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Selection for milk production in a single Holstein herd: effects on correlated traits

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Motivation

Rare selection scheme – Langhill herd

Selection Line (SL)

- selected for milk production since mid-1970s

Control Line

- selected for average PIN index values

Does selection work?

What has happened to other traits in the herd?



Selection method – Langhill Herd

Cows mated to bulls with highest PTA for fat+protein weight - inbreeding consideration

- welfare considerations

Bulls chosen from available commercial bulls at the time of mating

Selection Line cows replacements chosen from SL dams



Data source and summary method

National evaluation results for all cows born in the Langhill herd from 1980 to 2005

PTA for production and fertility traits - February 2009

PTA from Selection Line cow means by year of birth

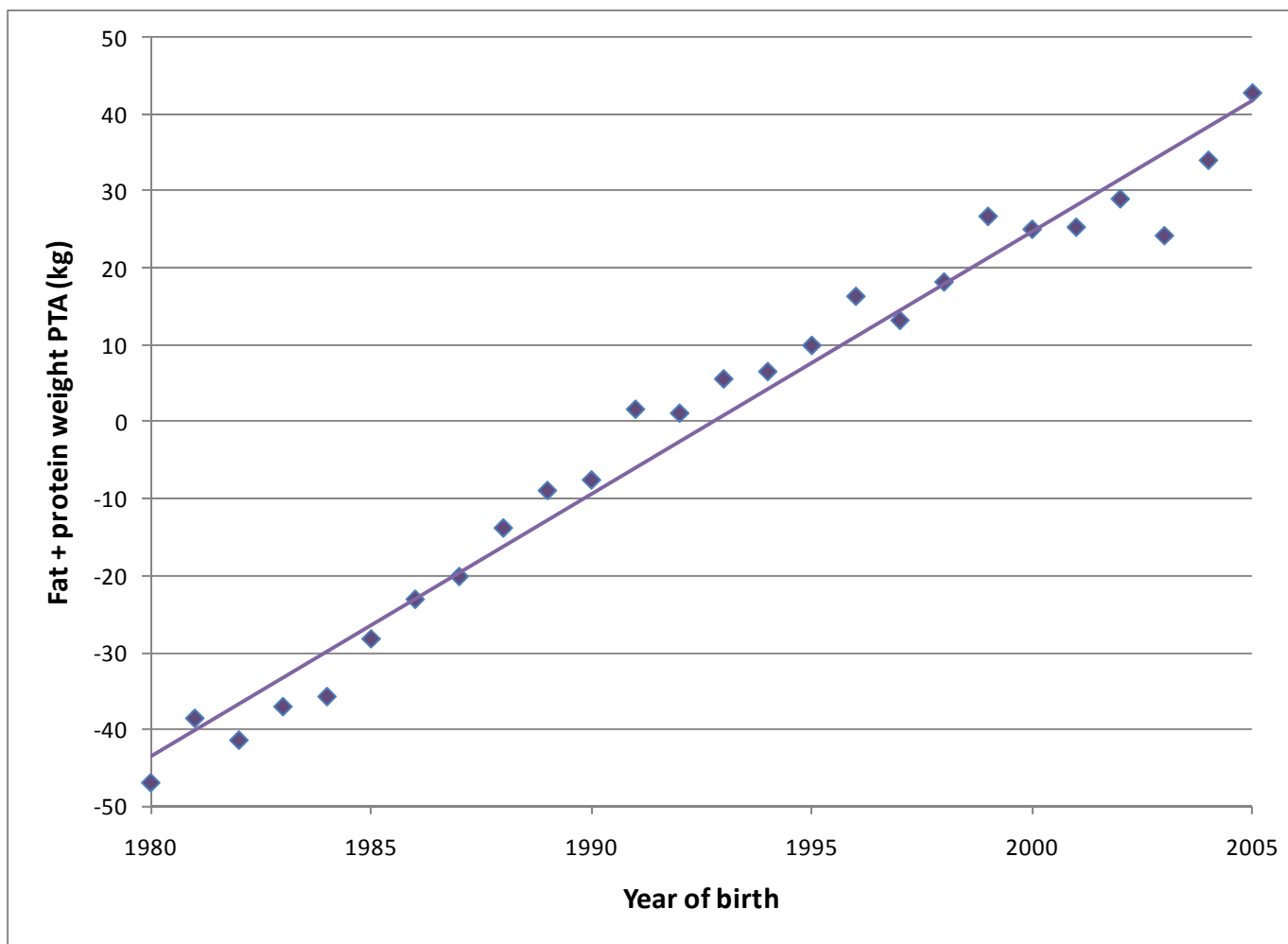
All data analysed by NLIN in SAS



Results

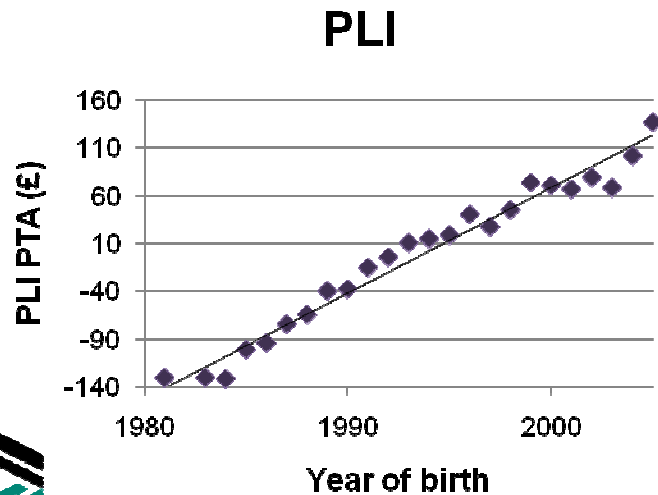
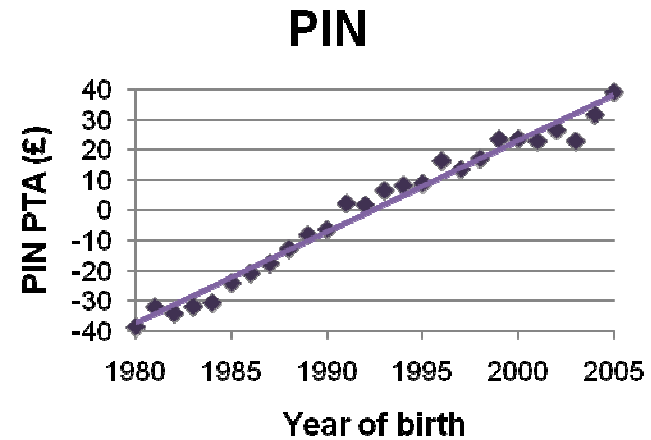
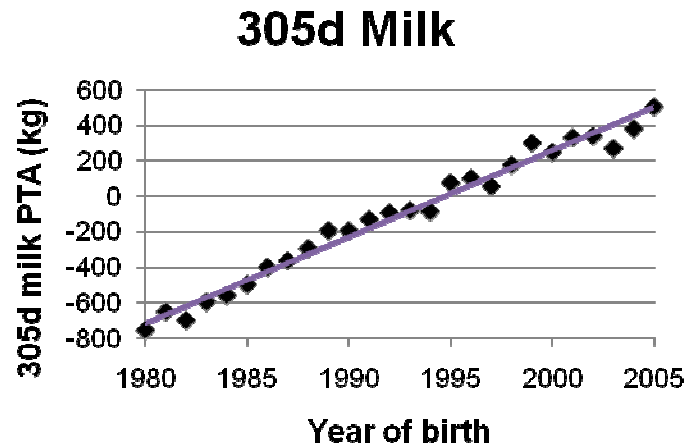


