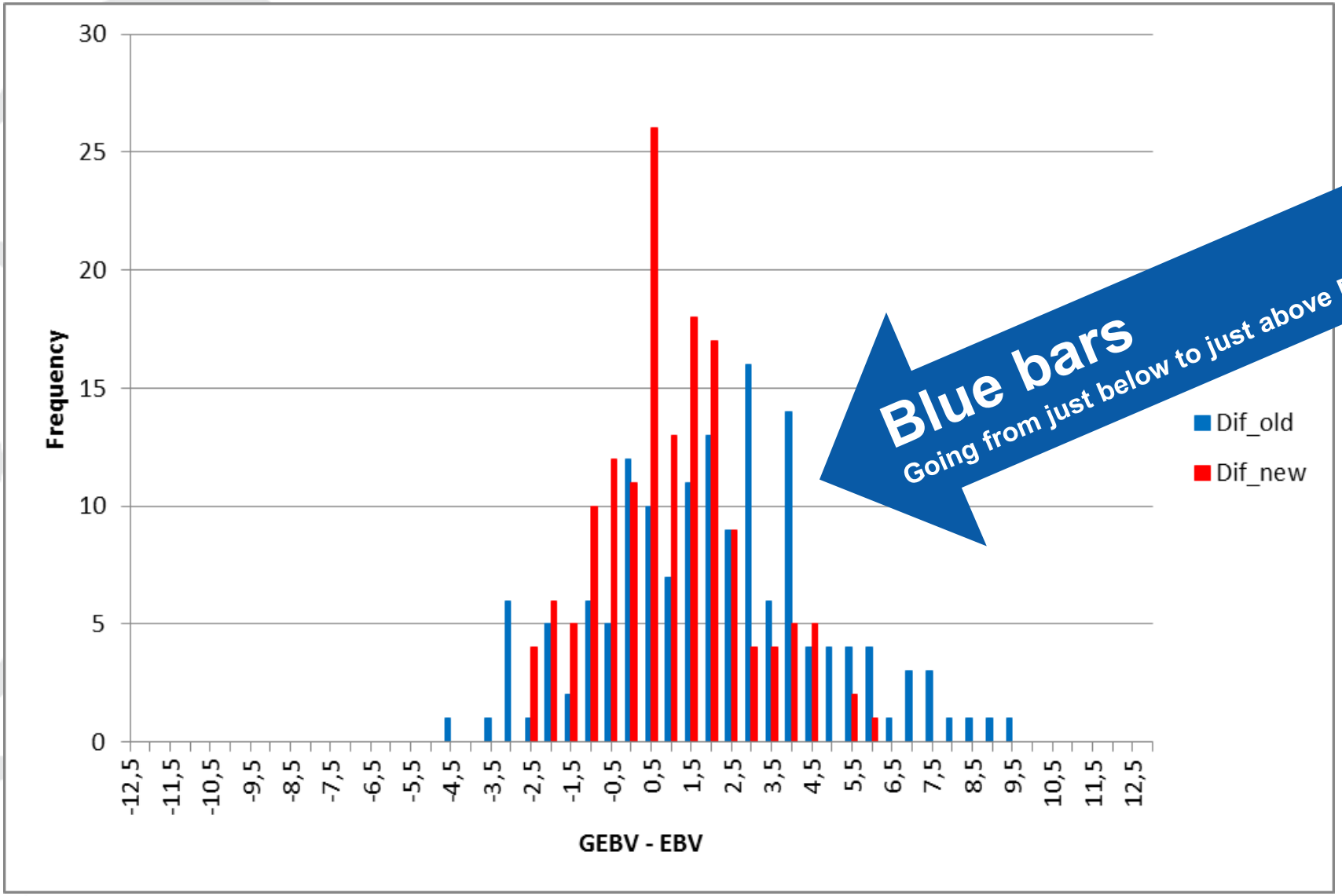
Genomic prediction is improved

Observation 1

Larger difference in breeding values than theoretically expected:

(Rel < 90%)

(Rel > 90%)


30
25
20
15
10
5
0
Frequency
-12,5
-11,5
-10,5
-9,5
-8,5
-7,5
-6,5
-5,5
-4,5
-3,5
-2,5
-1,5
-0,5
0,5
1,5
2,5
3,5
4,5
5,5
6,5
7,5
8,5
9,5
10,5
11,5
12,5
GEBV - EBV
Dif_old
Dif_new
Blue bars
Going from just below to just above REL 90%

Transition rules – example yield

Information sources

Genomic	Genomic+daughter	Daughter
		
REL < 60%	**60% < REL < 90%**	**REL > 90%**

Previously: Weight of information

Information sources

Genomic + ped. | **Genomic+daughter** | **Daughter**

REL < 60%

60% < REL < 90%

REL > 90%

Now: Weight of information (10% polygenic effect)

Information sources

Genomic + ped.

