# VikingGenetics

## Breeding for what truly matters

Presented by

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VIKINGGENETICS®

# Den genetiska framstegstakten och inavelsgradens förändring efter introduktionen av genomisk selektion

**NØK**

**July 2018**

**Rättvik, Sweden**


VIKINGGENETICS

# Outline

- Factors influencing the genetic gain in general and the experience of the specific situation in a “genomic breeding program”
- Changes of breeding programs due to introduction of GEBV
- Other implications of genomic selection

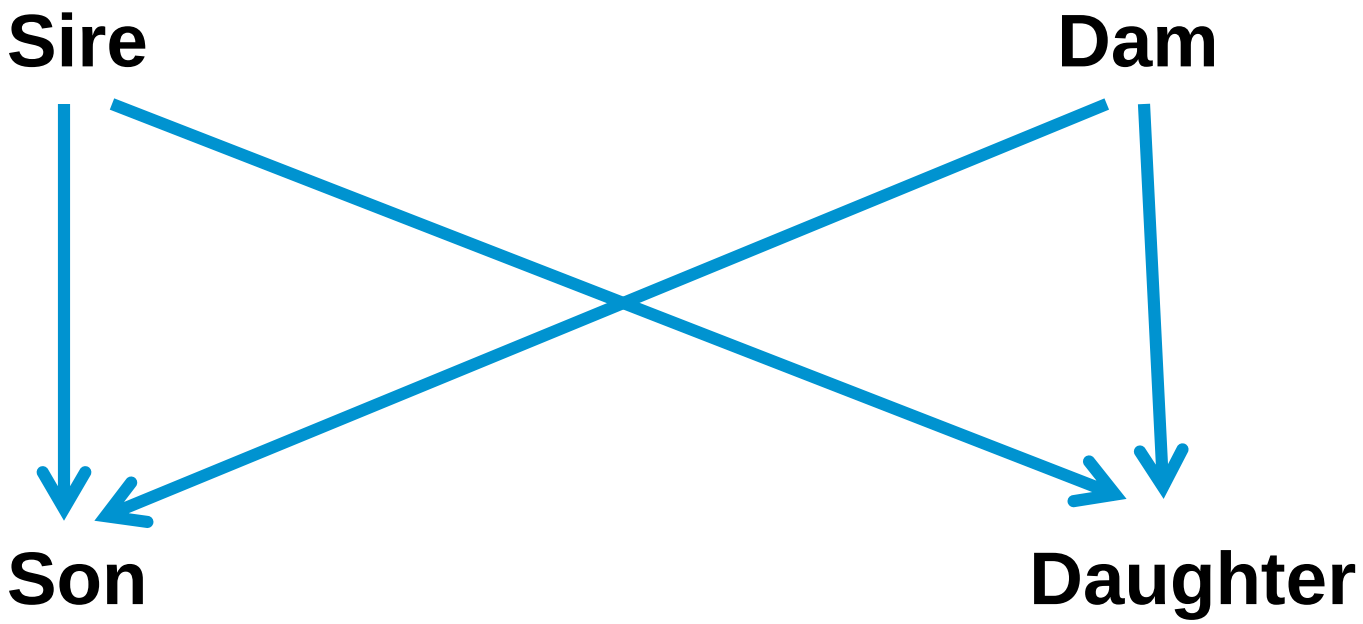
# Breeders equation

$$\Delta T = (rTI * i * \delta T) / L$$

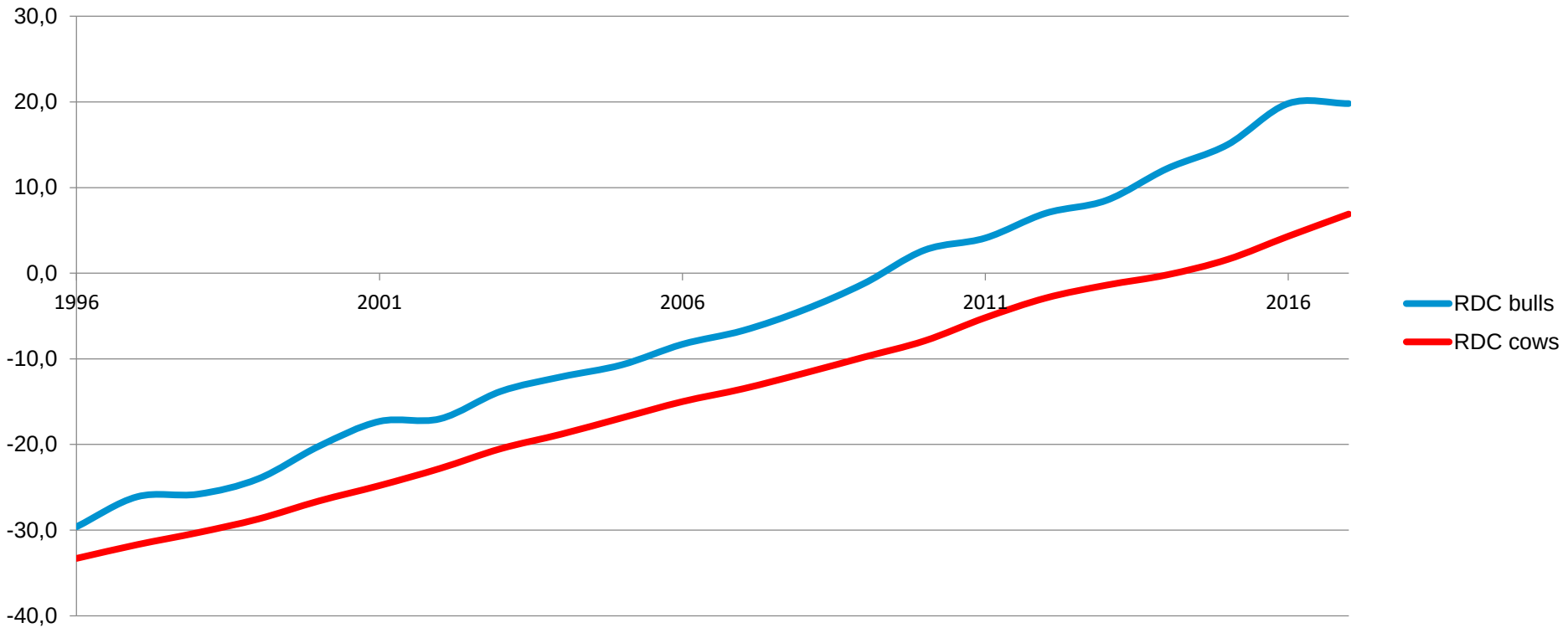
$\Delta T$ = annual genetic gain
rTI = Correlation between index and breeding objective
i = selections intensity
$\delta T$ = variation in the breeding objective
L = length of generation interval

**Select young parents that are highly selected and have accurate breeding values!**

# 4 selection paths



# The genetic gain is generated by the bulls and transformed to the female population through the use of AI



# Key factors for genomic selection

- Size of the reference population
- Quality and quantity of data registrations
- Efficiency of the methodology, chip technology and calculation methods

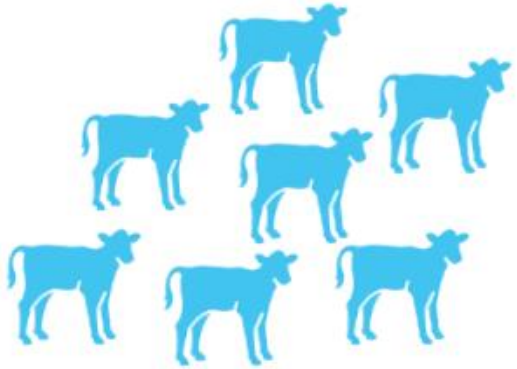
# Genomic selection - how does it work?