Fat+Protein weight– the selection criterion



Regression coefficient = 3.43 ± 0.0614 kg/year

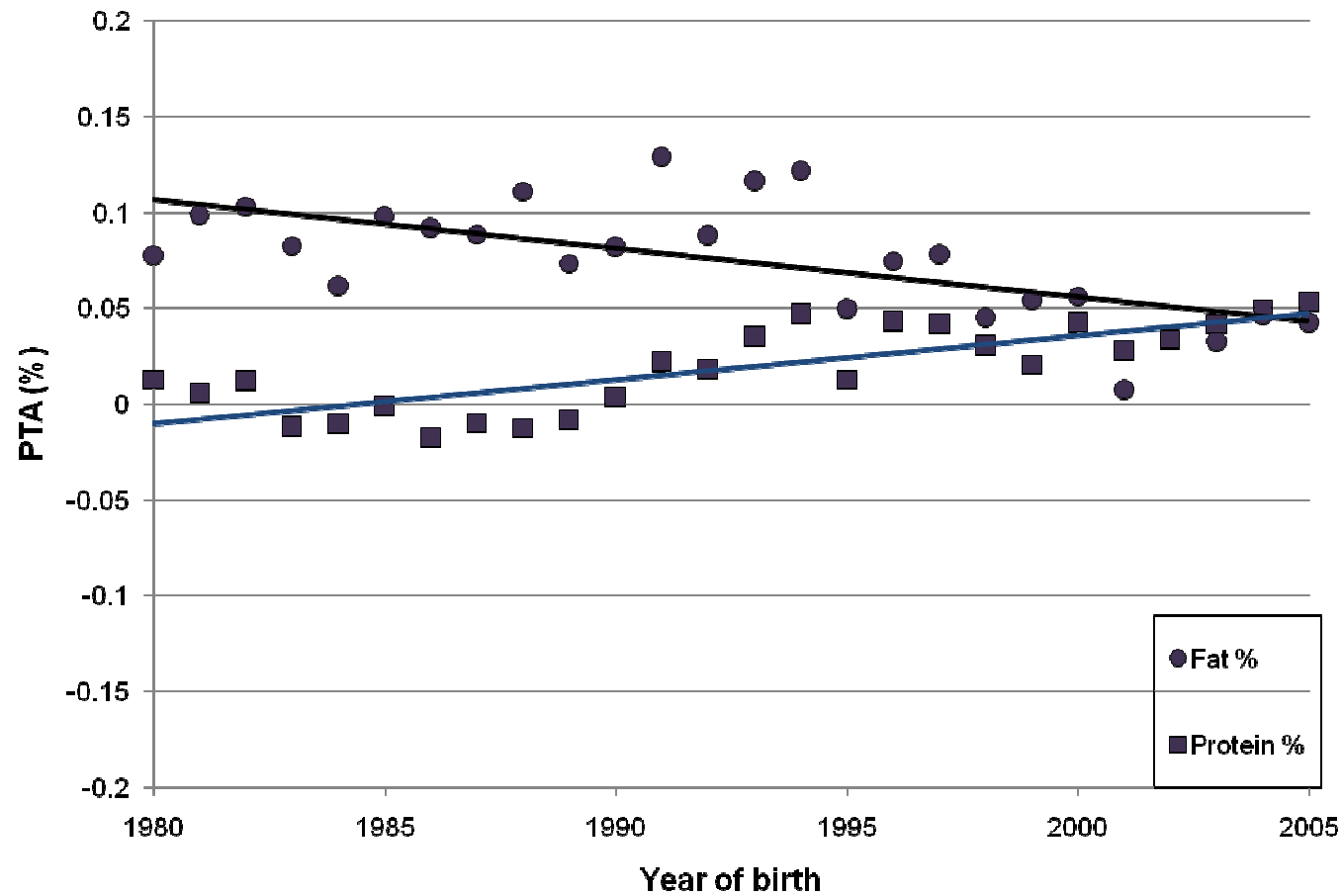
Trends in production traits



Trait	Regression coefficient (/yr)	s.e.	Change 1980-2005
Milk (kg)	48.6	1.14	1,264
PIN (£)	3.03	0.054	77.9
PLI (£)	11.1	0.205	289



