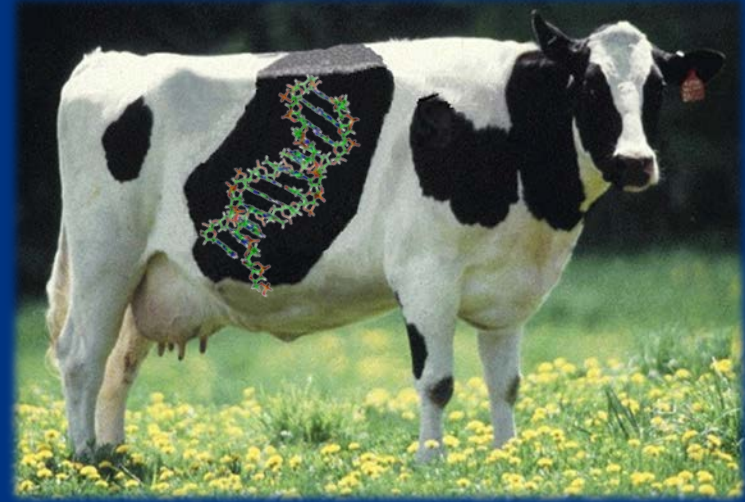


Selection changes in the United States due to genomics



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Introduction

- **Genomic testing of dairy cattle accelerated in the United States in early 2008.**
- **Genomics is changing the way breeding programs are operating.**
- **Genomics is changing information available & choice of parents producing replacements.**
- **It is impacting genetic improvement. Some differences in programs will be described.**

Objectives

- **Show number of genomic tests across time.**
- **Show how age of bulls' ancestors have changed.**
- **Show genetic merit of bulls entering artificial insemination (AI) service across time.**
- **Determine expected genetic merit of future animals derived from examining confirmed pregnancies.**

Traits examined

- **Milk**
- **Fat**
- **Protein**
- **Somatic cell score (SCS)**
- **Productive life (Prod. Life)**
- **Daughter Pregnancy Rate (Dau. Preg. Rate)**
- **Net Merit Dollars**

Number of US animals genotyped by year (Holstein)

<u>Year</u>	<u>Females</u>	<u>Males</u>
2007	77	2389
2008	2740	8810
2009	4445	7083
2010	14,212	6786
2011	37,091	9668
2012	81,382	11,699
2013	125,314	17,417

Number of US animals genotyped by year (Jersey)

<u>Year</u>	<u>Females</u>	<u>Males</u>
2008	90	1123
2009	532	1290
2010	3201	757
2011	7427	1287
2012	12,640	1598
2013	20,206	2829

Mean PTA* of Holstein bulls entering AI by year (yield traits)

<u>Year</u>	<u>Milk</u>	<u>Fat</u>	<u>Protein</u>	<u>Number bulls</u>
	----- (kg) -----			
2005	144	6	5	1818
2006	175	8	7	1755
2007	180	9	7	1910
2008	233	10	8	1797
2009	249	14	9	1766
2010	286	16	10	1613
2011	335	18	13	1731
2012	466	21	17	1811
2013	533	27	20	1593

**Based on April 2014 evaluations*

Mean PTA* of Holstein bulls entering AI by year (other traits)

<u>Year</u>	<u>SCS</u>	<u>Prod.</u> <u>Life</u>	<u>Dau. Preg.</u> <u>Rate</u>	<u>Net</u> <u>Merit</u>
2005	2.99	-0.2	-0.4	73
2006	2.94	0.3	-0.4	133
2007	2.91	0.4	-0.2	161
2008	2.92	0.6	-0.1	195
2009	2.88	1.6	0.2	281
2010	2.85	2.3	0.2	335
2011	2.81	2.9	0.5	426
2012	2.80	3.6	0.5	511
2013	2.75	4.2	0.8	618

**Based on April 2014 evaluations*

Mean PTA* of Jersey bulls entering AI by year (yield traits)

<u>Year</u>	<u>Milk</u>	<u>Fat</u>	<u>Protein</u>	<u>Number bulls</u>
	----- <u>(kg)</u> -----			
2005	88	6	3	181
2006	94	8	4	183
2007	90	10	5	216
2008	138	13	7	204
2009	168	14	8	209
2010	240	16	10	209
2011	313	20	13	236
2012	400	24	16	236
2013	393	26	16	264