**Reference population**

Old daughter proven sires are typed with 54,000 markers


**Genomic model**

Each marker gets a value for each trait



DNA-typed heifer- and bull calves get a genomic proof

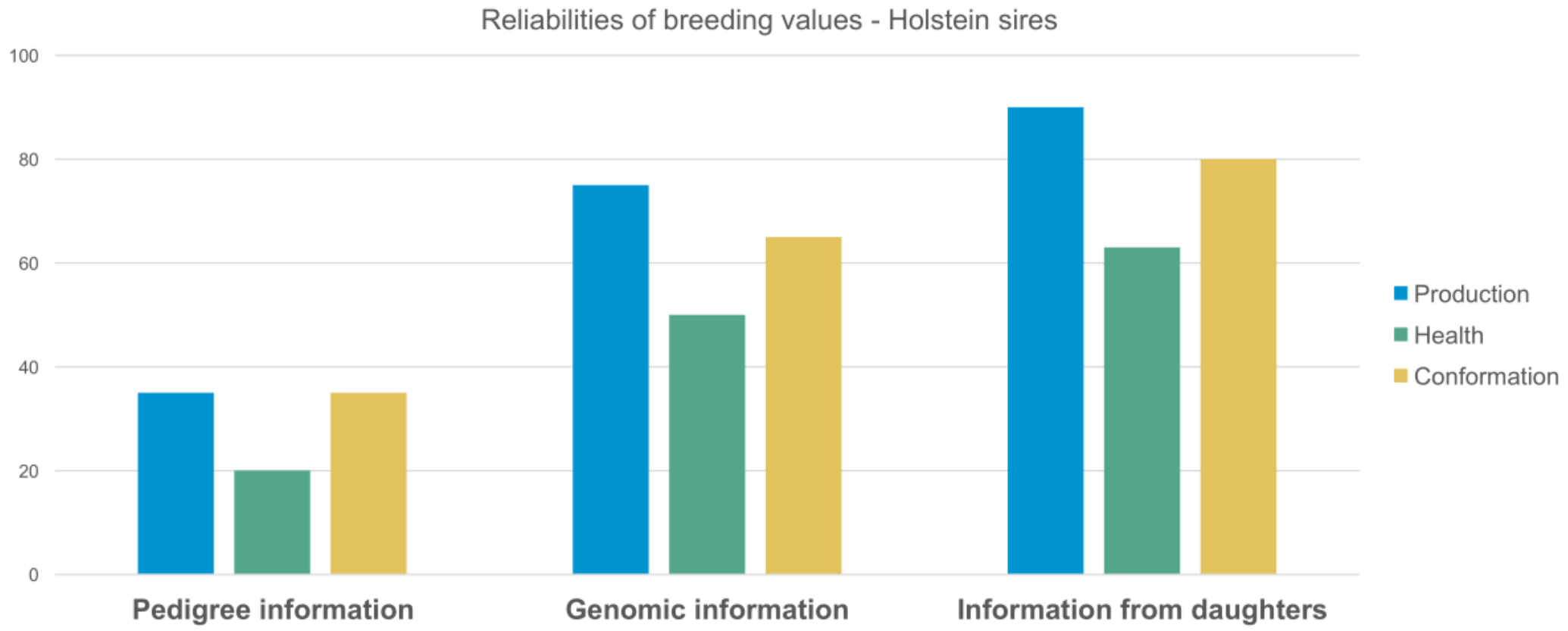
# Size of reference population

| | No. of sires | No. of cows | Source | LD project** |
|---|---|---|---|---|
| VikingHolstein | 34,535 | 30,103 | VG + Eurogenomics* | 15,000 |
| VikingRed | 8,212 | 32,318 | VG + Norway | 10,000 |
| VikingJersey | 2,609 | 17,788 | VG + USA/Canada | 7,000 |

Updated: 2018-02-07

* EuroGenomics includes proven bulls from the Netherlands, France, Germany, Spain and Poland
** No. of females financially supported by VikingGenetics to maintain/improve strong reference group