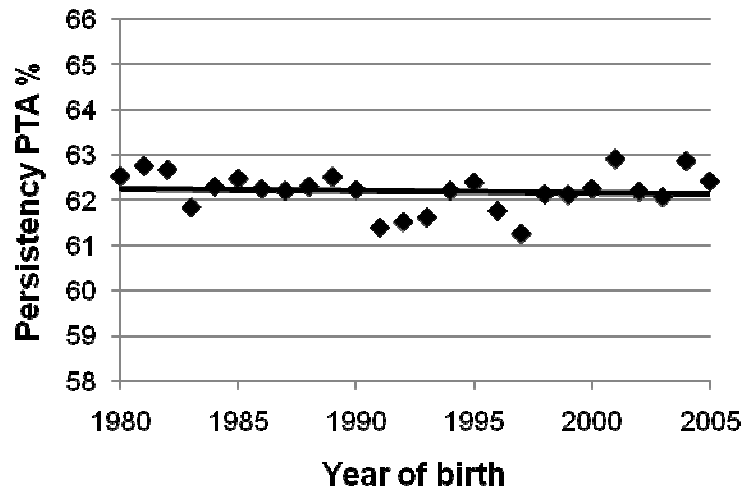
Trends in fat and protein percent



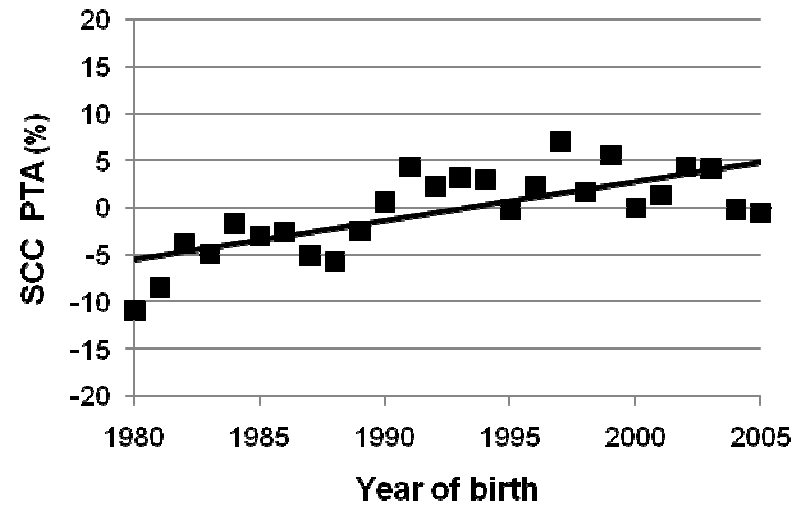
Fat % slope -0.00250 ± 0.000558 %/year
Protein % slope 0.00235 ± 0.000265 %/year