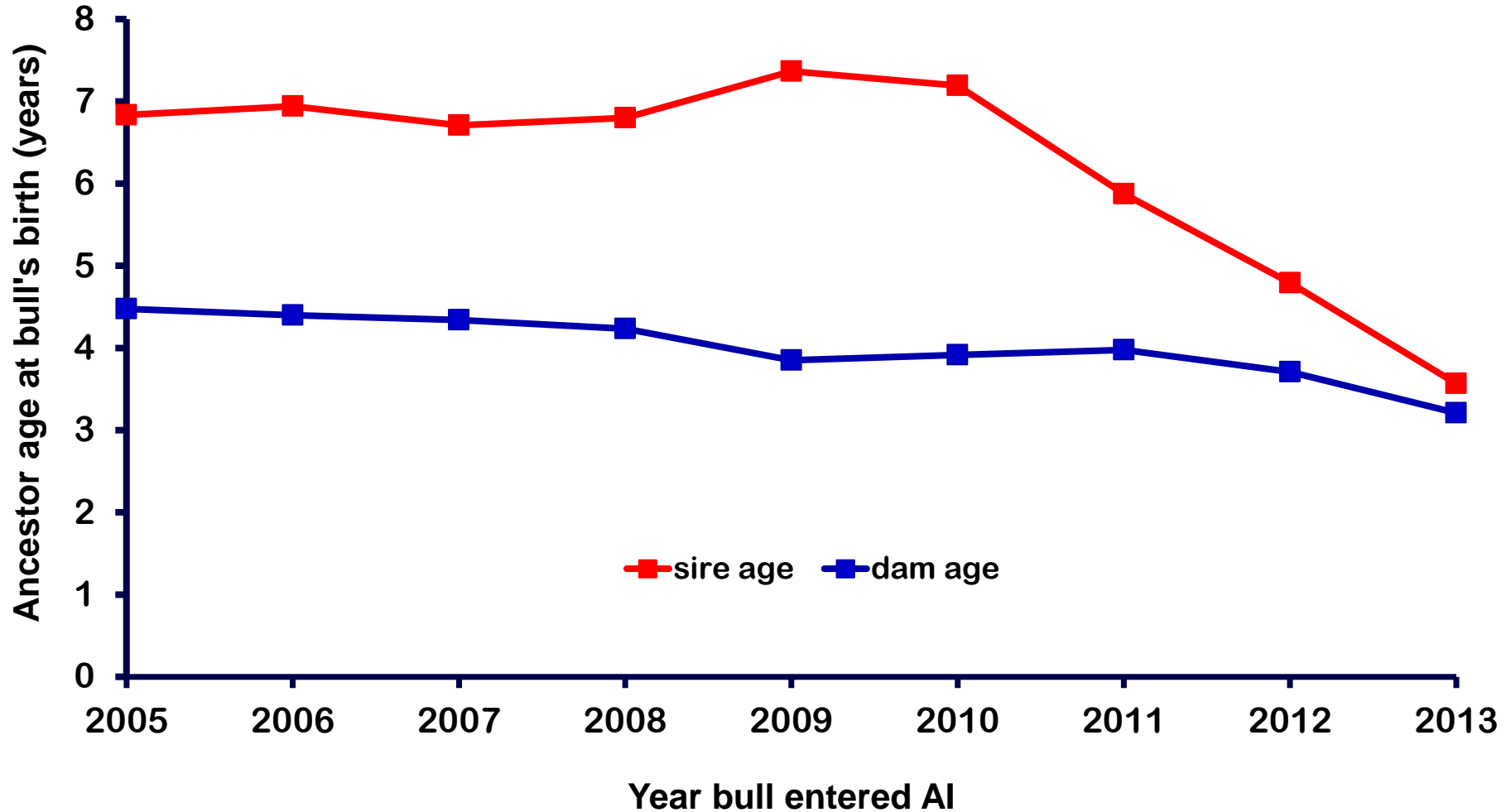
**Based on April 2014 evaluations*

Mean PTA* of Jersey bulls entering AI by year (other traits)

