IT-Solutions for
Animal Production

Disposal reasons as potential indicator traits for direct health traits in German Holstein cows

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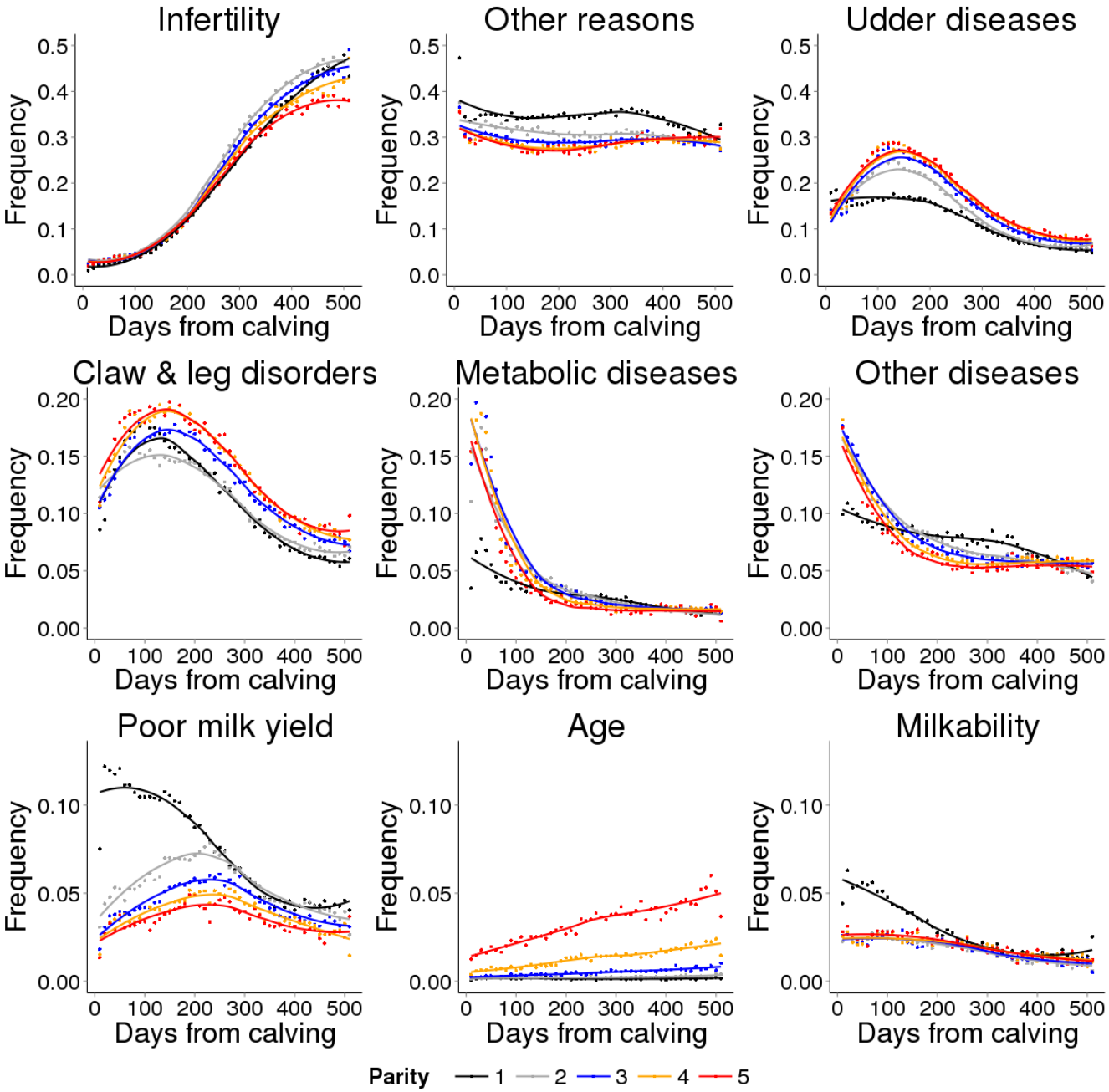
Motivation

- direct health data
  - labor intensive and costly
  - small proportion of animals phenotyped
    - in current population
    - no historical data
  - difficult to increase reliabilities of EBV
- disposal reasons
  - routinely recorded via milk recording since decades
  - but challenging
    - 9 standardized codes for culling
    - only one reason of potentially multiple reasons recorded
  - pre-analyses were promising (Heise et al. 2018)



Heise et al. 2016

Can we use disposal reasons to increase the reliability of EBV for direct health traits?

