Three regression models for fitting lamb weight as age increases

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Objective

Estimate the difference in lamb weight when suckler ewes have chronic or acute mastitis

Methods

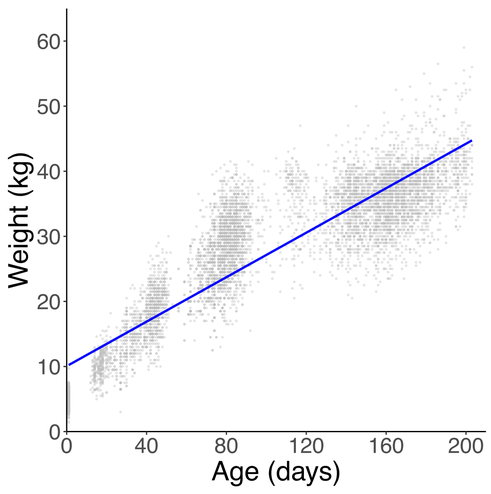
Longitudinal study on a 600 ewe suckler flock in York, UK

Chronic & acute mastitis cases recorded over 12 months

Lamb weights recorded at birth & at regular intervals thereafter

AM: acute mastitis (presence of symptoms e.g. hot udder, abnormal milk)

IMM: intramammary mass (mass of abnormal consistency within udder tissue)



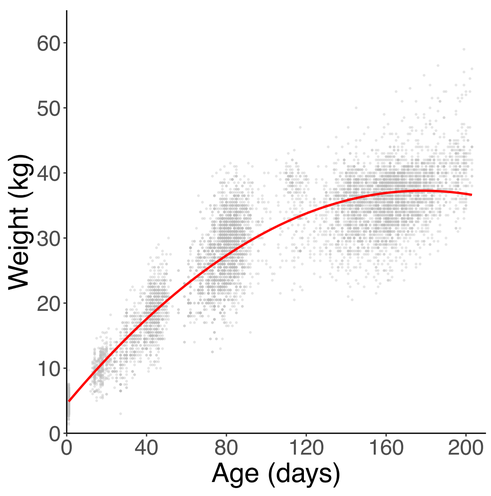
LINEAR MIXED EFFECT

$y_{ijk} = \beta_0 + \beta x_{ijk} + u.age_{jk} + v_k + u_{jk} + e_{ijk}$

```
Weight ~ Birth Weight + Number of Lambs + AM
during lactation + IMM during lactation + IMM
during pregnancy + Breed + IMM month before+ age +
(1+age|LambID)
```

R package: **lme4** function: **lmer**

df = 16, AIC = 35730

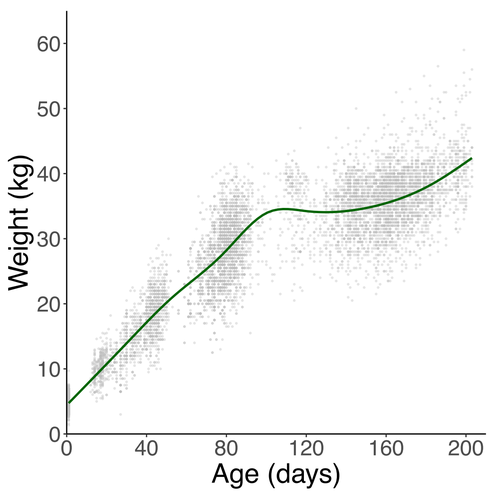


LINEAR MIXED EFFECT WITH QUADRATIC TERM

```
Weight ~ Birth Weight + Number of Lambs + AM
during lactation + IMM during lactation + IMM
during pregnancy + Breed + IMM month before+
poly(days,2) + (1+age|LambID)
```

R package: **lme4** function: **lmer**

df = 17, AIC = 32491



GENERALISED ADDITIVE MIXED MODEL

$y_{ijk} = \beta_0 + \beta x_{ijk} + f(days_{ikj}) + u.age_{jk} + v_k + u_{jk} + e_{ijk}$

```
Weight ~ Birth Weight + Number of Lambs + AM
during lactation + IMM during lactation + IMM
during pregnancy + Breed + IMM month before+
s(age, bs = 'cs',k = 40),
random=list(LambID=~1,LambID=~days)
```

R package: **mgcv** function: **gamm**

df = 17, AIC = 28644

Coefficients taken from GAMM model
Significant to p <0.05

1.0kg lighter
When ewe has an IMM during pregnancy

510g lighter
When ewe has an IMM during lactation

370g lighter
When ewe has an IMM the month before

1.4kg lighter
When ewe has AM any time during lactation

Full model methods and results tables available via:

bit.ly/KBPoster

Conclusions

- Lamb growth after weaning is not linear
- A generalized additive model appears to give the best model fit
- Ewes with chronic mastitis during pregnancy or acute mastitis during lactation have lighter lambs

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