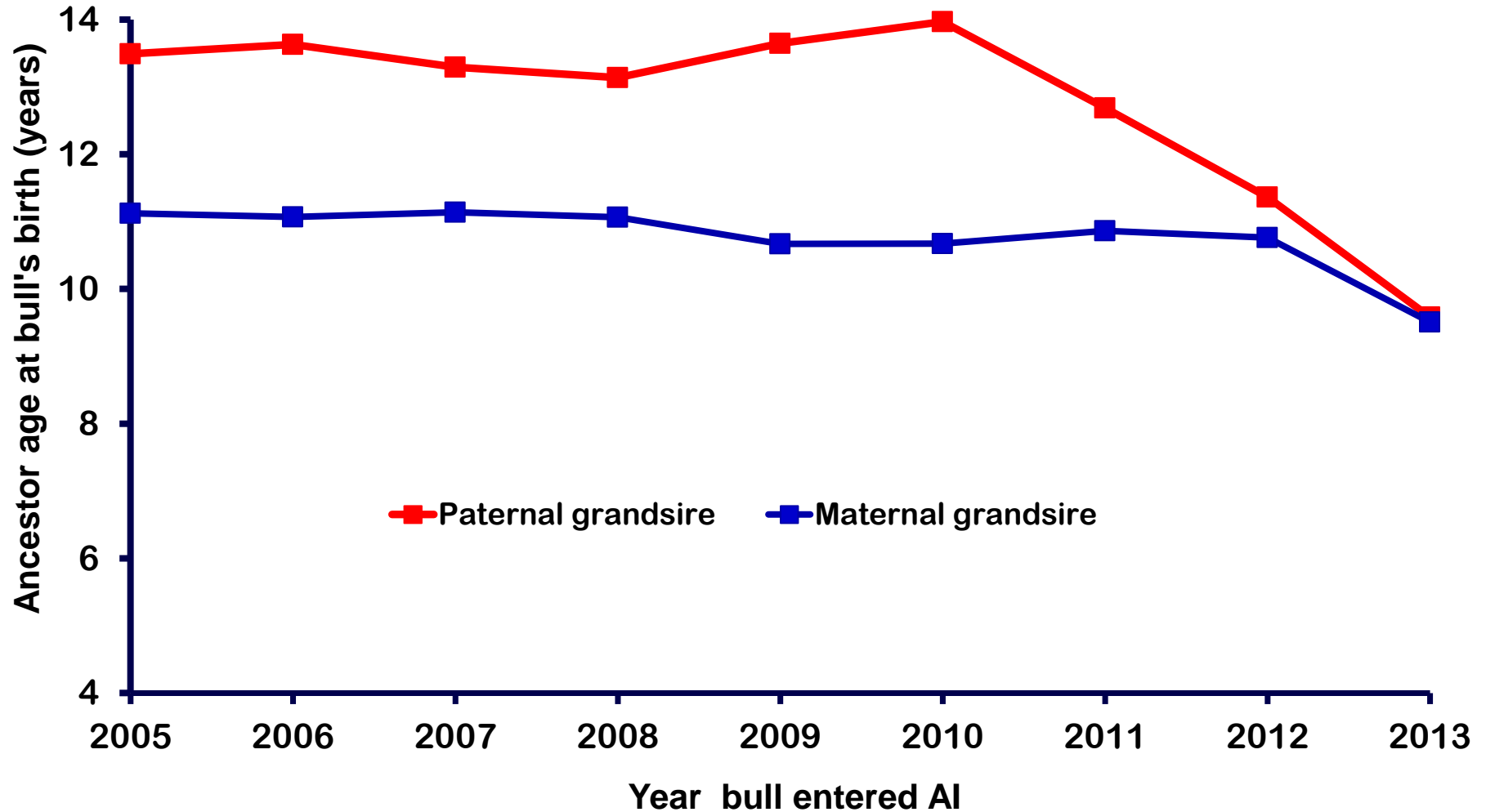
<u>Year</u>	<u>SCS</u>	<u>Prod.</u> <u>Life</u>	<u>Dau. Preg.</u> <u>Rate</u>	<u>Net</u> <u>Merit</u>
2005	3.04	0.3	-0.2	68
2006	3.05	0.4	-0.1	96
2007	3.05	0.6	0.0	120
2008	3.04	0.9	0.0	158
2009	3.05	1.4	0.1	201
2010	3.02	1.9	0.1	243
2011	2.98	2.6	0.1	329
2012	2.96	2.7	-0.1	376
2013	2.94	3.2	0.1	436

