

Milk production of the mother is associated with birth weight rather than sex of calf

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Sex bias in maternal investment

Trivers-Willard hypothesis:

Investment in male / female offspring related to expected reproductive benefit, dependent on maternal condition

- Ratio male / female offspring
 - Amount / quality of milk
- Higher investment in male offspring (good conditions)
E.g. Red deer, rhesus macaque, human

Sex bias in bovine milk production

- US Holstein: more milk for heifer calves (Hinde et al. 2014)
 - 2.39×10^6 lactations, 1.49×10^6 cows
 - Mixed model: calf sex, parity and *year*
- Danish Holstein: more milk for bull calves (Græsbøll et al., 2015)
 - 71,088 cows, 2 lactations each
 - Mixed model: calf sex, calving ease, *year*, and *herd*



Aim

Quantify effect of sex of calf on subsequent 305-day milk production in Dutch dairy cows



Materials and methods

305-day milk production records (2007-2013)

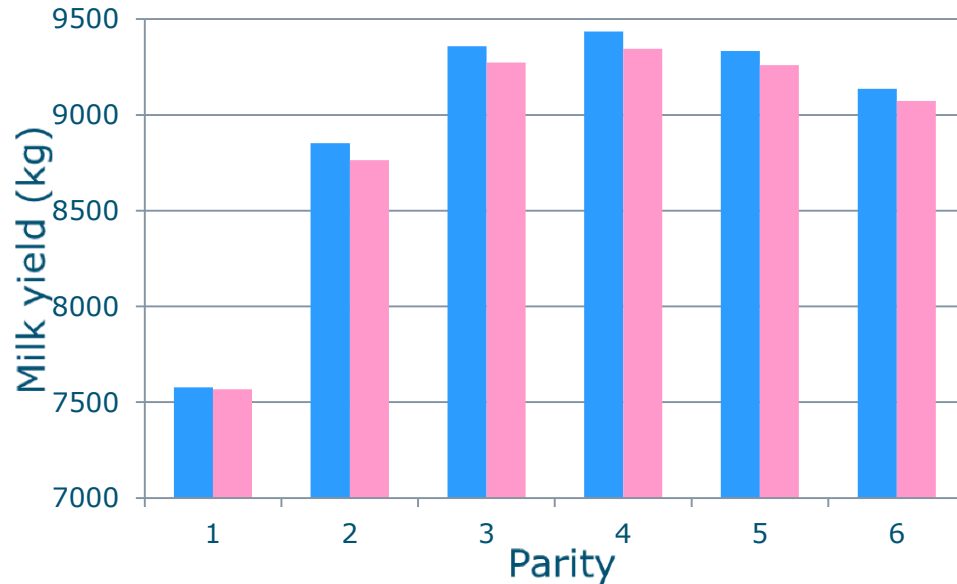
1,615,765	Lactations (50.5% male calves)
861,273	Holstein Friesian cows
7,303	Herds

Dutch Holstein Herdbook, CRV



Results – means

305-day milk production for **male** and **female** calves



Higher milk yield
after giving birth
to male calves

Up to 90 kg (1%)
in parity 2 and 4



Materials and methods

Sire model (ASReml):

$$Y = \mu + b_1 * \text{gestation length} + b_2 * \text{lactation length} \\ + \text{sex of calf} + \text{calving ease} + \text{birth weight} \\ + \textit{sire of cow} + \textit{HerdYearSeason}$$

Calving ease: 1 – 4 (1=easy)

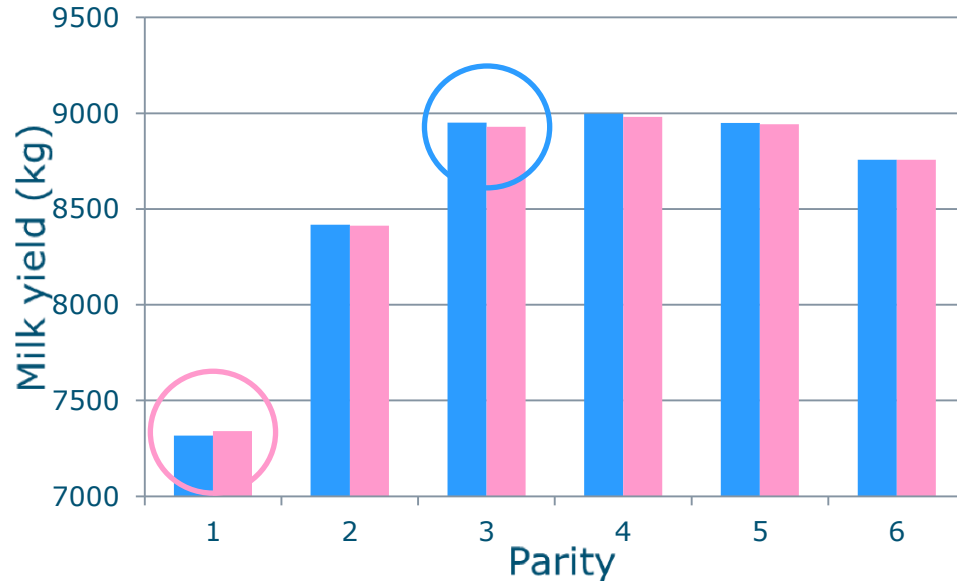
Birth weight: 1 – 12 (1=17.5 - 22.4 kg ... 12=72.5 - 77.4 kg)