Data

- health
  - documentation by Farmers, Hooftrimmers, Veterinarians
  - data from prototype German genetic evaluation of health traits for Holsteins

  - ➢ No. of obs. per herd and year ≥ 20 (any trait, sum of 1st and 2nd lactation)
  - ➢ No. of daughters per sire ≥ 10

- disposal reasons
  - from data preparation for genetic evaluation of longevity

  - ➢ age at first calving from 20 to 40 months
  - ➢ both parents known
  - ➢ calving intervals from 300 to 600 days

- in total:
  - **484‘362** animal records
  - **5‘969** sires

Health traits

- 1st and 2nd lactation separately
- binary coding

- reproduction
  - retained placenta
  - other puerperial disorders
  - endometritis
  - ovarial cycle disorders
  - ovarial cysts

- udder
  - early mastitis (DIM -10 to 50)
  - late mastitis (DIM 51 to 305)
  - mastitis (DIM -10 to 305)

- claw and leg disorders
  - interdigital hyperplasia
  - laminitis
  - white line defect/abscess
  - claw ulcers
  - digital phlegmona
  - digital dermatitis

- metabolic diseases
  - left-displaced abomasum
  - ketosis
  - milk fever

Trait definition

‚Culling because of a certain reason‘

Code	Description
0	lactation survived or culled for another reason
1	culled for respective reason
-	survival observation in lactation right- or left-censored or culled in previous lactation

Example: culled in 1st lactation because of ‚udder diseases‘

	infertility	udder diseases	metabolic diseases	claw and leg disorders
lactation 1	0	1	0	0
lactation 2	–	–	–	–