**Based on April 2014 evaluations*

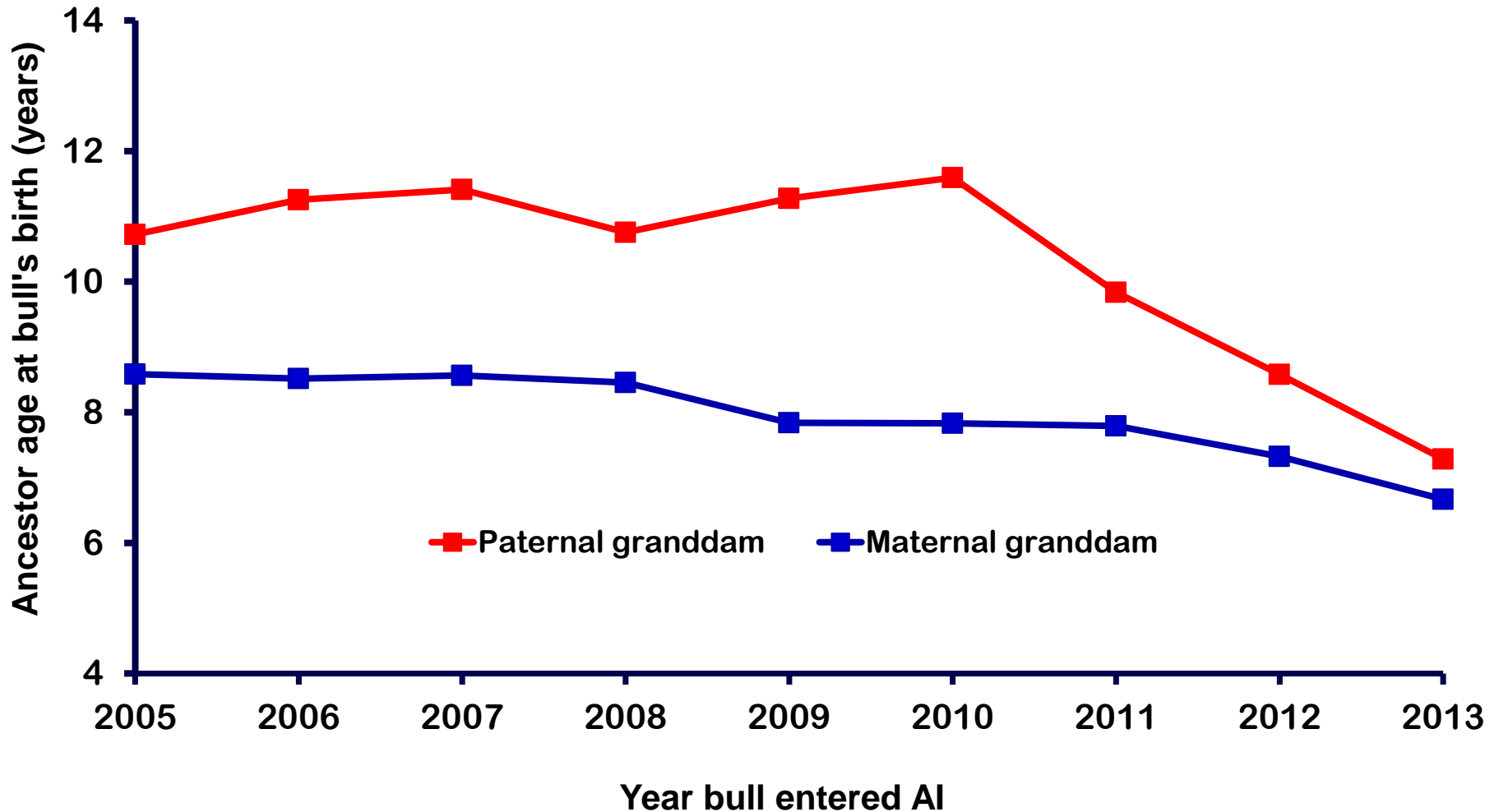
Age of sire and dam at bull's birth (all breeds)