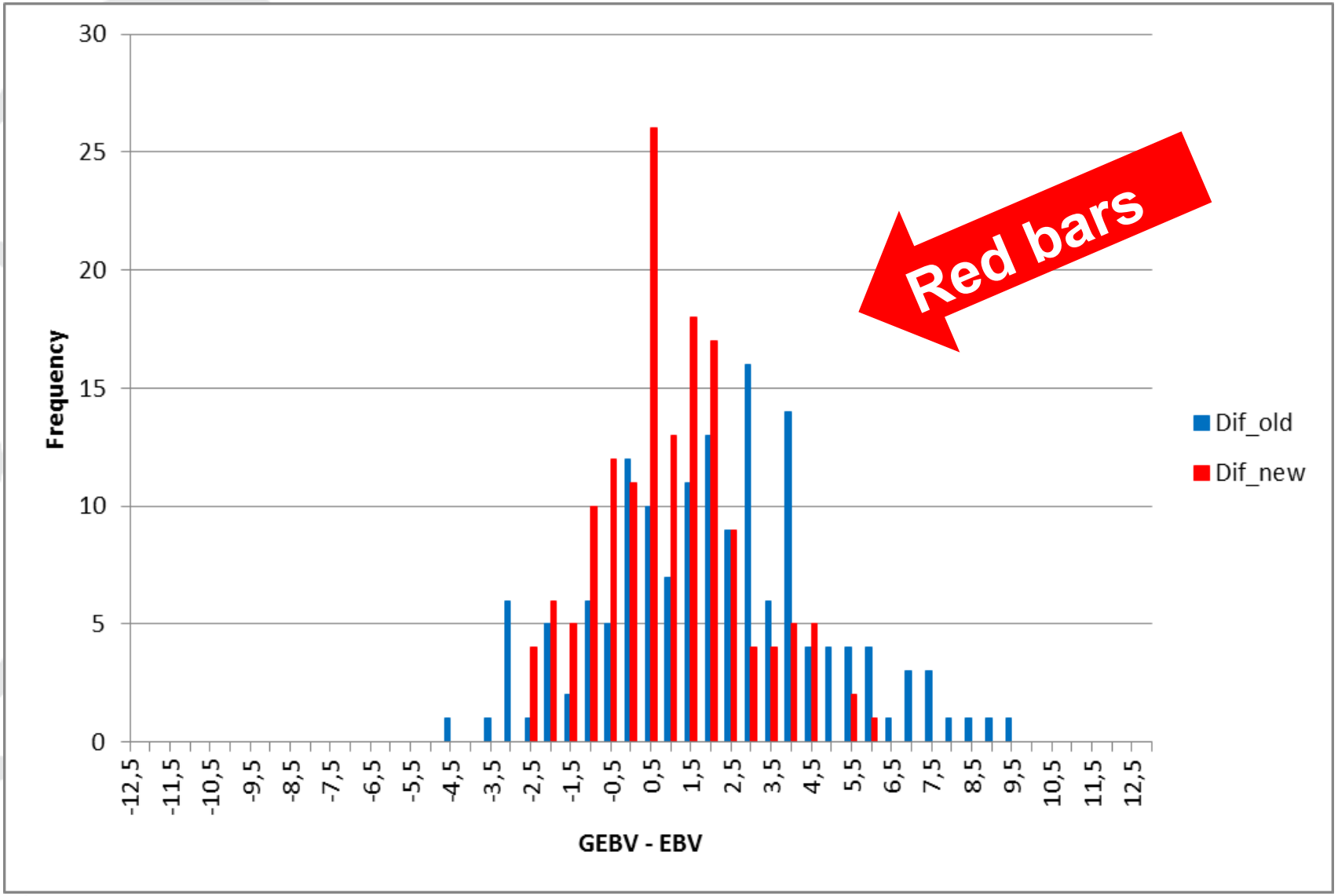
REL < 60%

Genomic+daughter

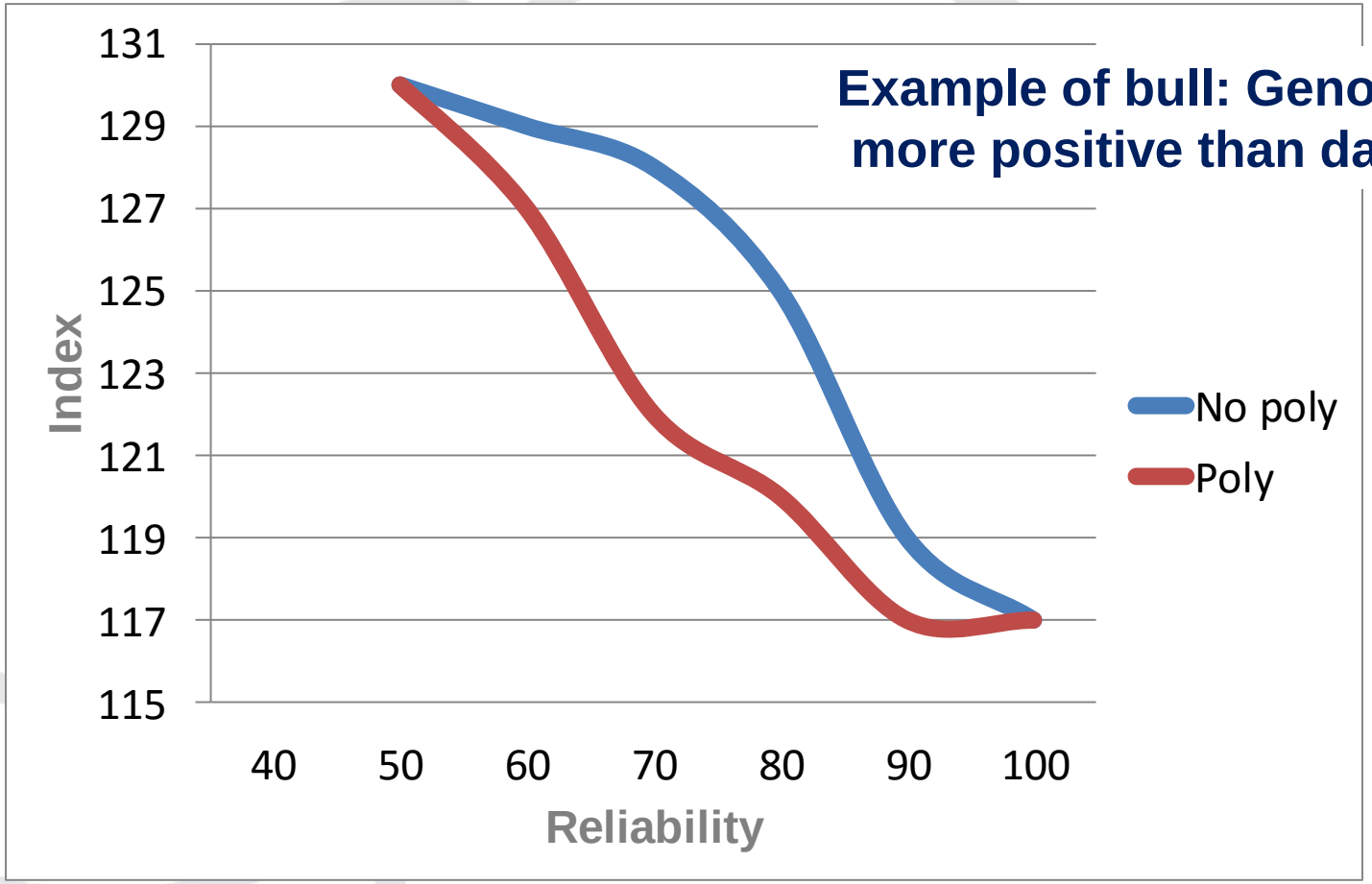
60% < REL < 90%

Daughter

REL > 90%

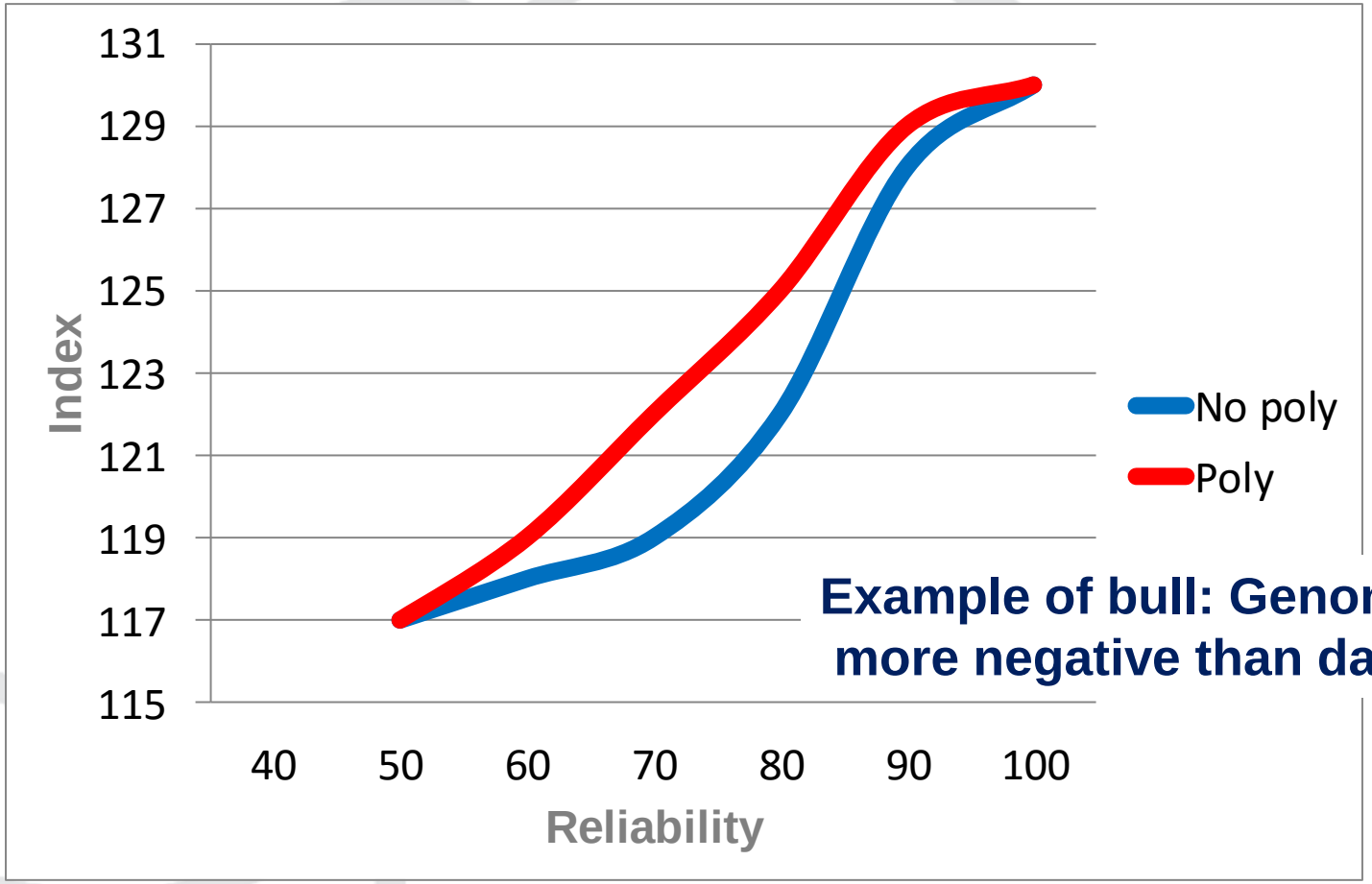

Red bars
Frequency
30
25
20
15
10
5
0
-12,5
-11,5
-10,5
-9,5
-8,5
-7,5
-6,5
-5,5
-4,5
-3,5
-2,5