# Reliabilities of breeding values



# Reliabilities on GEBV's

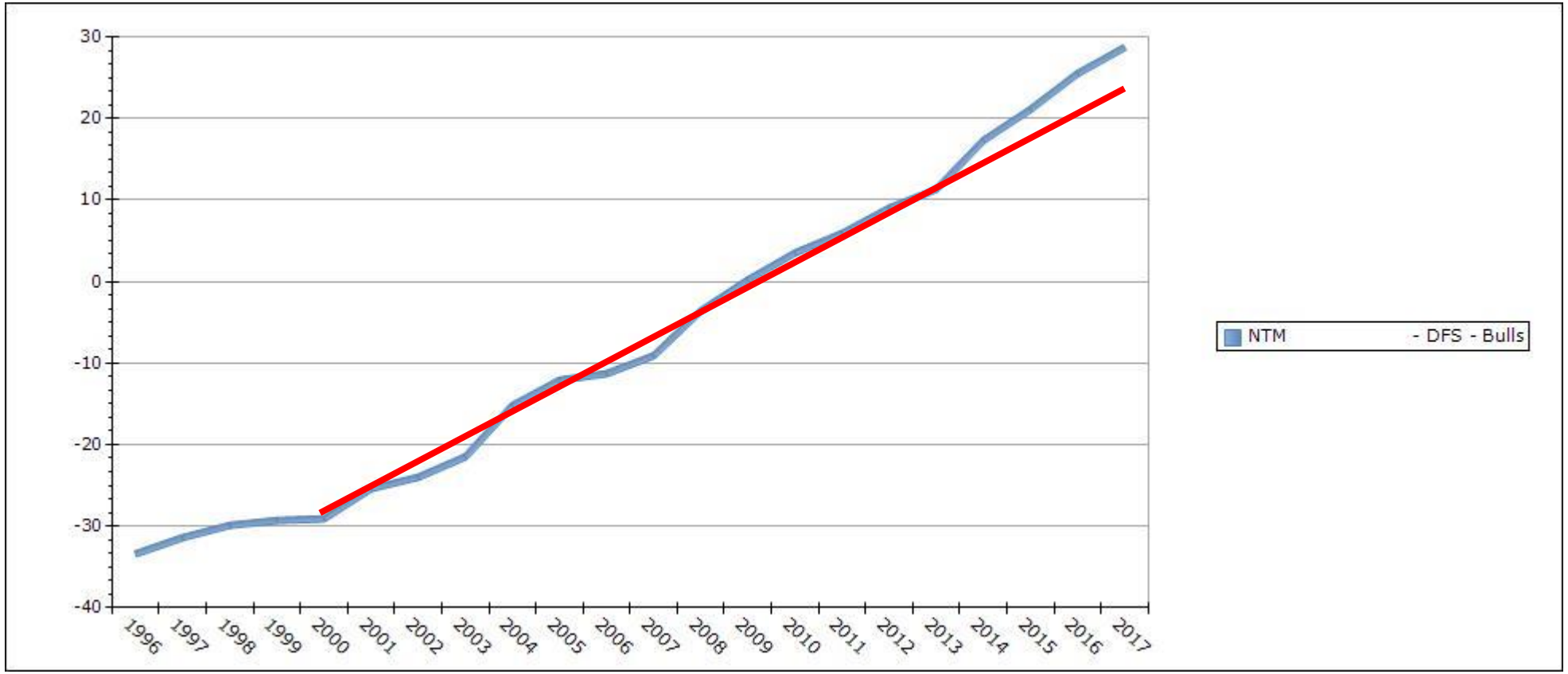
60-80%

55-70%

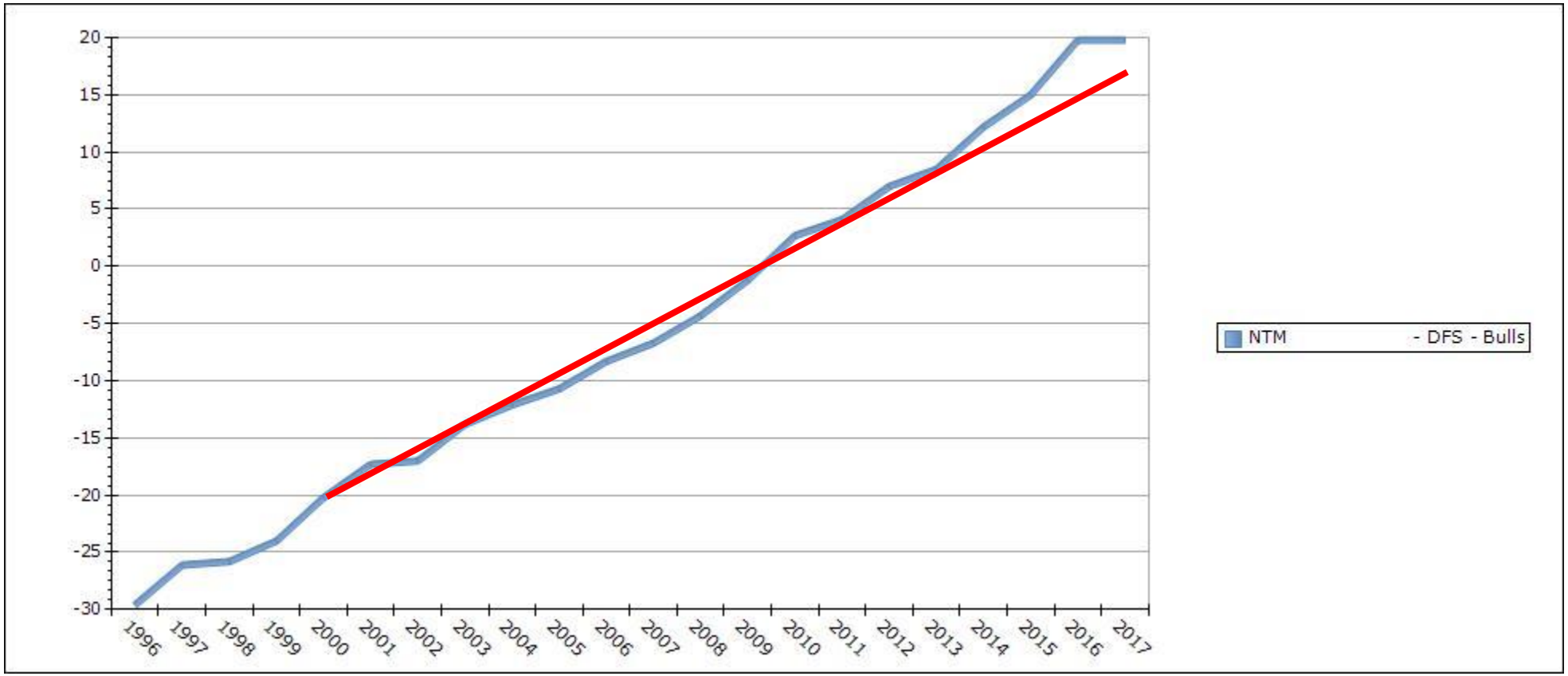
45-65%

Updated: April 2018

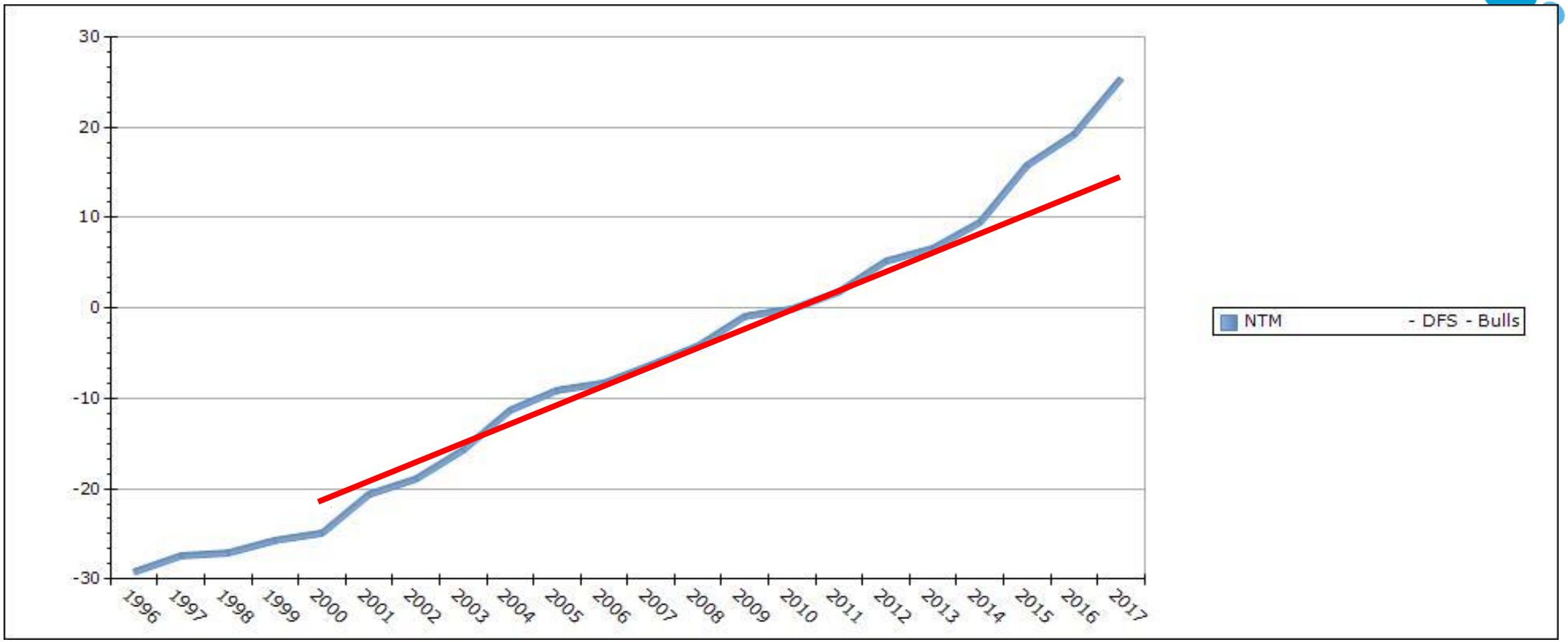
# Trends NTM. VikingHolstein bulls



# Trends NTM. VikingRed bulls



# Trends NTM. VikingJersey bulls



# Annual genetic