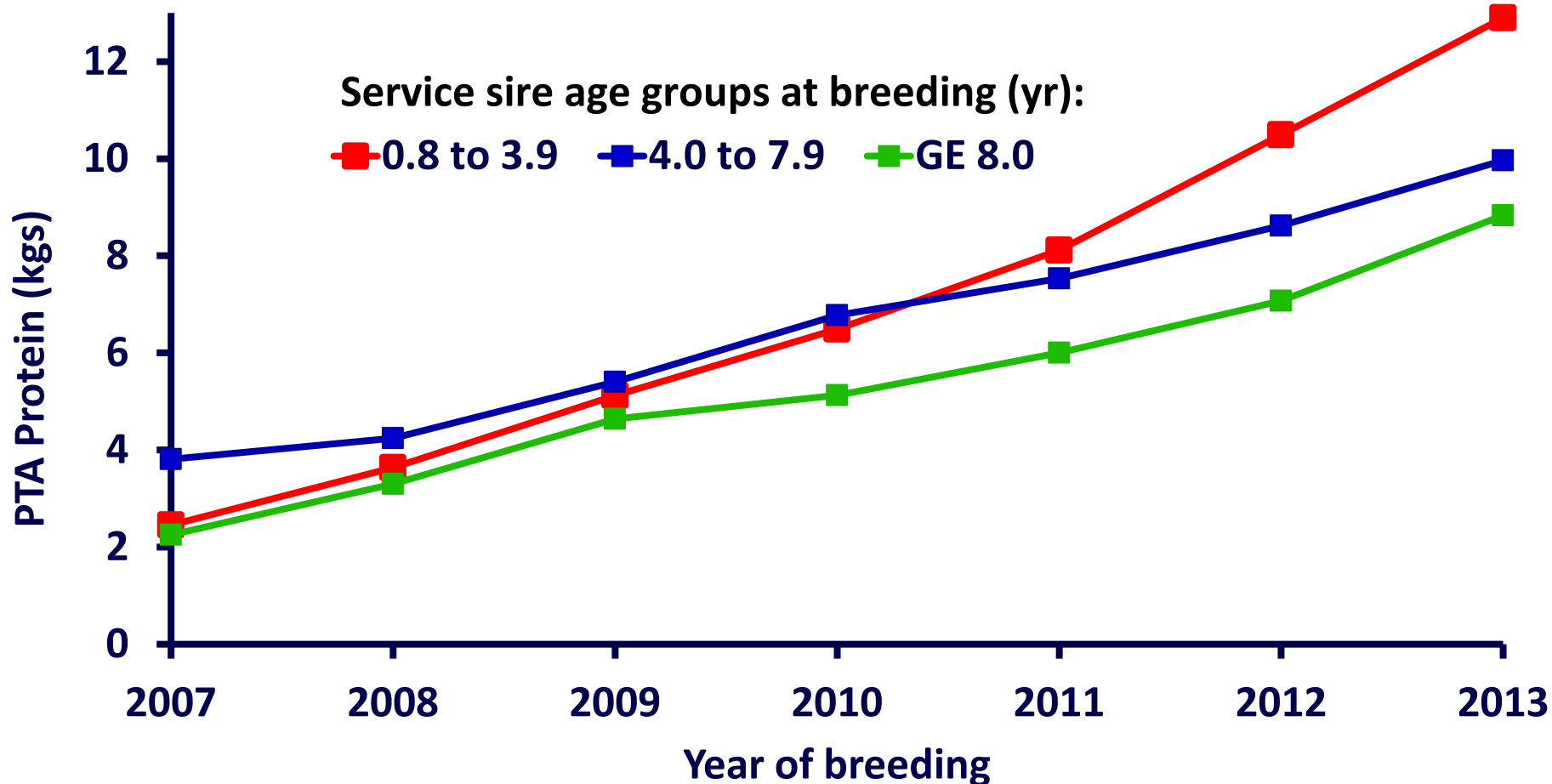
Age of Paternal and Maternal grandsire at bull's birth