Persistency, SCC and Lifespan

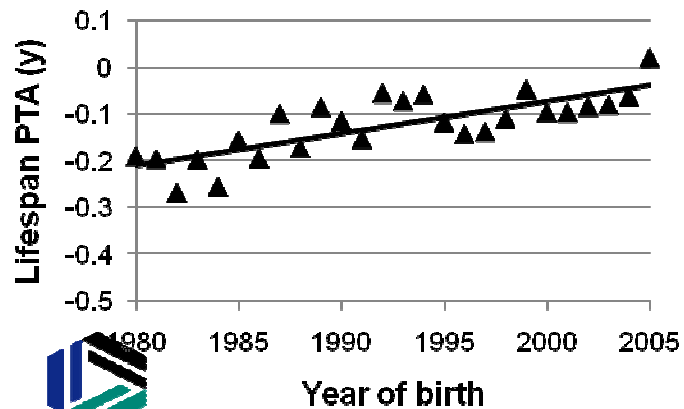
Persistency



SCC



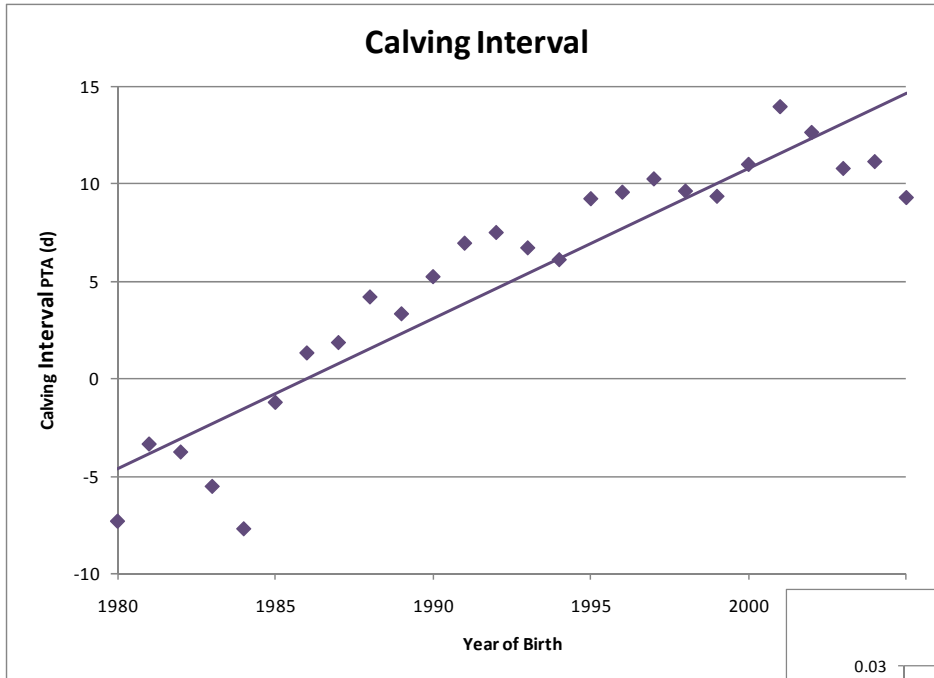
Lifespan



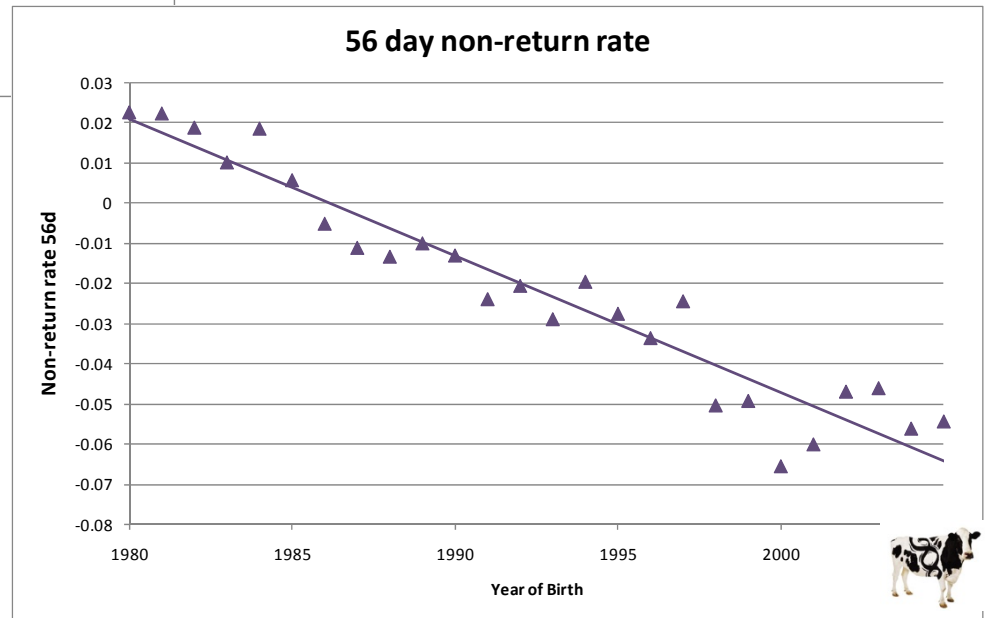
Trait	Regression coefficient (/yr)	s.e.	Change 1980-2005
Persistency (%)	-0.00265	0.00598	-0.11
SCC (%)	0.337	0.0439	10.4
Lifespan (y)	0.00655	0.000728	0.21