-1,5
-0,5
0,5
1,5
2,5
3,5
4,5
5,5
6,5
7,5
8,5
9,5
10,5
11,5
12,5
GEBV - EBV
Dif_old
Dif_new

More smooth transition with polygenic effect



Example of bull: Genomic info more positive than daughter info

More smooth transition with polygenic effect



Example of bull: Genomic info more negative than daughter info

Introduction af polygenic effect

- All breeds
- Both males and females
- All traits

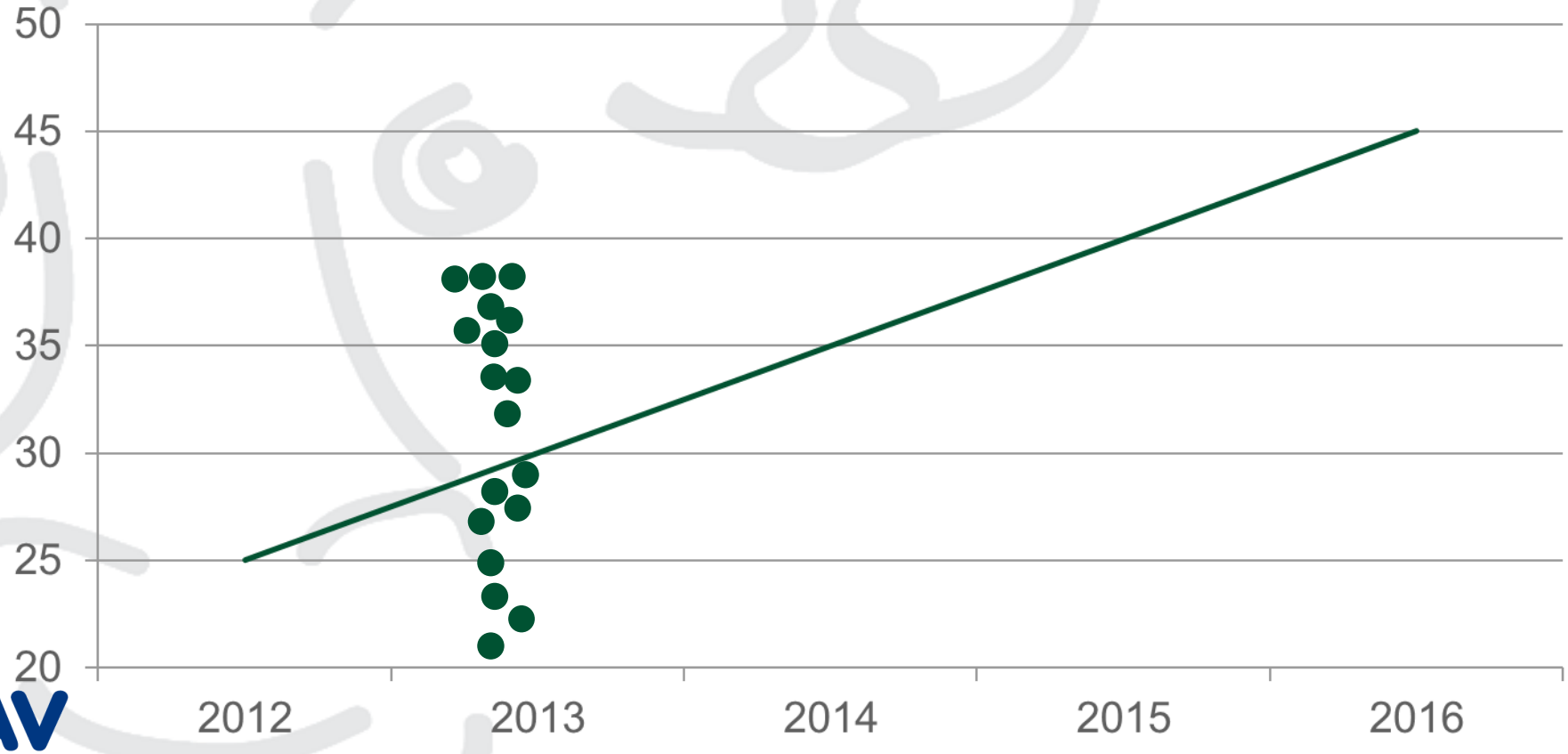
Observation 2

Drop in breeding values from being used for AI to having daughters was larger than expected for young bulls

