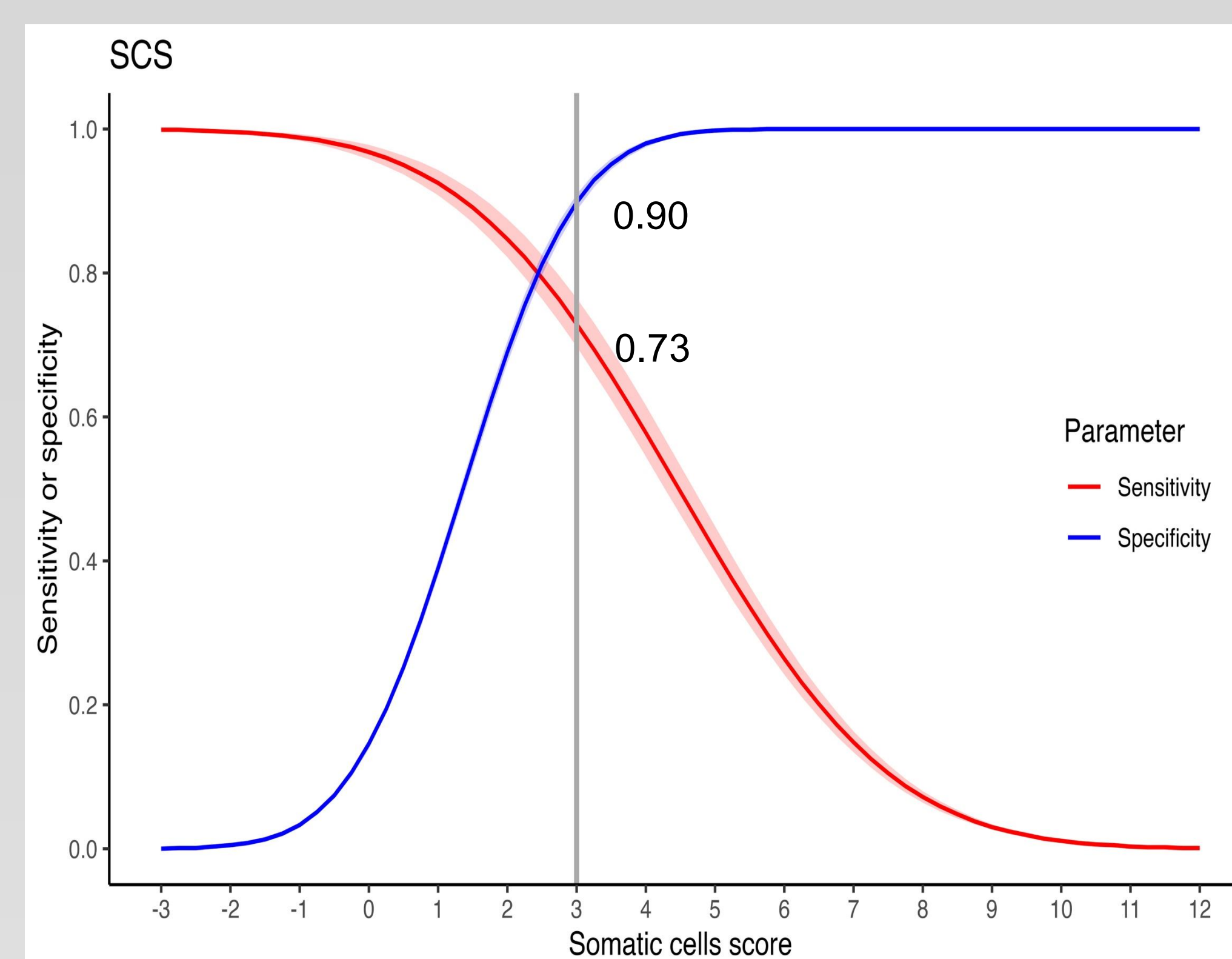
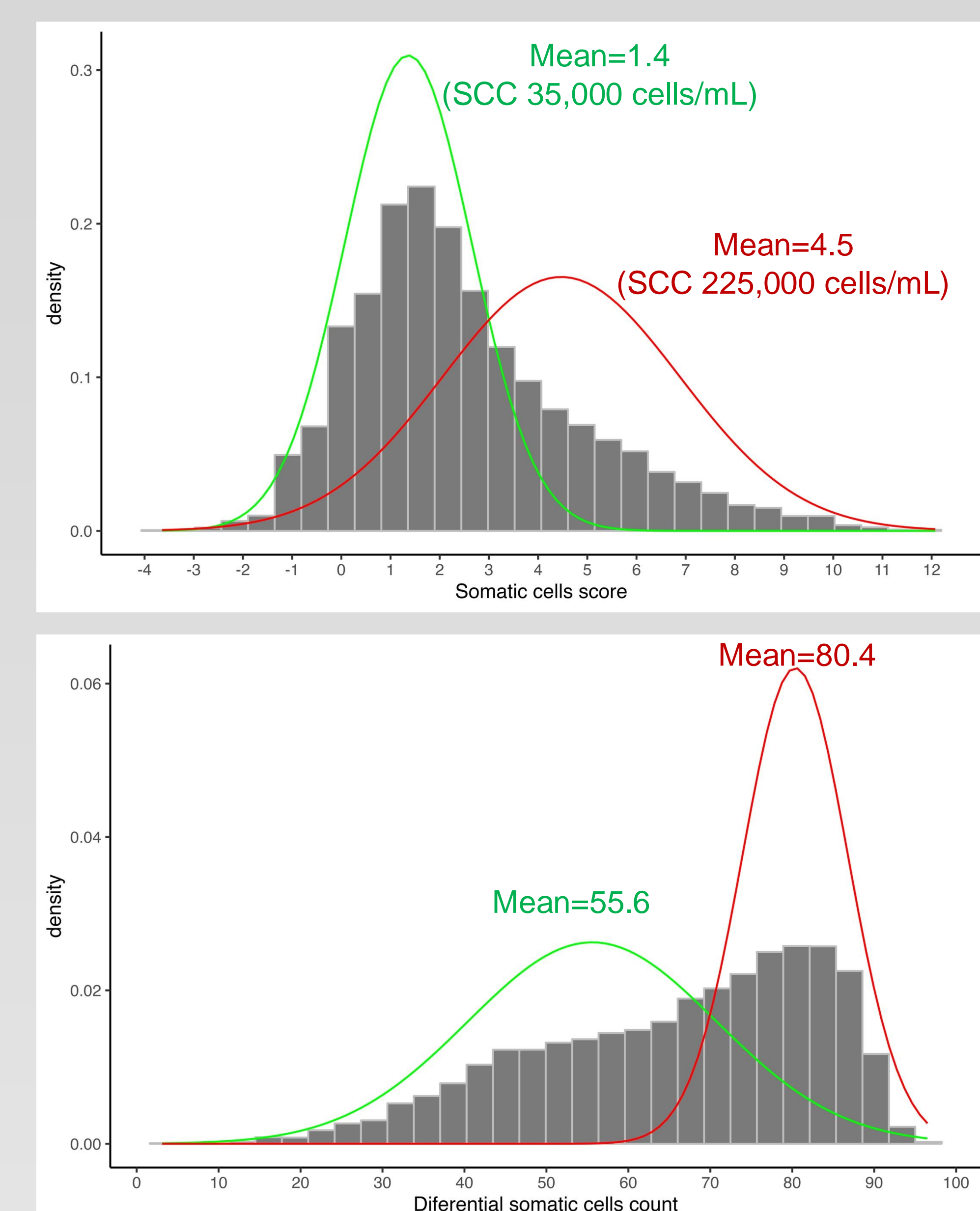
Posterior distributions: Se and Sp using the cumulative distribution functions ( $\Phi$ ) of the standard normal distributions.

## Results

Figures 1 and 2. Estimated normal distributions of somatic cells score (SCS) or differential somatic cells count (DSCC)

Figures 3 and 4. Diagnostic accuracy of SCS and DSCC

Figures 5 and 6. Predicted probabilities of a quarter being affected by subclinical mastitis.



## Take home points:

- The GFMM provided good accuracy on differentiating normal quarters from quarters with subclinical mastitis.
- We observed that SCS seemed more reliable than DSCC for predicting the probability of subclinical mastitis.