Sire of cow: 3 generations pedigree



Results – predicted means

305-day milk production for male and female calves

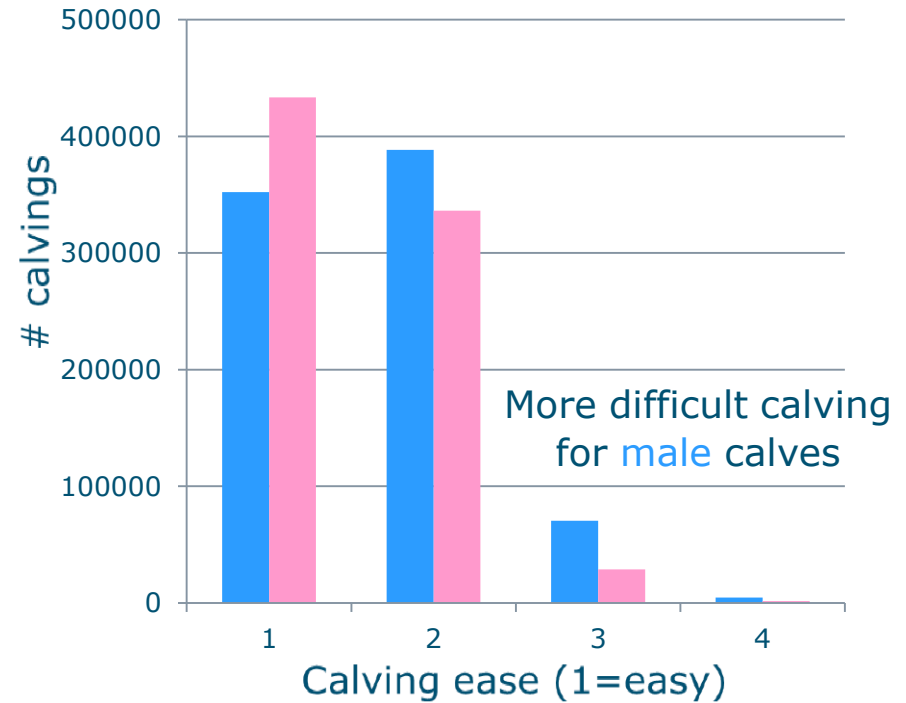
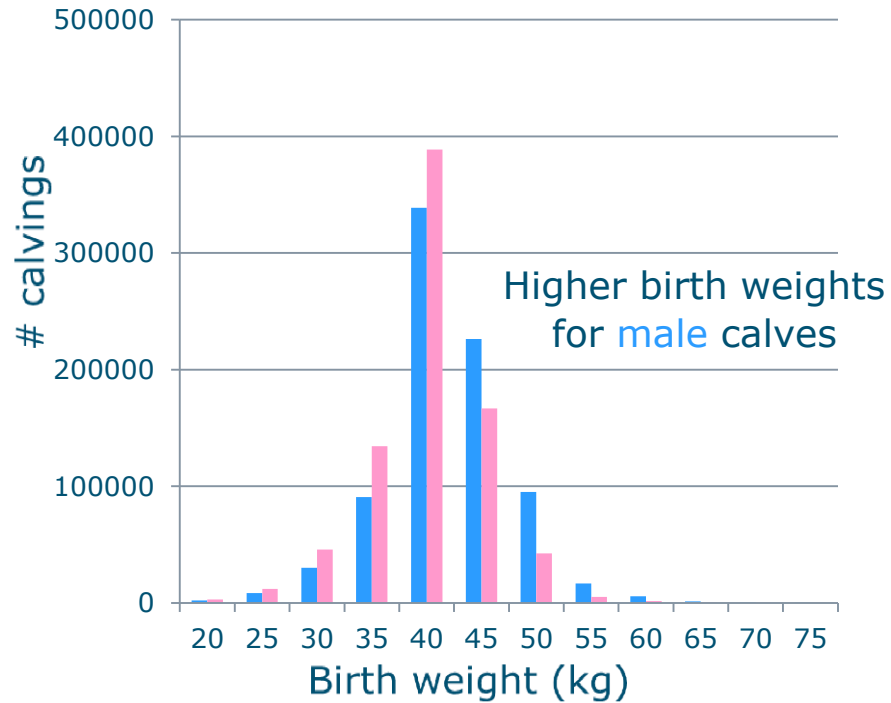


