



Sex and survival – making the most of what you've got

Joanne Conington

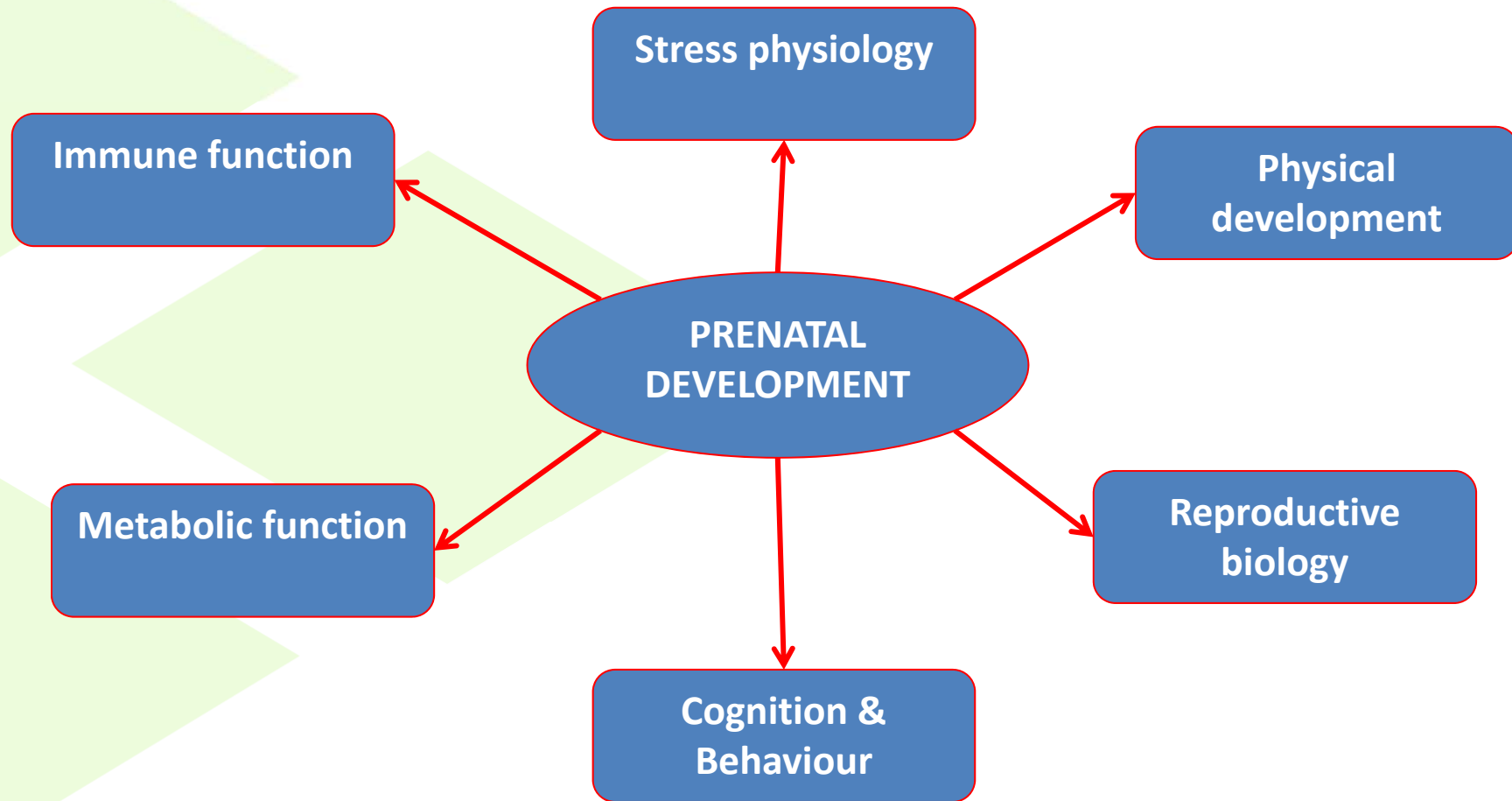
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¹Formerly Signet, currently Limousin Society