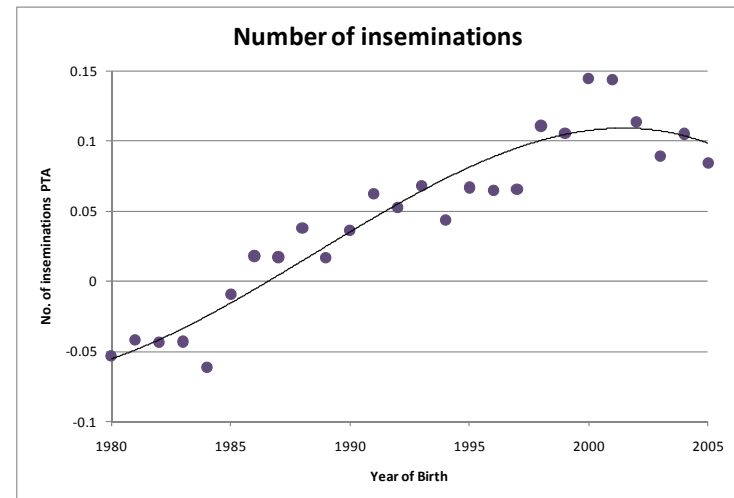
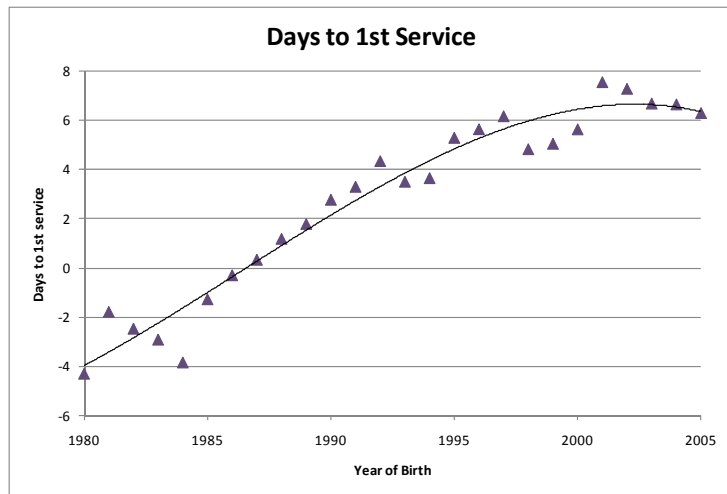
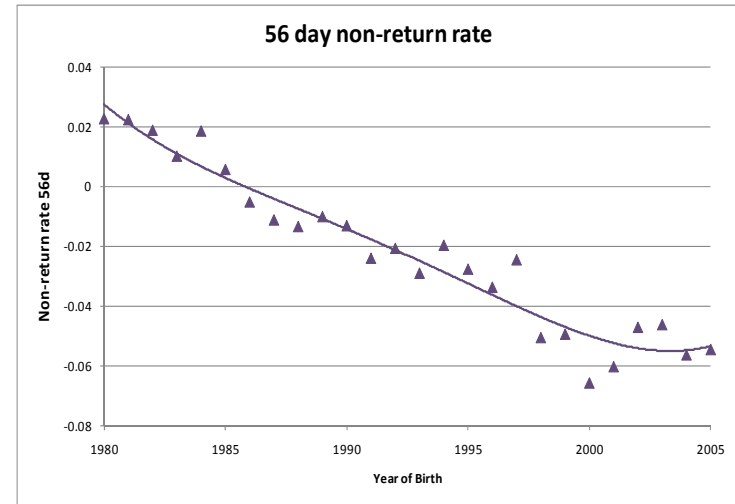
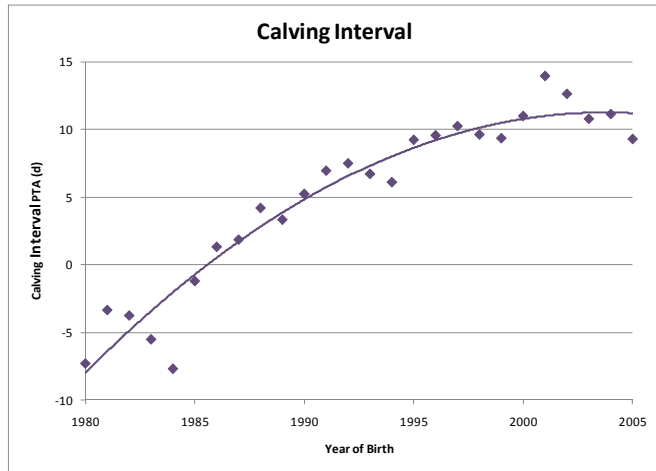
Fertility traits



Trait	Regression coefficient (/yr)	s.e.	Change 1980-2005
CI (d)	0.707	0.0287	16.6
NR56	-0.00328	0.000176	-0.08



