

# EBVs with medium reliability

Ranking at different evaluation runs  
Use of breeding values in practice

Gert Pedersen Aamand, NAV

Guosheng Su and Anders C. Sørensen  
Århus University

**NAV**



Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

# EBVs with medium reliability

## Bulls

- We are used to EBVs based on progeny group with more than 100 daughters
  - Production 90% reliability
  - Mastitis, fertility 65-75% reliability

**NAV**



Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

# EBVs with medium reliability

## Bulls

- We are used to EBVs based on progeny group with more than 100 daughters
  - Production 90% reliability
  - Mastitis, fertility 65-75% reliability
- We have to get used to genomic EBVs based on DNA information only
  - Reliability for all traits reliability 30-50% when based on Nordic reference data

**NAV**



Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

# EBVs with medium reliability

My definition:

- Medium reliability 30-60%
- High reliability > 60%



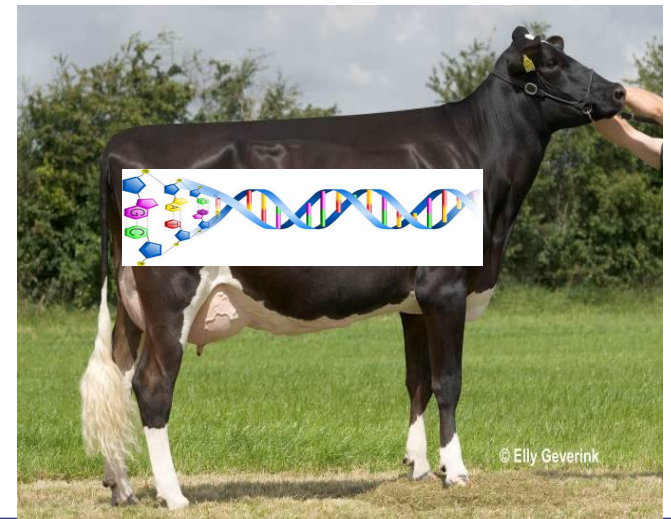
**NAV**



Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

# EBV what does it mean?

- The EBVs = the best estimate for the true breeding value (BV) of an animal
- The probability that the EBV is higher or lower than the true BV is the same




**NAV**



Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

# Reliability what does it mean?

- The reliability tells how accurate the EBV is estimated
- 100% = the true BV 
- 90% the true BV can deviate a "bit" from the EBV
- 40% the true BV can deviate considerable from the EBV of an animal

**NAV**



# True breeding values versus EBVs

| EBV         | +25 NTM |     |     |     |     |     |     |     |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|
| Reliability | 30%     | 40% | 50% | 60% | 70% | 80% | 90% | 95% |
| Min         | +6      | +7  | +9  | +11 | +13 | +15 | +18 | +20 |
| Max         | +44     | +43 | +41 | +39 | +37 | +35 | +32 | +30 |

Medium reliabilities

High reliabilities

5% of the changes will be outside min or max

**NAV**



# Intensive use of **one** bull

- *High reliability* – the true BV of the bull is close to the EBV – we "know" quite well what we get – low risk
- *Medium reliability* – the true BV of the bull can deviate quite a bit from the EBV – we do not "know" that well what we get – high risk – we can gain more if we are lucky or loose more if we are unlucky

**NAV**





# Intensive use of **a group** (e.g. 6) of bulls

- *High reliability* – the **average** true BV of group of bulls is very close to the **average** EBV – we "know" very well what we get – very low risk
- *Medium reliability* – the **average** true BV of the group of bulls is close to the **average** EBV – we "know" quite well what we get – low risk

# EBVs with medium reliability

Ranking at different evaluation runs

**NAV**



Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

# Ranking at different evaluation runs

## - we get more information

- We know from progeny testing that EBVs can change when reliability increases from 70% to 80% due to increasing number of daughters
- Correlation between the  $EBV_{70}$  and  $EBV_{80}$  is 0.94
- Standard error of difference  $EBV_{80}-EBV_{70}$  is 3.5-4.0 index point (note expectation of difference is 0)