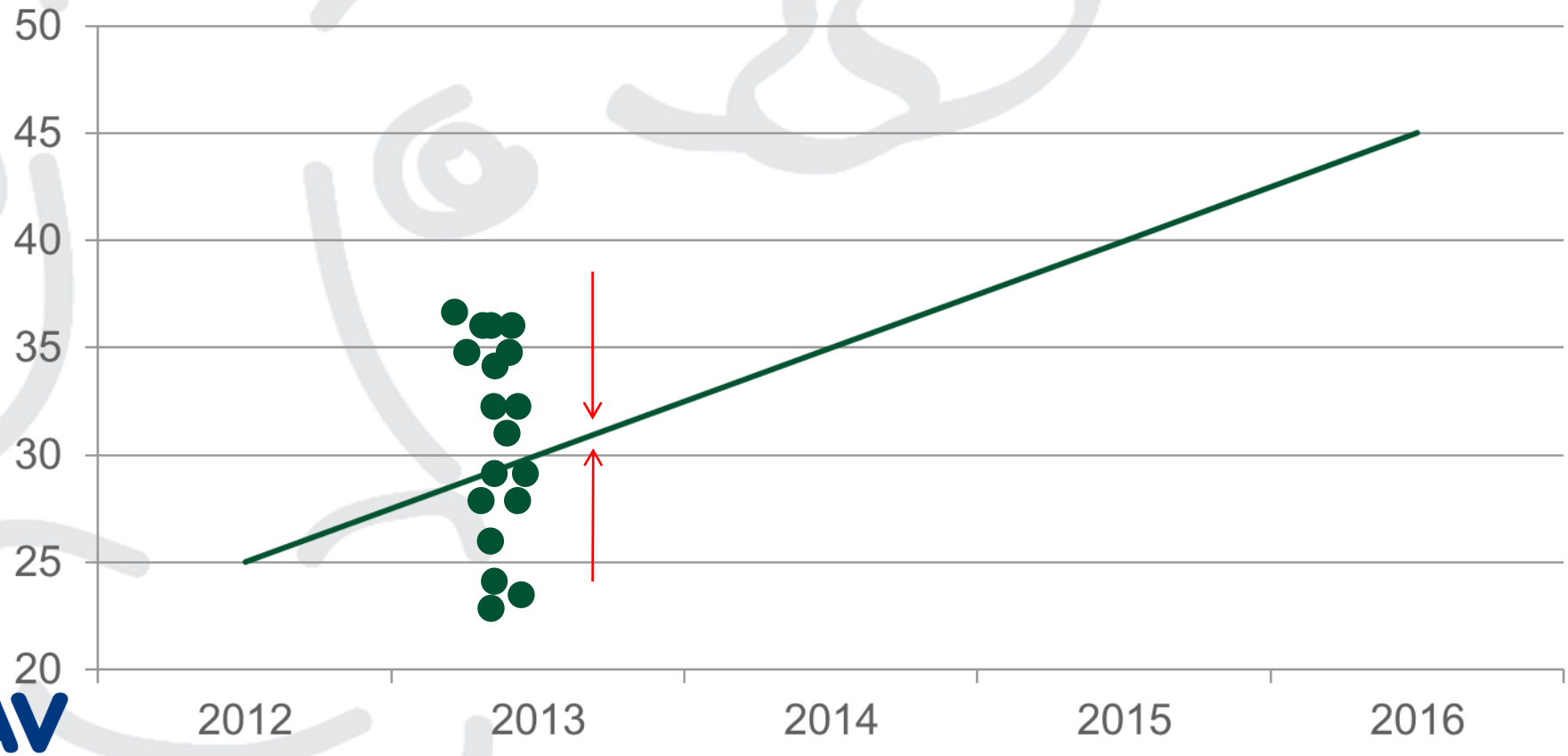
Genomic

Genomic + first daughter

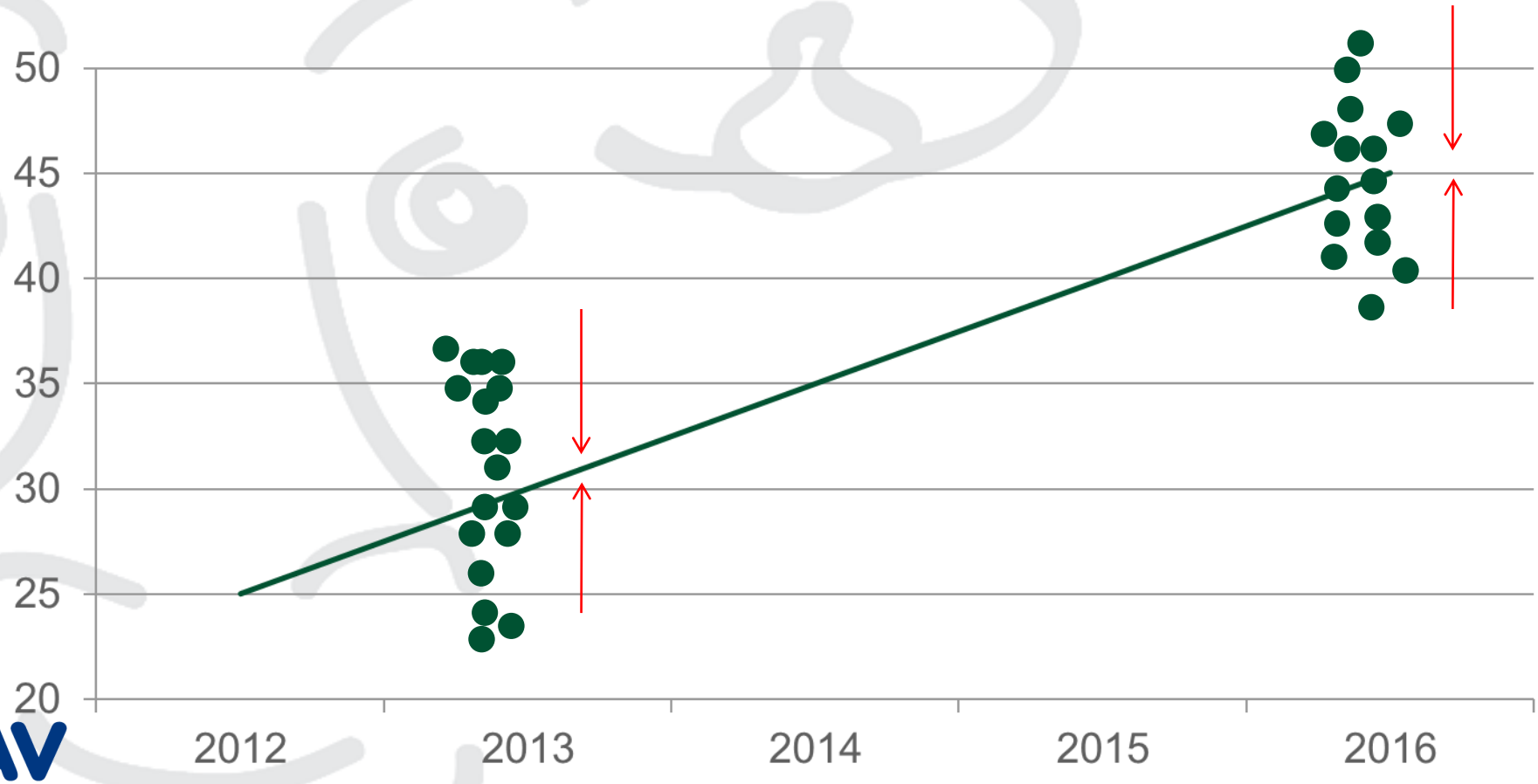
Without standardization