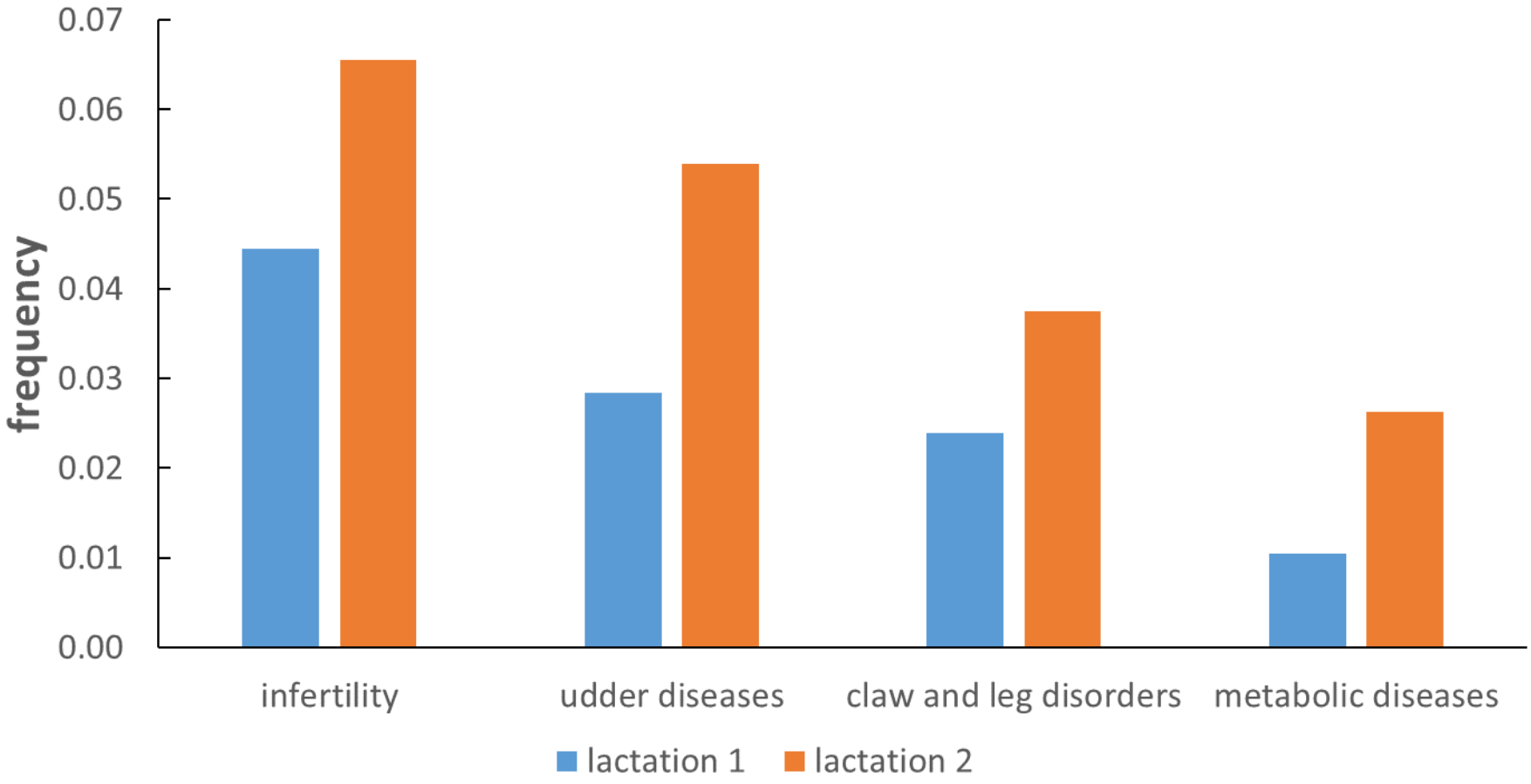
Estimation of variance components

$$\mathbf{y} = \mathbf{Xb} + \mathbf{Zs} + \mathbf{e}$$

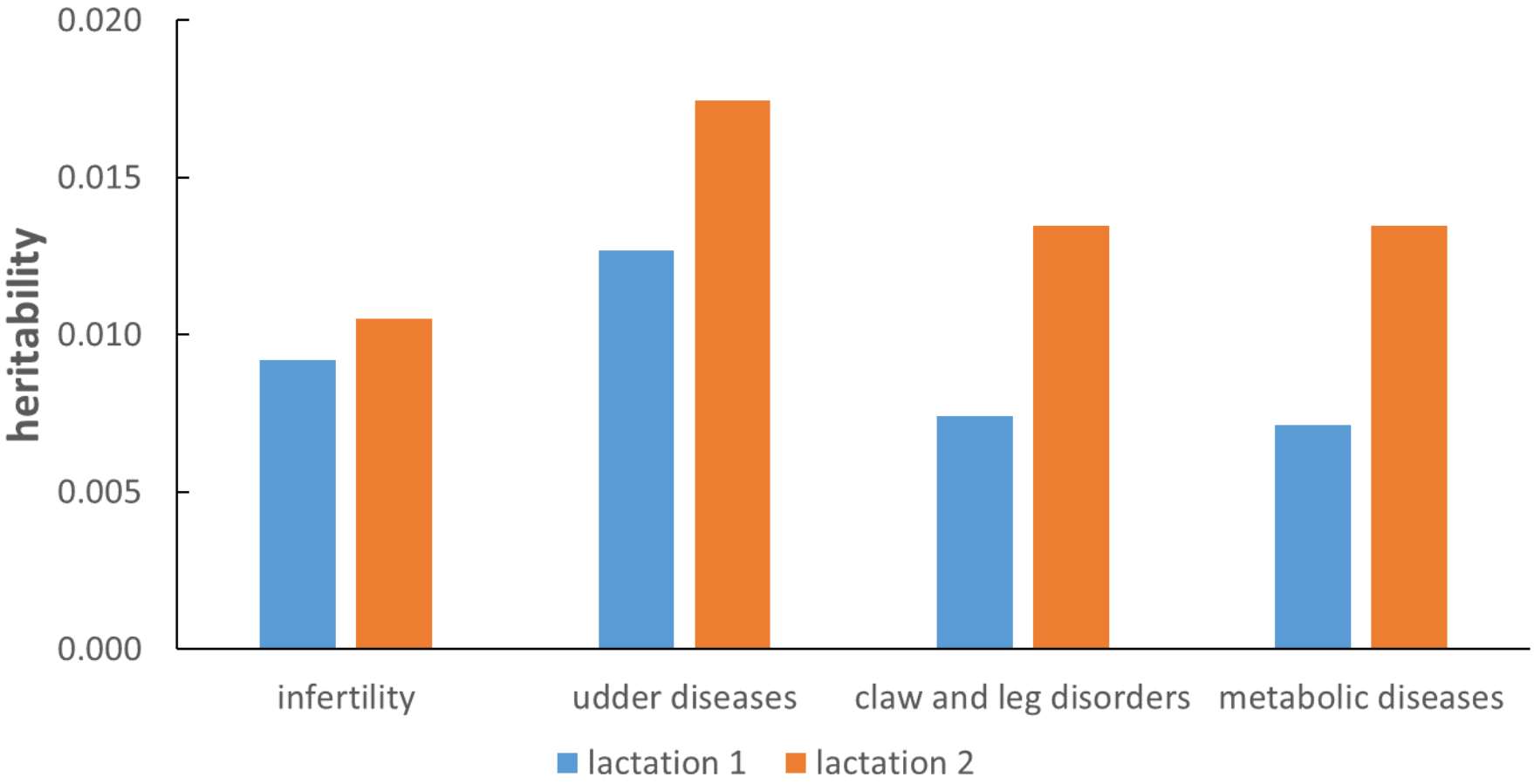
$\mathbf{y}$:	vector with observations (1/0)
	incidence matrix, linking observations to classes of fixed effect
$\mathbf{b}$:	vector with values for fixed effect (herd × year of calving)
$\mathbf{Z}$:	incidence matrix, linking observations to sires
$\mathbf{s}$:	vector with values for sires; $\mathbf{s} \sim \mathrm{N}(0, \mathbf{G} \otimes \mathbf{A})$
$\mathbf{e}$:	vector with values for residuals; $\mathbf{e} \sim \mathrm{N}(0, \mathbf{R} \otimes \mathbf{I})$
$\mathbf{G}$:	genetic (co)variance matrix
$\mathbf{R}$:	residual (co)variance matrix
$\mathbf{A}$:	pedigree-based relationship matrix for sires (1 generation)

- bivariate runs
  - health trait
  - disposal reason trait
- software: VCE (Groeneveld et al., 2010)