# EBVs can change when we get more information

- Standard error of difference  $EBV_{80} - EBV_{70}$  is 3.5-4.0 index point

## Example

- $EBV_{70} = 110$
- $EBV_{80}$  can be between 102 and 118!  
(5% outside)

# EBVs with medium reliability – correlations change more - when get new/more information (10%)

| Increase in reliability         | From 40 to 50% | From 70 to 80% |
|---------------------------------|----------------|----------------|
| Standard deviation on EBV2      | 8.5            | 10             |
| Correlation EBV1,EBV2           | <b>0.89</b>    | <b>0.94</b>    |
| Standard error change EBV2-EBV1 | 3.5-4.0        | 3.5-4.0        |
| Min – max (mean 110)            | 102-118        | 102-118        |

# What happened in March for Holstein correlation $DGV_{old} - DGV_{new} = 0.834$ ?

Several improvements introduced:

- Eurogenomics data increase reliability by about 0.13% - correlation 0.874
- Model change – correlation 0.967
- EBVs from updated routine run - correlation 0.99
- Weighted vs. unweighted analysis - correlation 0.99
- **Expected correlation =  $0.874 * 0.967 * 0.99 * 0.99 = 0.828$**

**NAV**

# Conclusion

- We got a lot of new information (euro genomics data) in the DGVs – results as expected
- Learning's:
  - Medium reliability on DGV - we have to adjust our "eyes" used to "high" reliabilities
  - Remember DGVs are under R&D not routine yet even though we use them in practice – we might get significant extra information by extra reference animals, HD chips, better methods!