Higher milk yield after giving birth to female calves in parity 1 (24 kg, <0.5%)

Higher milk yield after giving birth to male calves in parity 3 (21 kg, <0.5%)

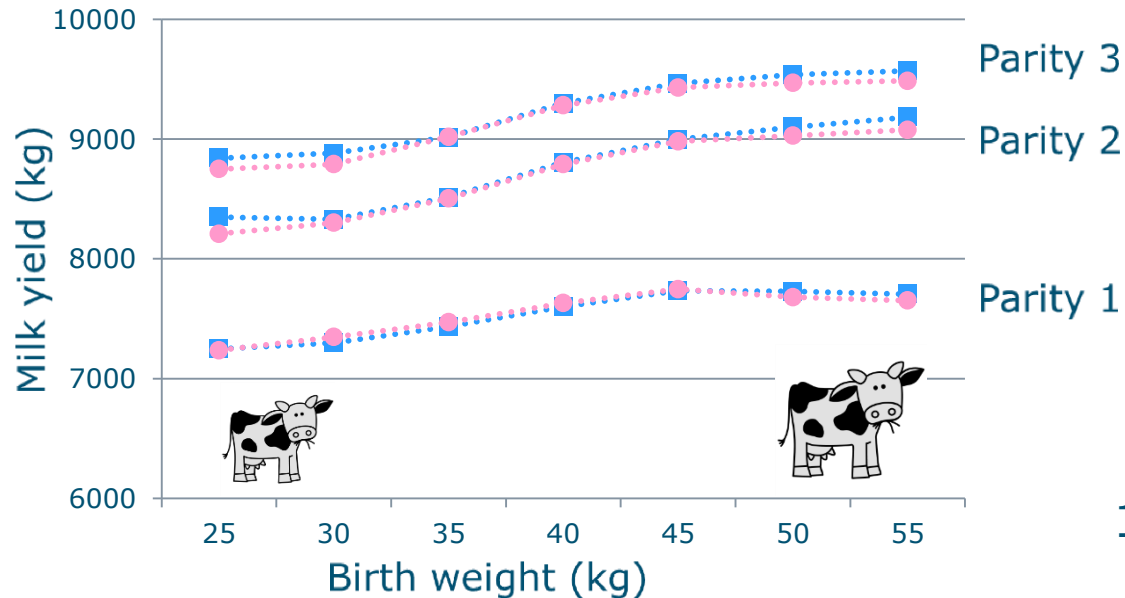


Results – birth weight and calving ease



Results – birth weight

305-day milk production affected by birth weight

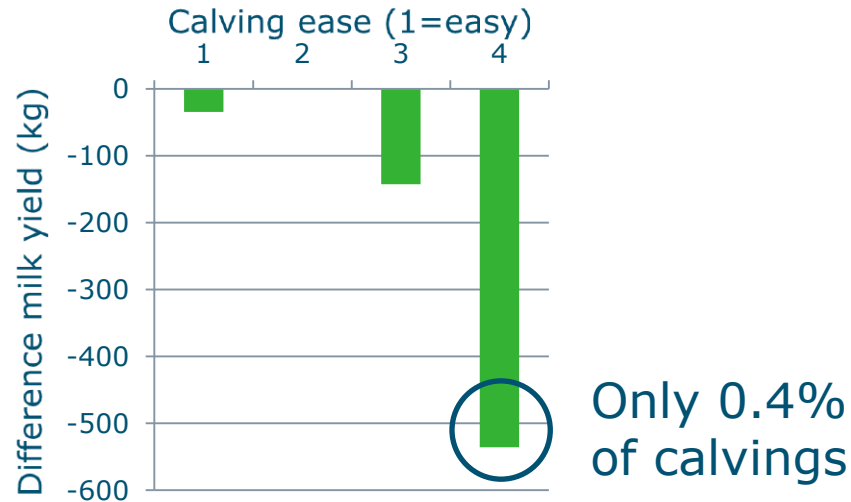


Higher milk yield
after giving birth
to heavier calves

25 -> 55 kg
619 kg in parity 1 (8.4%)
1008 kg in parity 2 (12.0%)

Results – birth weight and calving ease

Despite more calving difficulties associated with lower milk yield



Higher milk yield after giving birth to heavier calves

25 -> 55 kg
619 kg in parity 1 (8.4%)
1008 kg in parity 2 (12.0%)



Conclusion

No conclusive effect of **sex of calf** on subsequent milk, fat and protein production of the mother

Higher **birth weight of calf** results in higher milk, fat and protein production of the mother