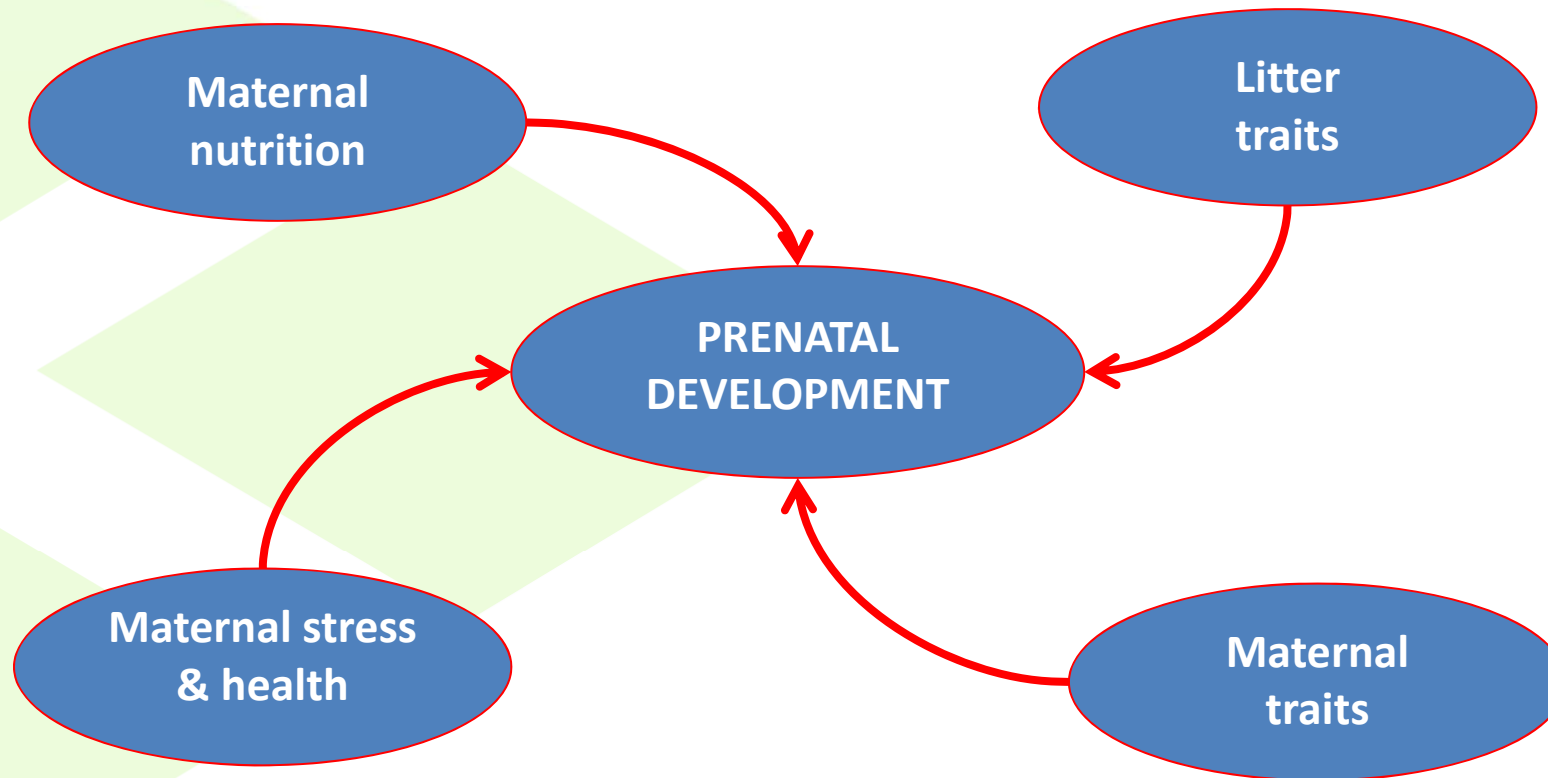
SBRT Nov 1-3, 2013

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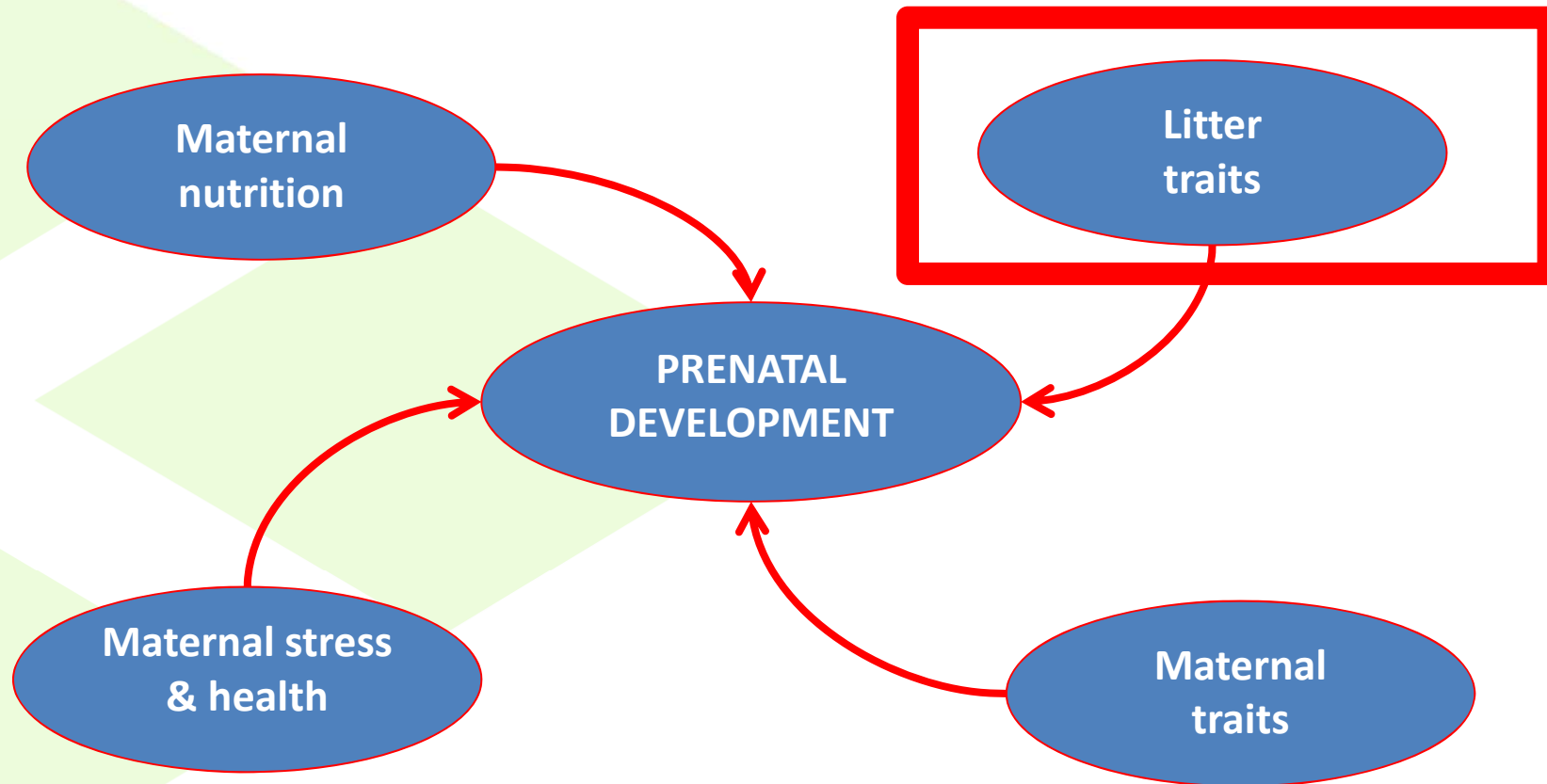
Factors affected by development before birth



Factors affecting development before birth



Factors affecting development before birth



Gender differences



- Many (obvious) differences
 - Live weights at birth to adulthood (males are heavier and grow faster)
 - Body composition (males are leaner)
- Not so obvious
 - Male lambs have more footrot
 - Male lambs have higher worm burdens
 - Male lambs are behaviourally 'slower' at birth
- Impact on others before birth?