**NAV**



# EBVs with medium reliability

Use of breeding values in practice

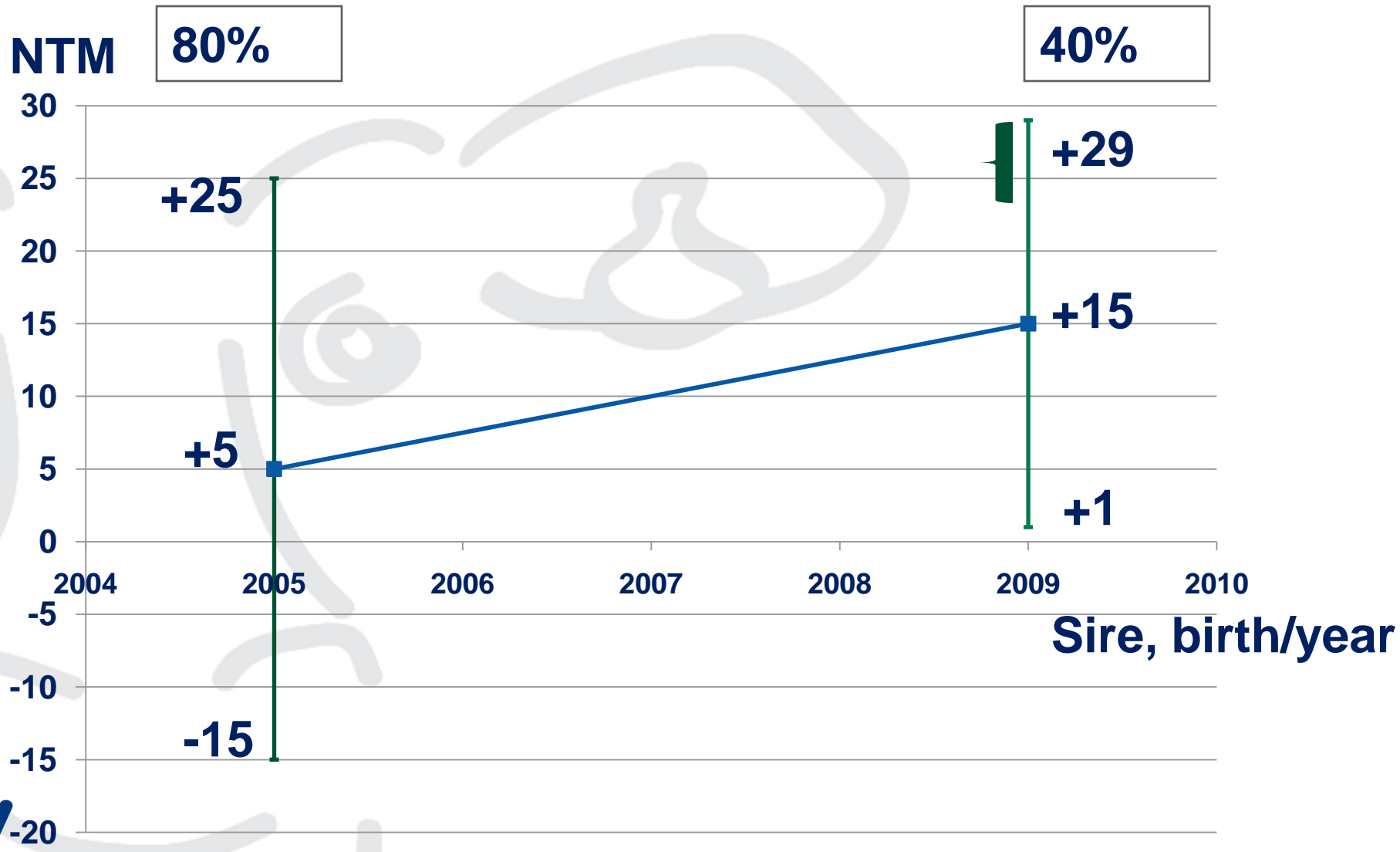
**NAV**



Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation



# Variation in NTM among bulls



**NAV**



Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

# True breeding values versus EBVs

| EBV         | +25 NTM |     |     |     |     |     |     |     |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|
| Reliability | 30%     | 40% | 50% | 60% | 70% | 80% | 90% | 95% |
| True min    | +6      | +7  | +9  | +11 | +13 | +15 | +18 | +20 |
| True max    | +44     | +43 | +41 | +39 | +37 | +35 | +32 | +30 |

Medium reliabilities

High reliabilities

EBVs can deviate more from true BV with medium than high reliabilities

**NAV**



# Use of a team of bulls

| EBV                     | +25 NTM |                |        |
|-------------------------|---------|----------------|--------|
|                         | 1 bull  | Mean of 5 bull | 1 bull |
| Reliability single bull | 50%     | 50%            | 90%    |
| Reliability group       |         | 90%            |        |
| Min                     | +9      | +18            | +18    |
| Max                     | +41     | +32            | +32    |

Risk can be reduced by using a team of bulls

**NAV**

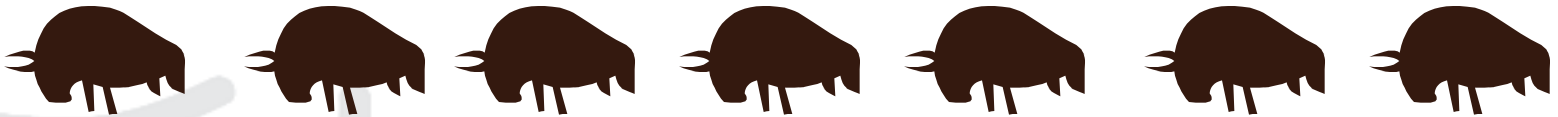


# Use a team of bulls

| EBV                     | +25 NTM |                |        |
|-------------------------|---------|----------------|--------|
|                         | 1 bull  | Mean of 7 bull | 1 bull |
| Reliability single bull | 30%     | 30%            | 90%    |
| Reliability group       |         | 90%            |        |
| Min                     | +6      | +18            | +18    |
| Max                     | +44     | +32            | +32    |

Risk can be reduced by using a team of bulls

**NAV**



Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

# Conclusion

## Medium reliabilities

- **Do not focus on a single bull and his single EBVs, but use a group of bulls with high EBVs**
- **In practice avoid focus on a single Genvik plus bull and his EBVs, when he is used as bull sire and proven sire!**

# Medium reliabilities overall conclusions

- More information give more re ranking than we are used to with high reliabilities
- Higher risk by focusing on single bulls than with higher reliabilities – focus on a group