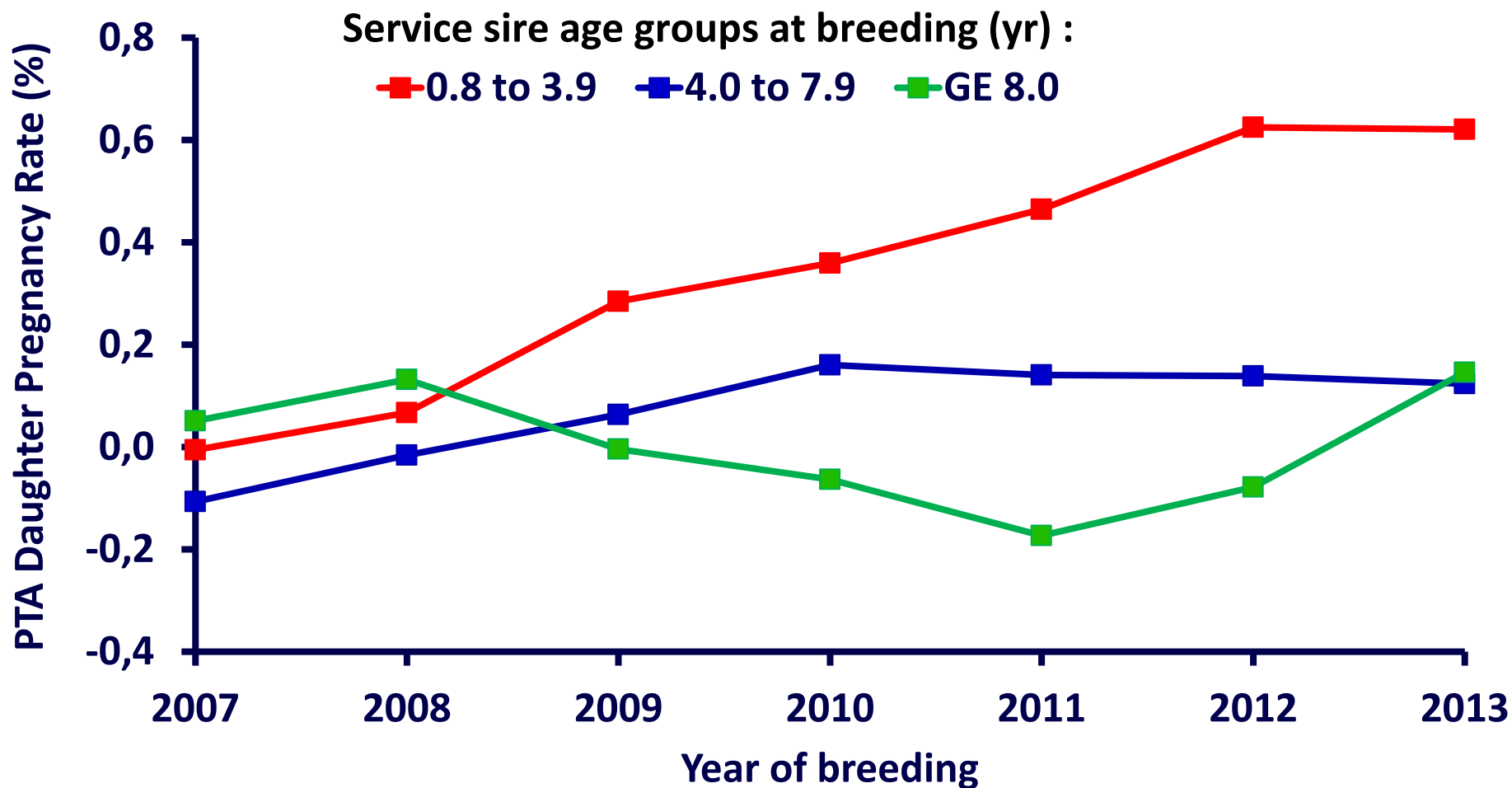
Age of Paternal and Maternal granddam at bull's birth