trend per year. females

| | Annual genetic trend per year | | |
|---|---|---|---|
| Breed / Period | 2000-2008 | 2009-2012 | 2013-2017 |
| VikingHolstrein | 1.85 | 2.61 | 2.82 |
| VikingRed | 1.88 | 2.34 | 2.11 |
| VikingJersey | 1.75 | 2.24 | 2.57 |

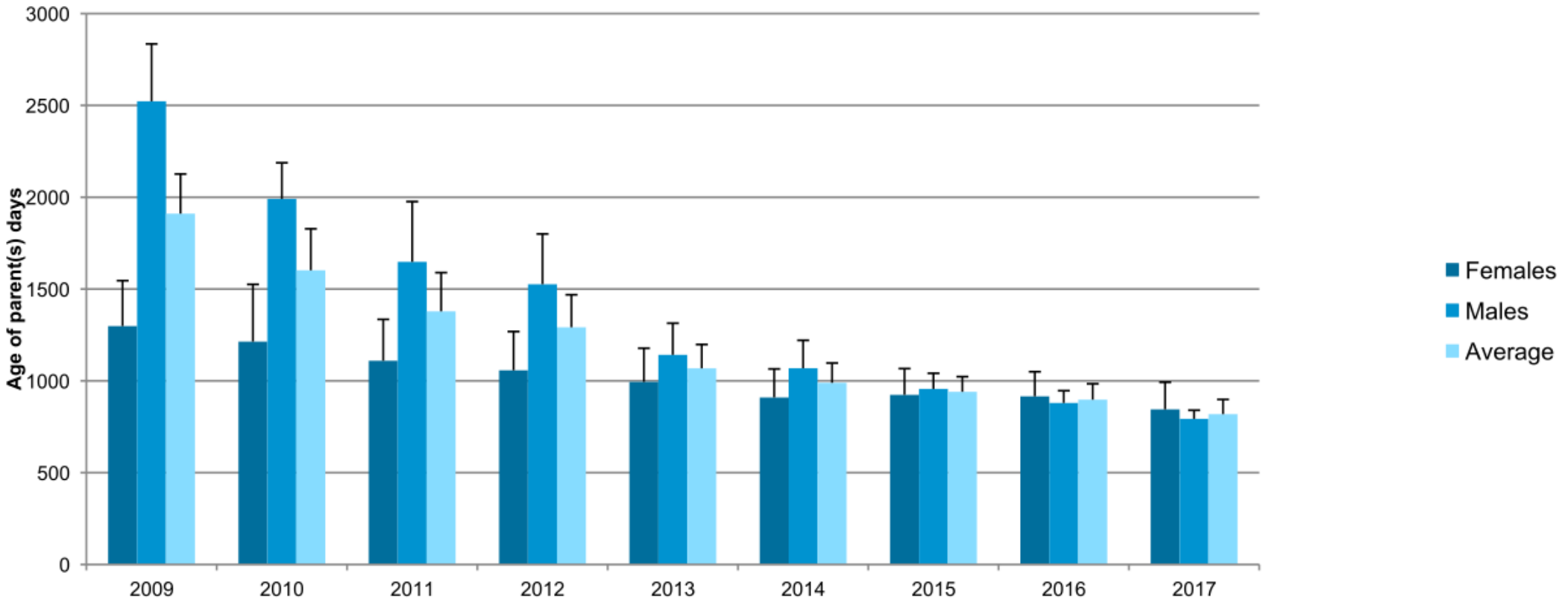
# Effect of female test

No. of animals: 107

| | Average sub index (Reliability) | | | | |
|---|---|---|---|---|---|
| | Before GS | After GS | Diff. | Increase | Decrease |
| NTM | 8 | 8 | 0 | 15 | -15 |
| Production index | 106 (29) | 106 (67) | 0 | 15 | -22 |
| Fertility | 104 (17) | 103 (42) | -1 | 11 | -12 |
| Udder Health | 102 (23) | 103 (56) | 1 | 15 | -10 |
| Udder | 102 (25) | 102 (60) | 0 | 14 | -19 |