Co-twin effects



- Does the sex of co-twin affect performance of the other twin?
- Records (Blackface) used from 1991-2009
 - Twins born and reared as twins by own (genetic) dam
- Live weights at
 - Birth (n=12,131)
 - Mid-lactation (n=11,438)
 - Weaning (n=11,279)

Methodology



Birth weight, (mean= 3.4kg)

1. Dam age, parity, farm, year, sex of co-twin (interaction of dam age & parity), random effect of sire
2. Ditto + covariate of co-twin birth weight

Methodology -models



Birth weight, (mean= 3.4kg)

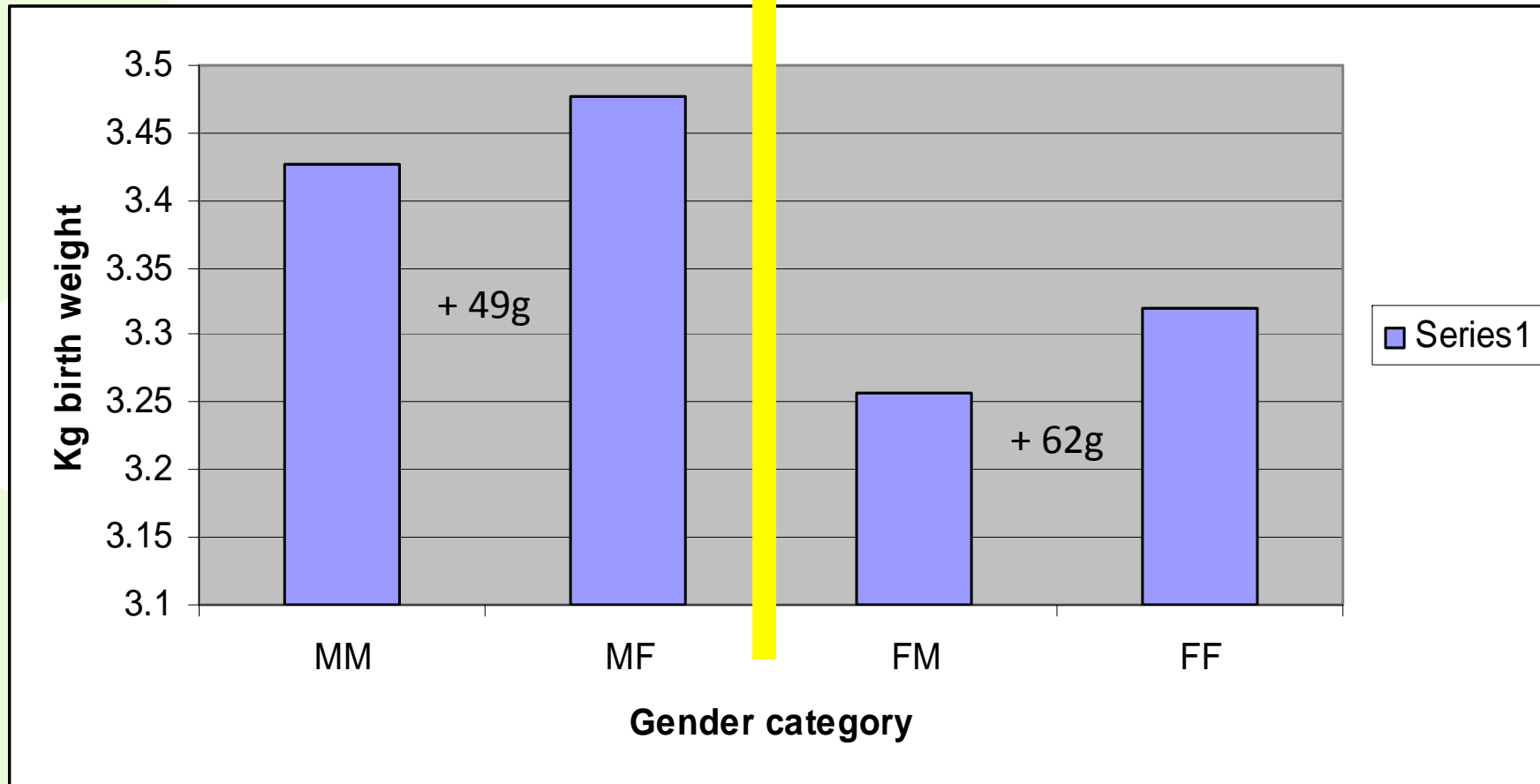
1. Dam age, parity, farm, year, sex of co-twin (interaction of dam age & parity), random effect of sire
2. Ditto + covariate of co-twin birth weight