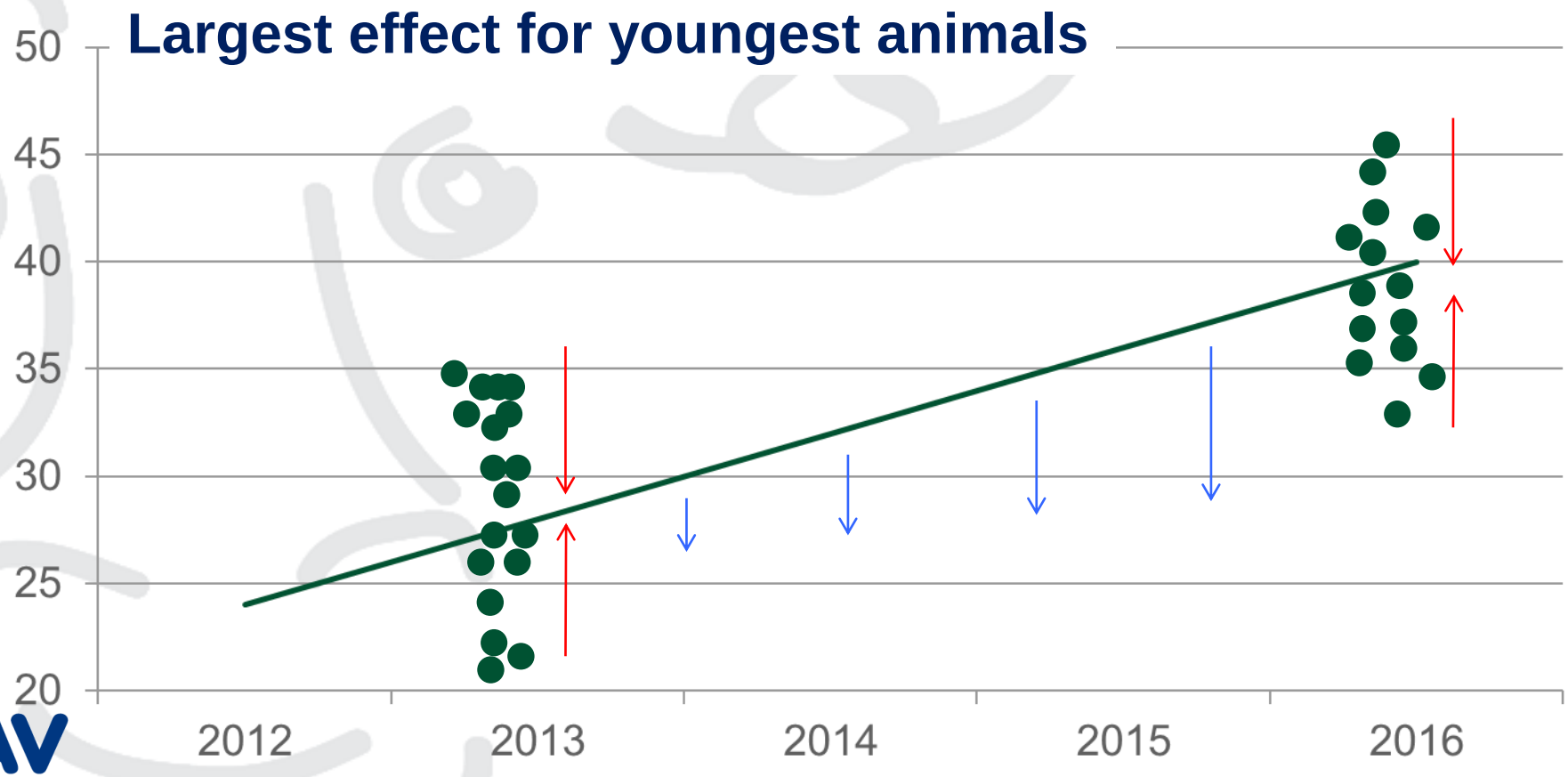
Standardization – within year



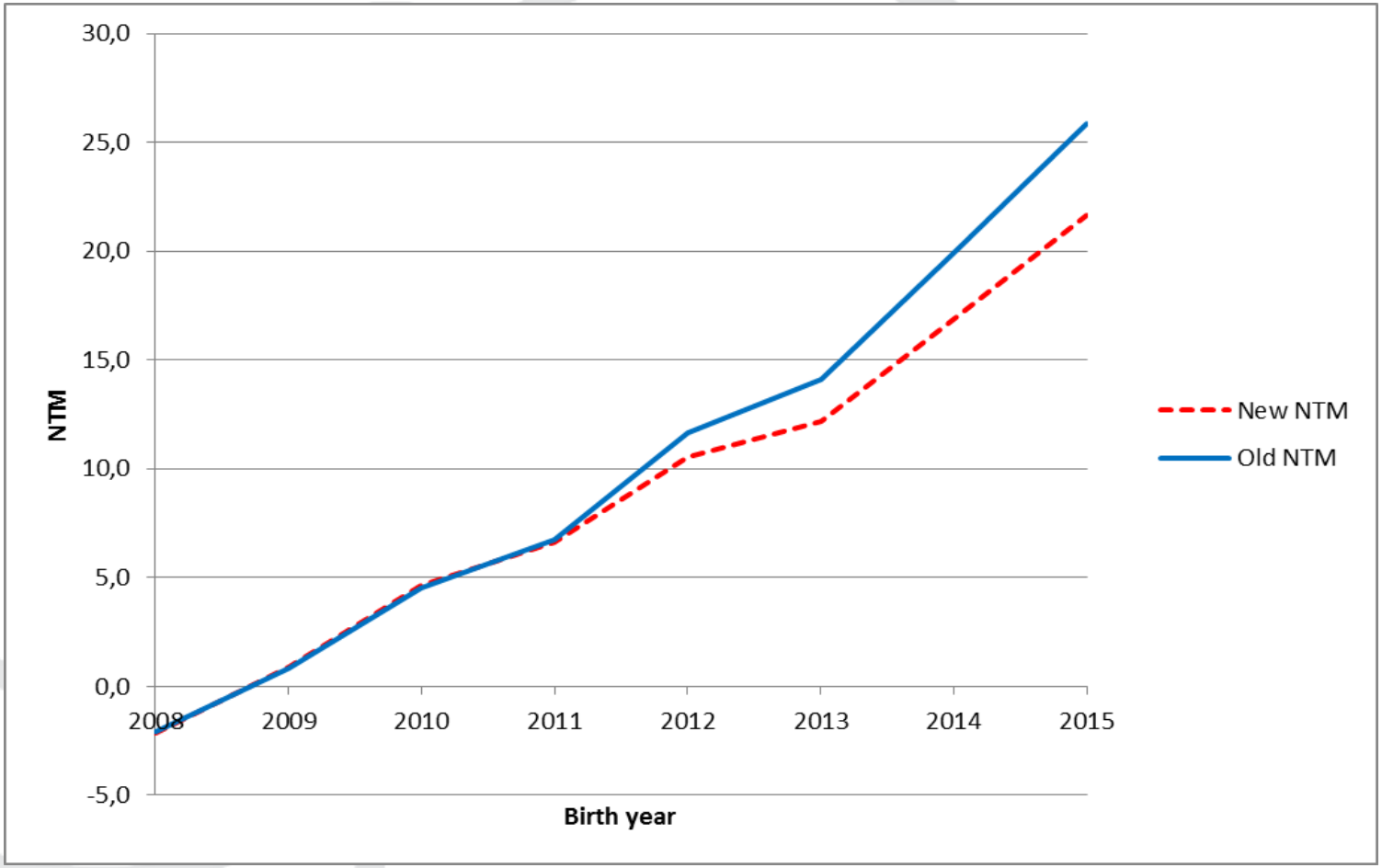
Standardization – within year



Standardization –
within year + trend across years



Exampel: NTM for RDC



Change of NTM

Sum of all changes:

- Improvement of traditional models for fertility, udder, yield and calving
  - Reranking of all animals
- Polygenic effect
  - Especially reranking effect on live genotyped cows and newly proven bulls
- Improved standardization
  - Lower index for genomic tested young AI bulls and genomic tested heifers

Changes for Holstein bulls born in 2015

Trait	New GEBV	Old GEBV	Difference
Yield (improvements!)	115.1	118.1	-3.0
Milk	108.3	109.9	-1.7
Fat	114.8	116.8	-2.0
Protein	113.8	116.8	-3.1
Growth	99.6	99.6	-0.1
Fertility (improvements!)	108.9	110.6	-1.7
Birth (improvements!)	105.5	106.8	-1.3
Calving (improvements!)	109.2	110.2	-1.1
Udder health	109.4	111.2	-1.8
Other Disease	106.9	107.5	-0.7
Frame	105.7	105.4	0.3
Feet& Legs	108.5	109.1	-0.6
Udder (improvements!)	117.3	117.2	0.1
Milkability	106.7	107.1	-0.5
Temperament	105.2	105.2	0.1
Longevity	114.2	120.8	-6.6
Claw health	107.4	108.3	-0.9
Youngstock survival	101.4	102.8	-1.3
NTM	28.7	33.4	-4.7

Changes for RDC bulls born in 2015

Trait	New GEBV	Old GEBV	Difference
Yield	112.4	115.3	-2.9
Milk	106.9	109.0	-2.0
Fat	110.8	112.9	-2.1
Protein	111.9	115.0	-3.1
Growth	99.5	99.6	-0.1
Fertility	104.1	104.7	-0.6
Birth	102.6	103.3	-0.7
Calving	103.5	104.8	-1.3
Udder health	107.8	109.1	-1.3
Other Disease	105.4	106.0	-0.6
Frame	103.9	103.9	0.0
Feet& Legs	106.9	108.8	-1.9
Udder	110.3	111.3	-1.0
Milkability	106.9	106.9	0.0
Temperament	102.5	103.3	-0.8
Longevity	111.9	114.4	-3.0
Claw health	102.6	103.0	-0.3
Youngstock survival	99.7	99.6	0.1
NTM	22.1	26.4	-4.3

Changes for Jersey bulls born in 2015

Trait	New GEBV	Old GEBV	Difference
Yield	111.5	114.1	-2.6
Milk	104.6	105.7	-1.1
Fat	109.5	111.9	-2.4
Protein	110.6	112.3	-1.7
Growth	99.1	99.5	-0.3
Fertility	102.6	102.6	0.1
Birth	100.4	100.0	0.4
Calving	103.3	104.3	-1.0
Udder health	107.2	107.6	-0.4
Other Disease	100.3	100.1	0.2
Frame	106.7	107.6	-0.9
Feet& Legs	104.3	104.3	-0.1
Udder	109.2	108.6	0.5
Milkability	101.7	103.0	-1.3
Temperament	100.1	100.6	-0.5
Longevity	108.1	108.9	-0.8
Claw health	-	-	-
Youngstock survival	-	-	-
NTM	17.3	19.8	-2.5

Correlation between new and old NTM

	Young Bulls	Heifers	Cows
Holstein	0.95	0.98	0.98
RDC	0.95	0.98	0.98
Jersey	0.96	0.98	0.99

- AI bulls born in 2013-2015
- Cows and heifers born after 2010

Changes between new and old NTM

Genomic tested bulls born in year 2015

Change in NTM	Holstein (%)	RDC (%)	Jersey (%)
-10			
-9			
-8	2.2		
-7	3.2	4.1	
-6	18.3	10.2	2.0
-5	33.3	33.7	0.0
-4	26.9	22.4	12.2
-3	8.6	20.4	34.7
-2	7.5	8.2	30.6
-1		1.0	20.4
0			
Average change	-4.7	-4.3	-2.5

Changes between new and old NTM

Genomic tested Heifers born in year 2015

Change in NTM	Holstein (%)	RDC (%)	Jersey (%)
-10			
-9	0.1		
-8	0.9	0.1	
-7	5.5	0.8	
-6	15.3	3.9	0.2
-5	26.8	13.8	1.4
-4	27.6	27.5	10.0
-3	16.5	29.9	29.5
-2	5.9	17.8	34.9
-1	1.3	5.1	19.6
0	0.2	1.0	4.2
1		0.1	0.3
Numbers	10,956	10,218	4,077

Changes between new and old NTM

Genomic tested Cows born after 2010

Change in NTM	Holstein (%)	RDC (%)	Jersey (%)
-8			
-7	0.2		
-6	1.2	0.1	
-5	4.7	0.6	
-4	12.8	2.9	0.1
-3	22.7	9.8	1.6
-2	26.1	21.2	8.2
-1	20.0	26.9	23.1
0	9.4	22.2	33.2
1	3.3	11.5	24.2
2	0.7	3.8	8.2
3	0.1	0.8	1.3
4		0.1	0.1
5			
Numbers	16,364	20,220	12,704