Updated: April 2018

# Change of generation interval, Holstein



# Use of different sire/semen category

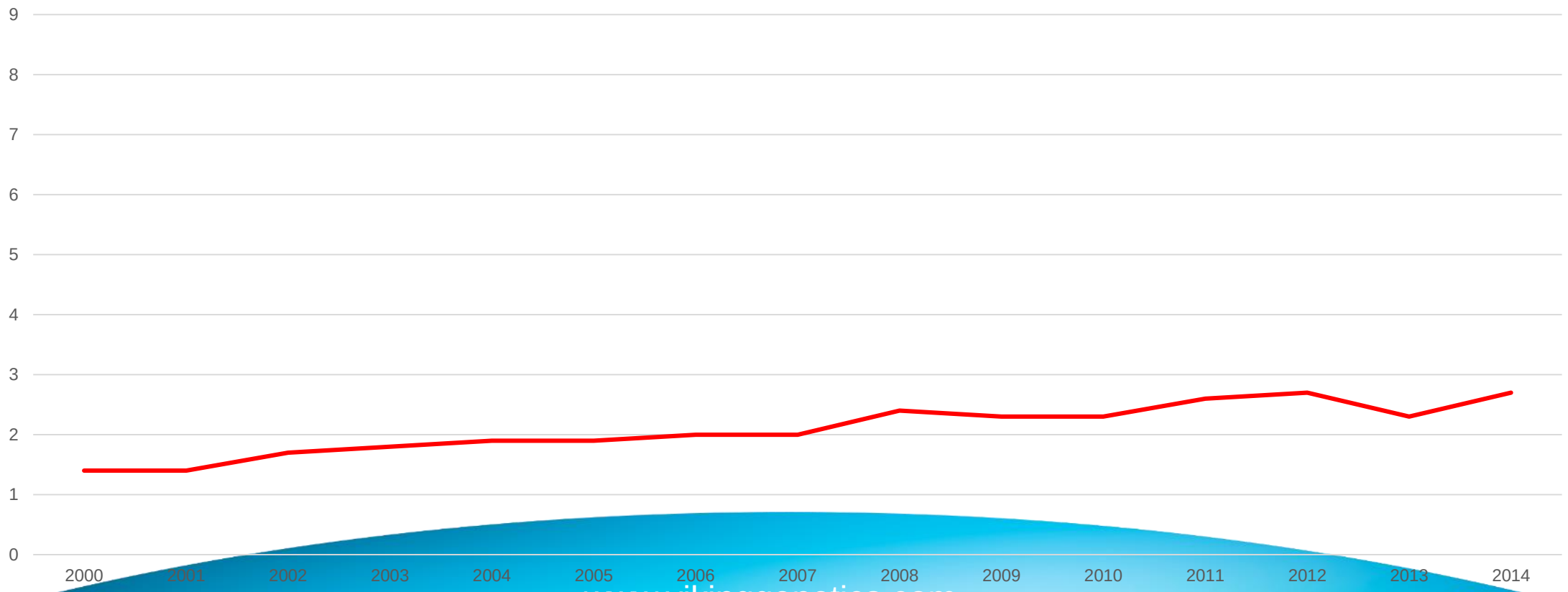
| | 2016 | 2017 | Actual 2018 |
|---|---|---|---|
| Daughter proven | 8 | 3 | 6 |
| Genomic | 91 | 96 | 93 |
| | | | |
| Sexed semen | 20 | 30 | 37 |