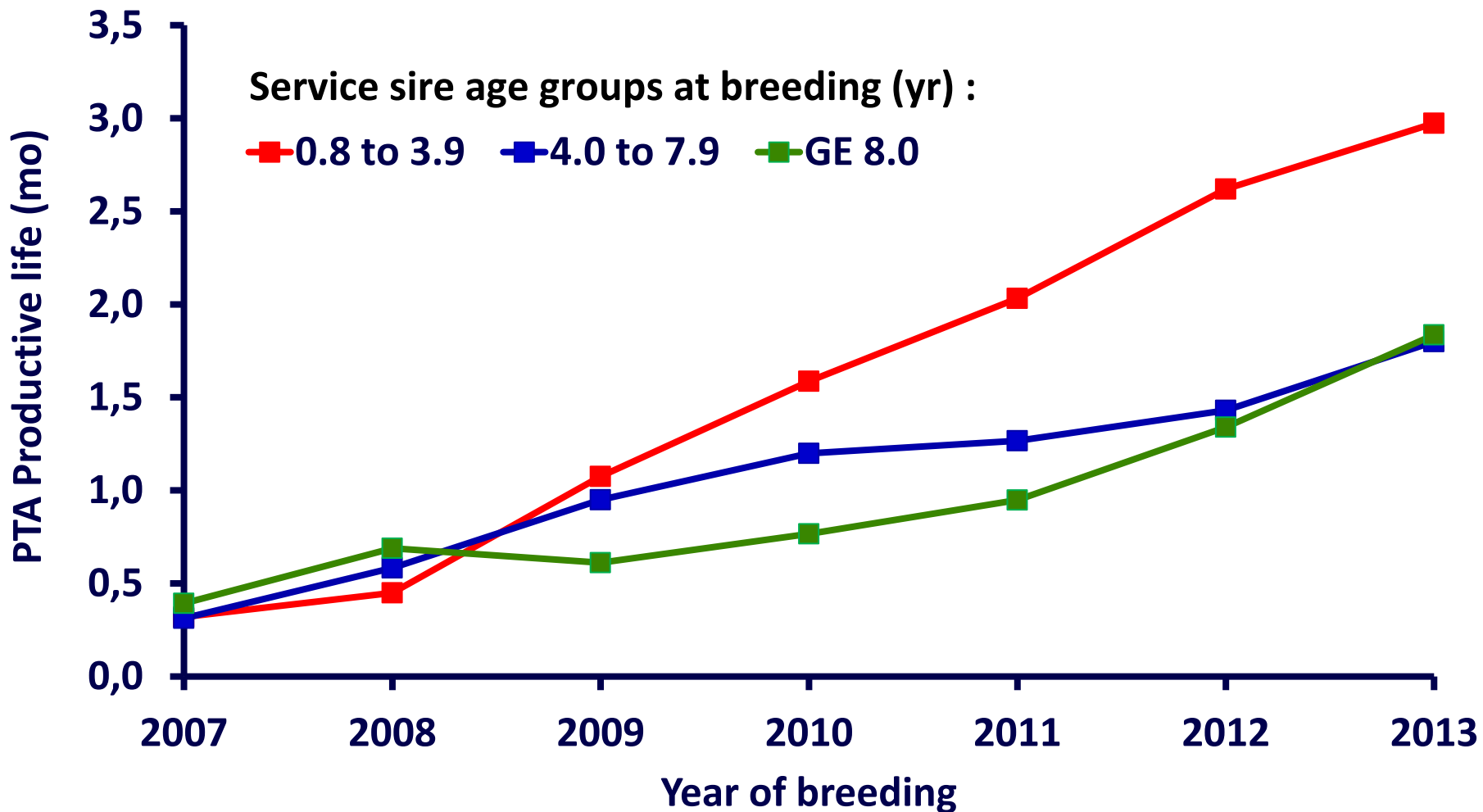
Mean PTA protein of HO service sires used in matings