Fertility traits - curves



PTA correlations with milk production

<u>Trait</u>	<u>Correlation</u>
Fat weight	0.84
Protein weight	0.96
Fat %	-0.36
Protein %	-0.12
Persistency	-0.01
SCC	0.31
Lifespan	0.00
PIN	0.87
PLI	0.86
Calving interval	0.72
Non-return rate	-0.67

Standard errors < 0.05

Discussion points

Selection works – herd level using widely available data

Selection for increased fat and protein associated with:

- Increased milk production
- Increased profit index values
- Small rise in protein %
- Small drop in fat %
- No change in persistency
- Small increase in lifespan
- Reduction in fertility and health (SCC)



Thank you for your attention



Milk production and fertility – phenotypic trends

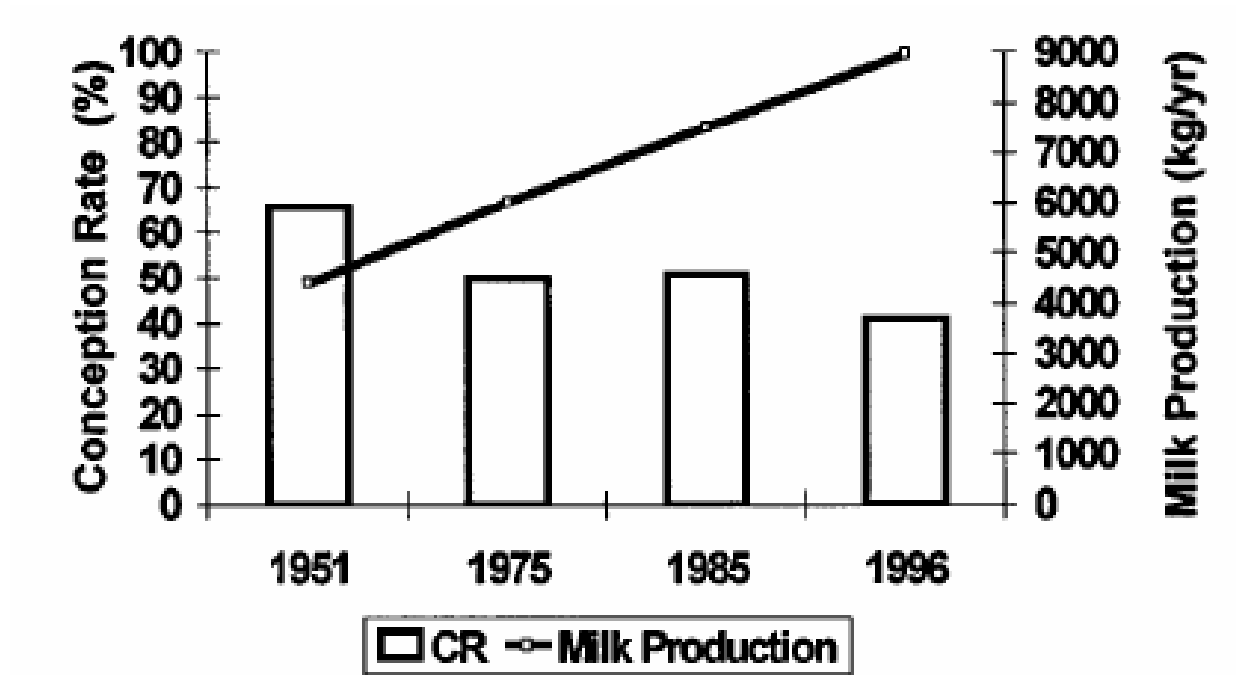


Figure 1. The inverse relationship between conception rate (CR) and annual milk production of Holstein dairy cows in New York.

Milk production and fertility – genetic correlations

Trait	Genetic Correlation Wall et al	Genetic Correlation Royal et al
Calving Interval	0.27	0.36
Days to 1 st service	0.49	0.32
Non-return rate to 56d	-0.25	-0.27

Wall et al., 2003. *Journal of Dairy Science*, **86**:4093-4102.
Royal et al., 2002. *Journal of Dairy Science*, **85**:958-967.

Wall et al. – Sire genetic progress