Updated: April 2018

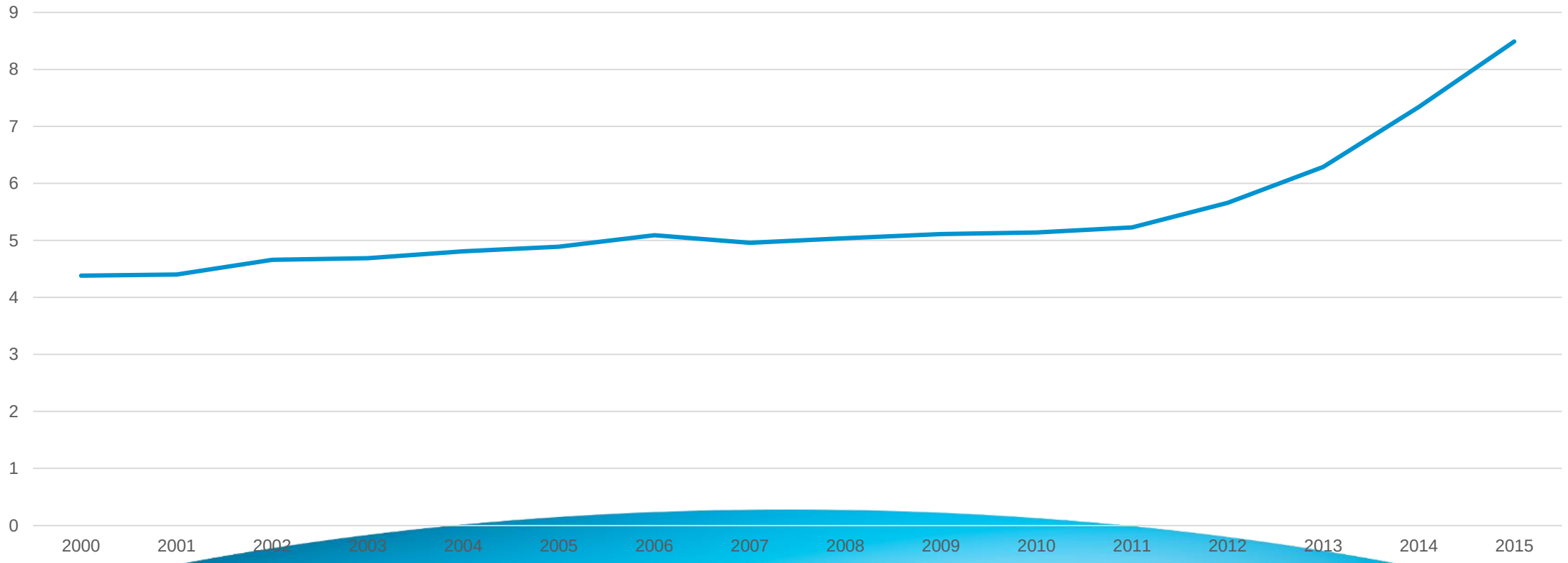
# Other implications of GS

- Shorter generation interval higher risk for increased inbreeding
- More genetic defects have been identified

# Inbreeding level VikingRed



# Inbreeding level European Holstein



# More haplotypes are found

**Bulls' status for haplotypes impacting fertility on the records of Holstein Association USA, Inc. as of 04/11/2016 (Blank=Tested-Free, C=Carrier) Use CTRL-F to search.**

| Stud Code | Name | Registration | HH1 | HH2 | HH3 | HH4 | HH5 | HCD |
|---|---|---|---|---|---|---|---|---|
| 29HO09061 | 208 D G DANO-ET | USA 17395753 | C | | | | | |
| | 2ND-LOOK ALEXANDER 9990 | 840003004418274 | | | | | | 1 |
| 7HO11511 | 2ND-LOOK FREDDIE 9997 | 840003004418281 | | | | | | 1 |
| 29HO16289 | 2ND-LOOK FREDDIE PRIDE-ET | 840003004418282 | | | | | C | |
| | 2ND-LOOK LEIF LUCAS-ET | 840003004418271 | | | | | | 1 |
| 7HO09546 | 2ND-LOOK MALLOY | USA 60882194 | | | | | | 1 |
| 14HO06571 | 2ND-LOOK MILLENNIUM-ET | 840003004418265 | | C | | | | 1 |
| | 2ND-LOOK MILLION 9980-ET | 840003004418264 | | | | | | 1 |
| | 2ND-LOOK OBSERVER 11014-ET | 840003008562090 | | | | | C | |
| 204HO00219 | 528 NEW-WORLD EMPIRE-ET | USA 17190309 | C | | C | | | |
| 7HO09021 | A L H DUKE-ET | NLD 418232477 | | | C | | | |
| | A-DOUBLESTAR ALAMO | USA 143144636 | | | | | | 3 |

# Summary

- Higher genetic gain (NTM) since the introduction of genomic selection
- More improvement of the genetic gain in health traits

- Challenges
  - Development of the inbreeding
  - Handling of haplotypes