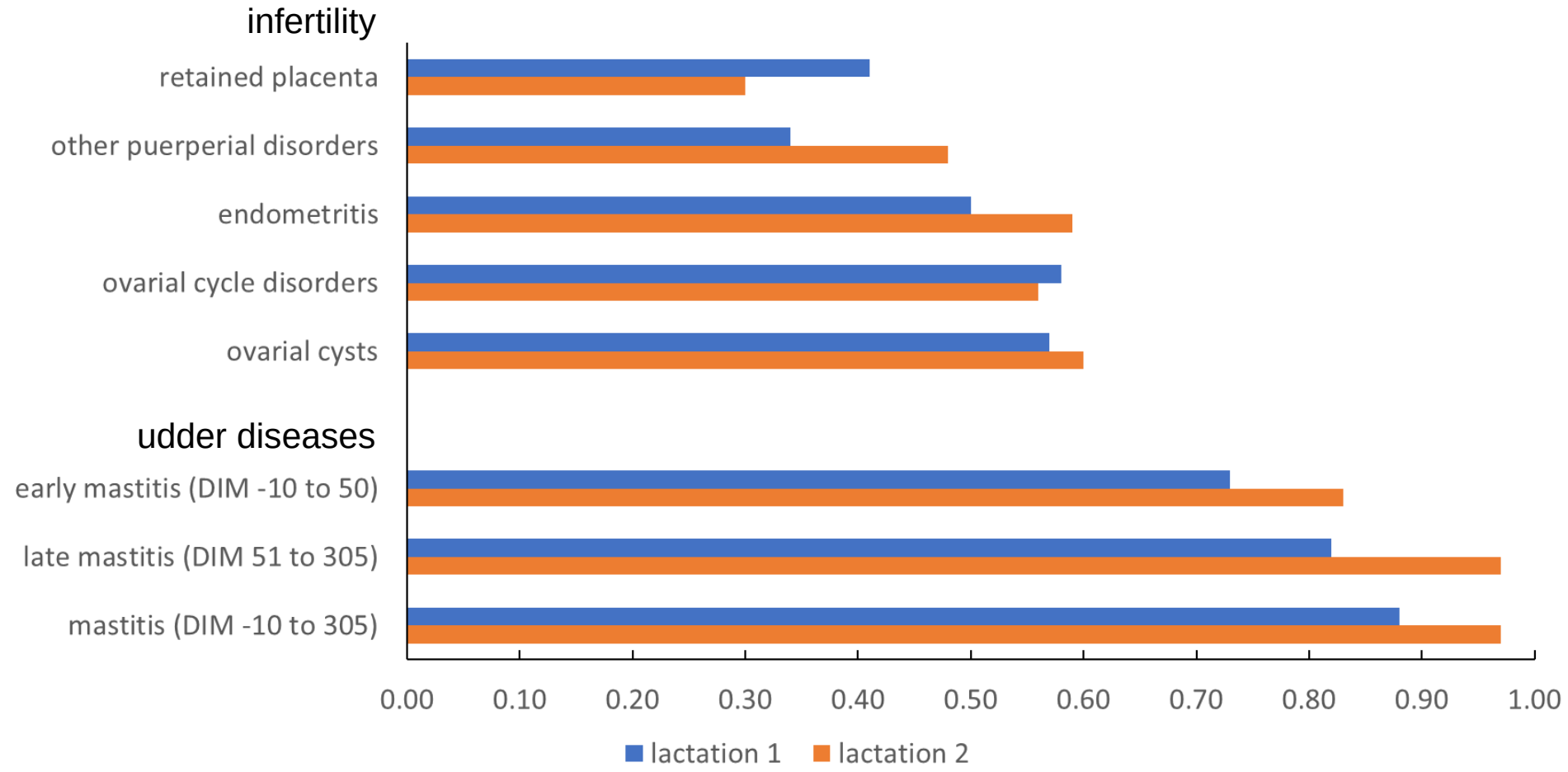
Disposal reasons – frequencies



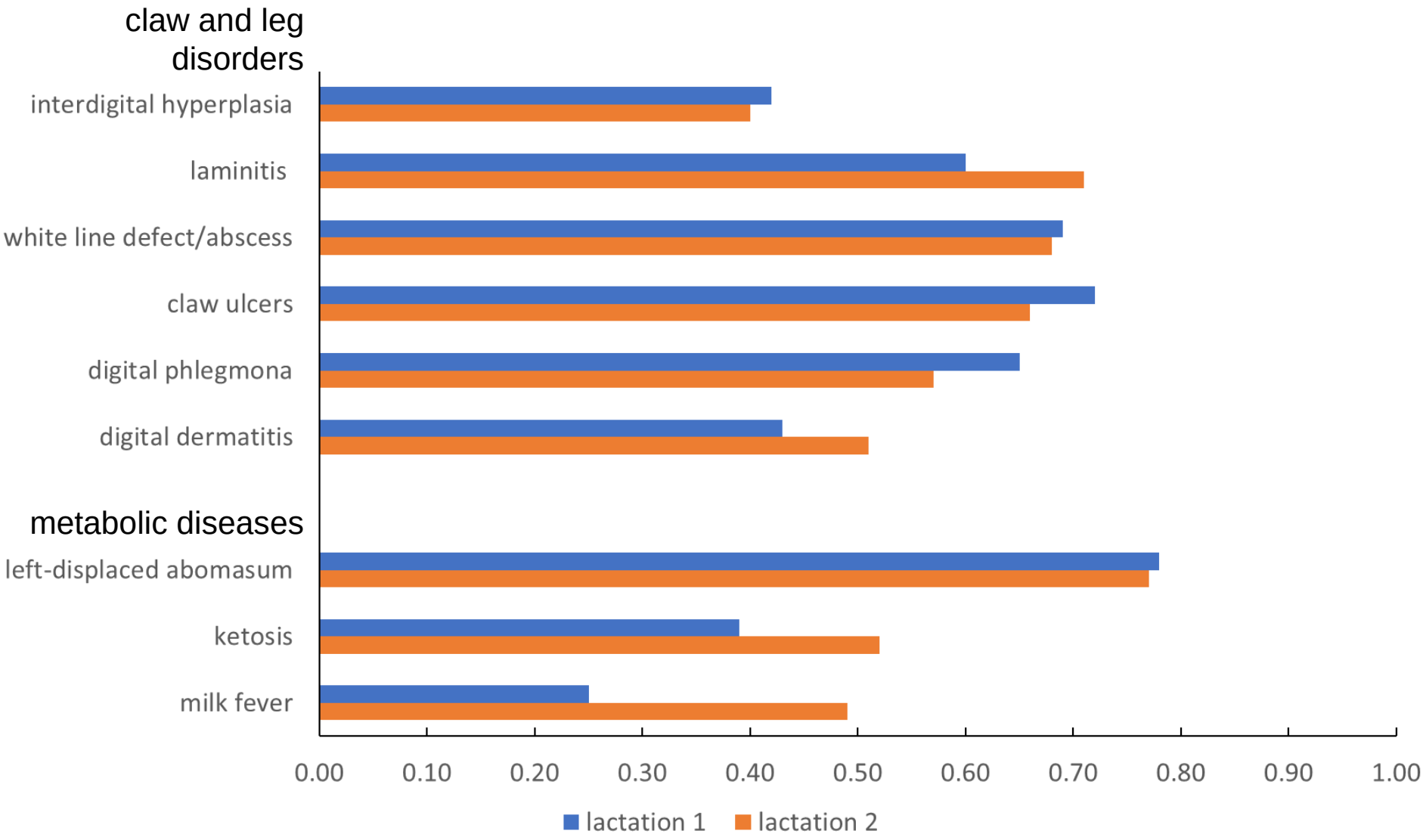
Disposal reasons – heritabilities



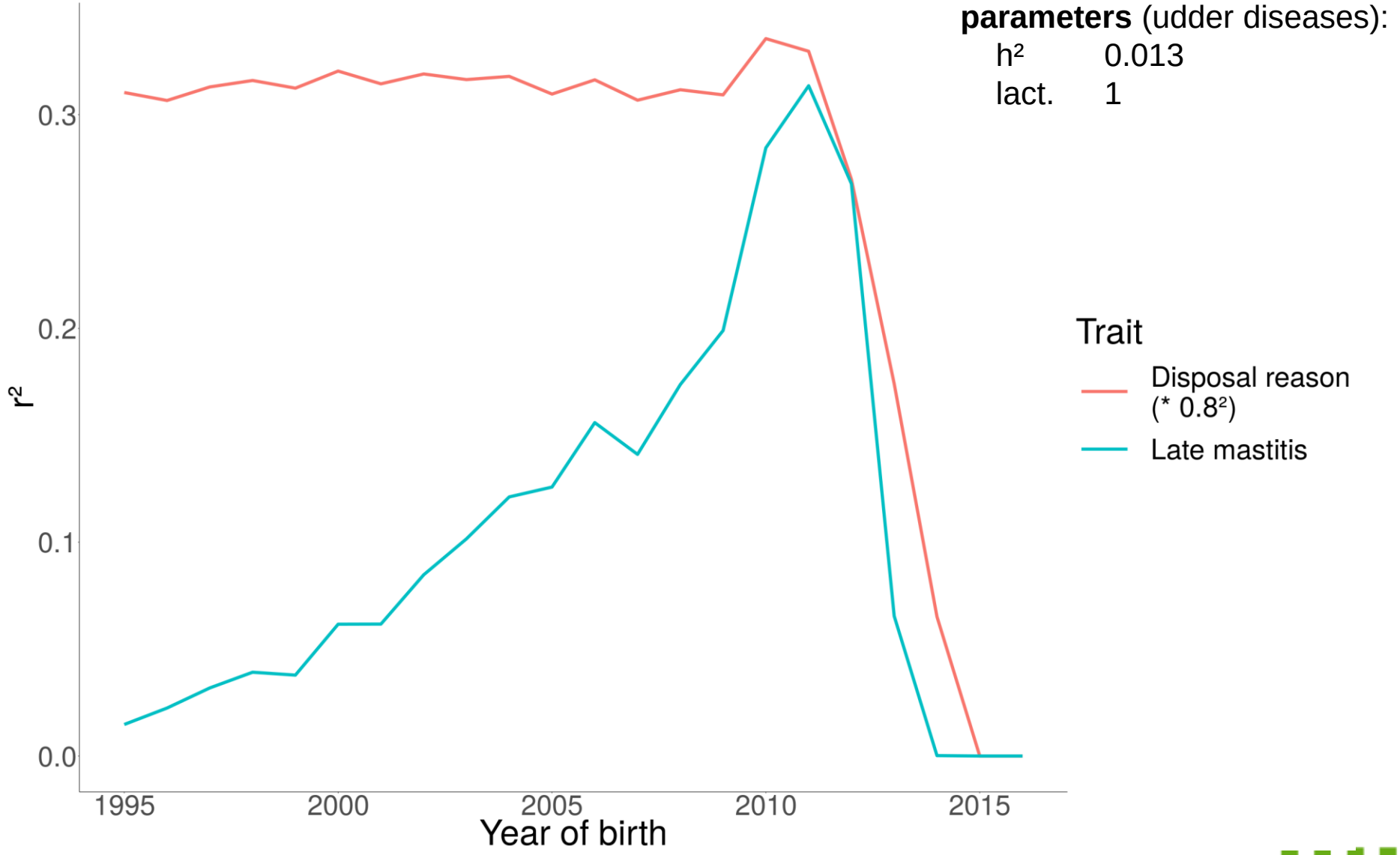
Genetic correlations



Genetic correlations



Mean reliabilities (AI bulls)



Can we use disposal reasons to increase the reliability of EBV for direct health traits?

Yes, we can!

Conclusions and prospect

- patterns are plausible
- further analyses and plausibility checks
- development of a routine genetic evaluation of disposal reasons

Thank you for your attention!

References

Groeneveld, E., M. Kovac, N. Mielenz (2010): VCE User's Guide and Reference Manual Version 6.0. Institute of Farm Animal Genetics, Friedrich Loeffler Institute (FLI), D-31535 Neustadt, Germany

Heise, J., K. F. Stock, S. Rensing, H. Simianer (2018): Potential use of routinely reported disposal reasons in dairy cattle breeding. *Züchtungskunde* **90:**13-26

Heise, J., Z. Liu, K.F. Stock, S. Rensing, F. Reinhardt, H. Simianer (2016): The genetic structure of longevity in dairy cows. J. Dairy Sci. **99**:1253-1265 doi:10.3168/jds.201510163.