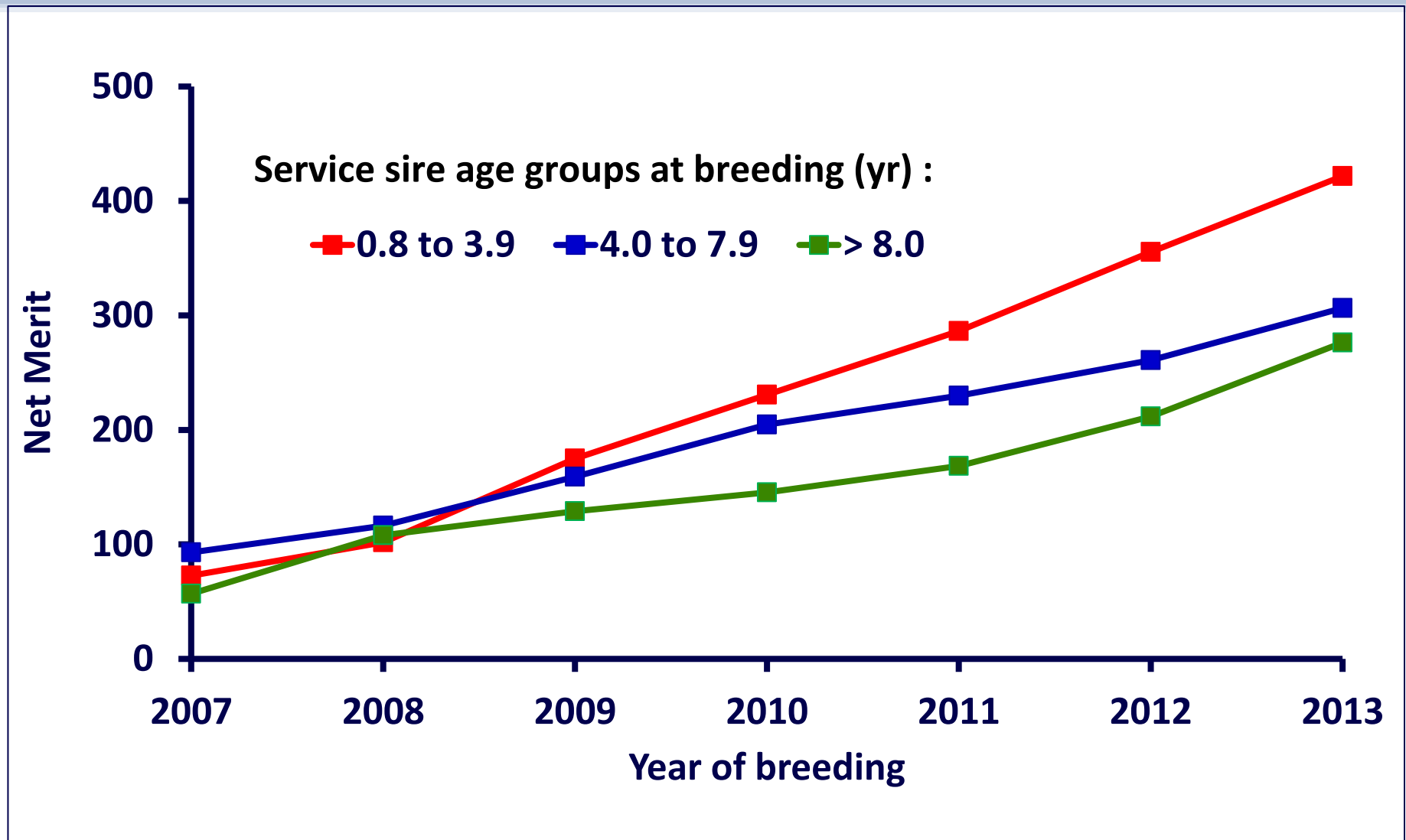
Mean PTA Daughter pregnancy rate of service sires used in matings



Mean PTA Productive life of HO service sires used in matings



Mean Net Merit of HO service sires used in matings



Conclusions

- Amount of genomic testing has been increasing. Still it seems risky predicting how the number of tests will change in the next few years.
- Bulls age when entering AI has not changed, remaining at 16 mo. All ancestors' ages when the bull entered AI service have declined.

Conclusions

- **The genetics of bulls entering AI has been accelerating for most of the important traits. A few of the fitness traits have increased faster than the yield traits.**
- **Using confirmed pregnancy from the breeding records, illustrates that the more rapid improvement due to genomics will continue.**

Acknowledgments

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- **Also, to personnel in the Animal Genomics and Improvement Laboratory who assisted in the transition of operations to the Council on Dairy Cattle Breeding**