Mid-lactation (ave age = 49d, mean = 15.7kg)

Weaning weight (ave age = 111d, mean = 26.7kg)

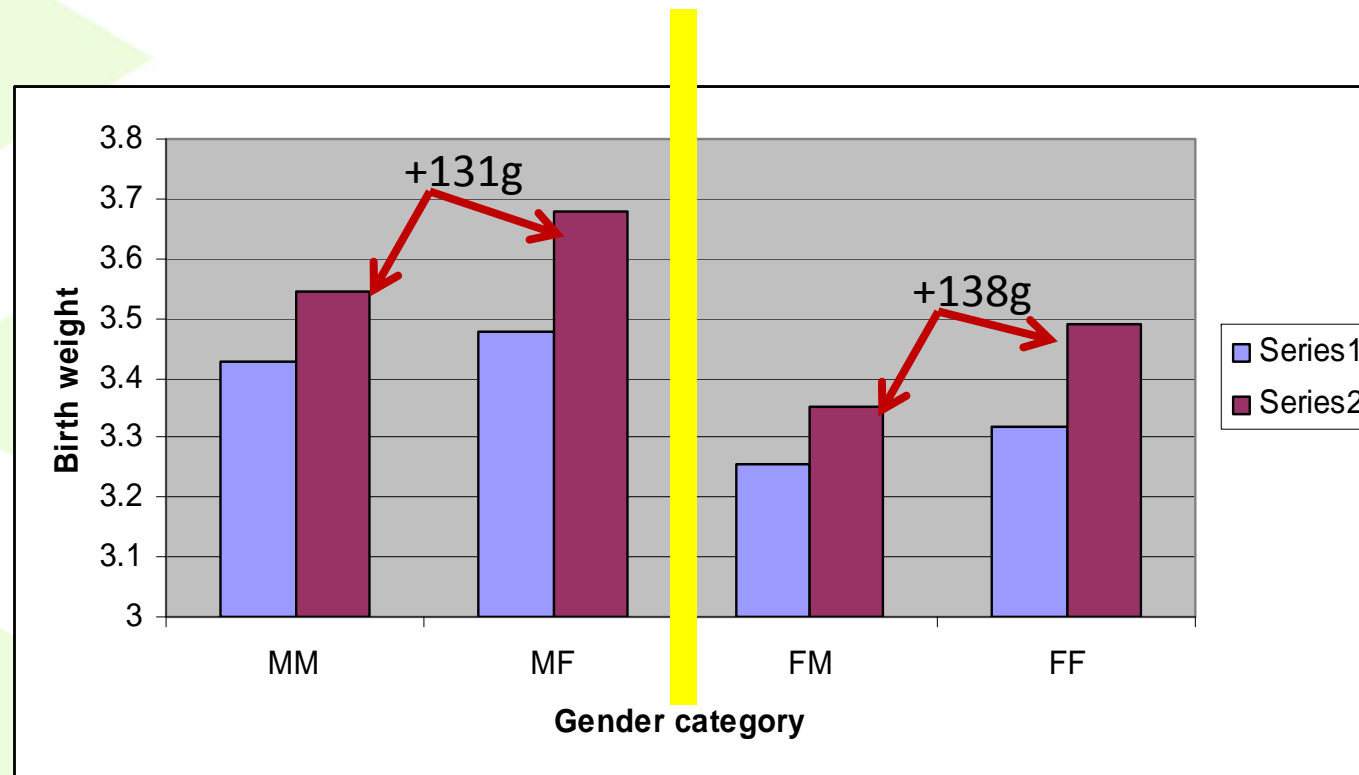
1. Dam age, parity, farm, year, sex of co-twin (interaction of dam age & parity) **grazing location, covariate age @ measurement**, random effect of sire
2. Ditto + covariate of co-twin live weight

Results – birth weight



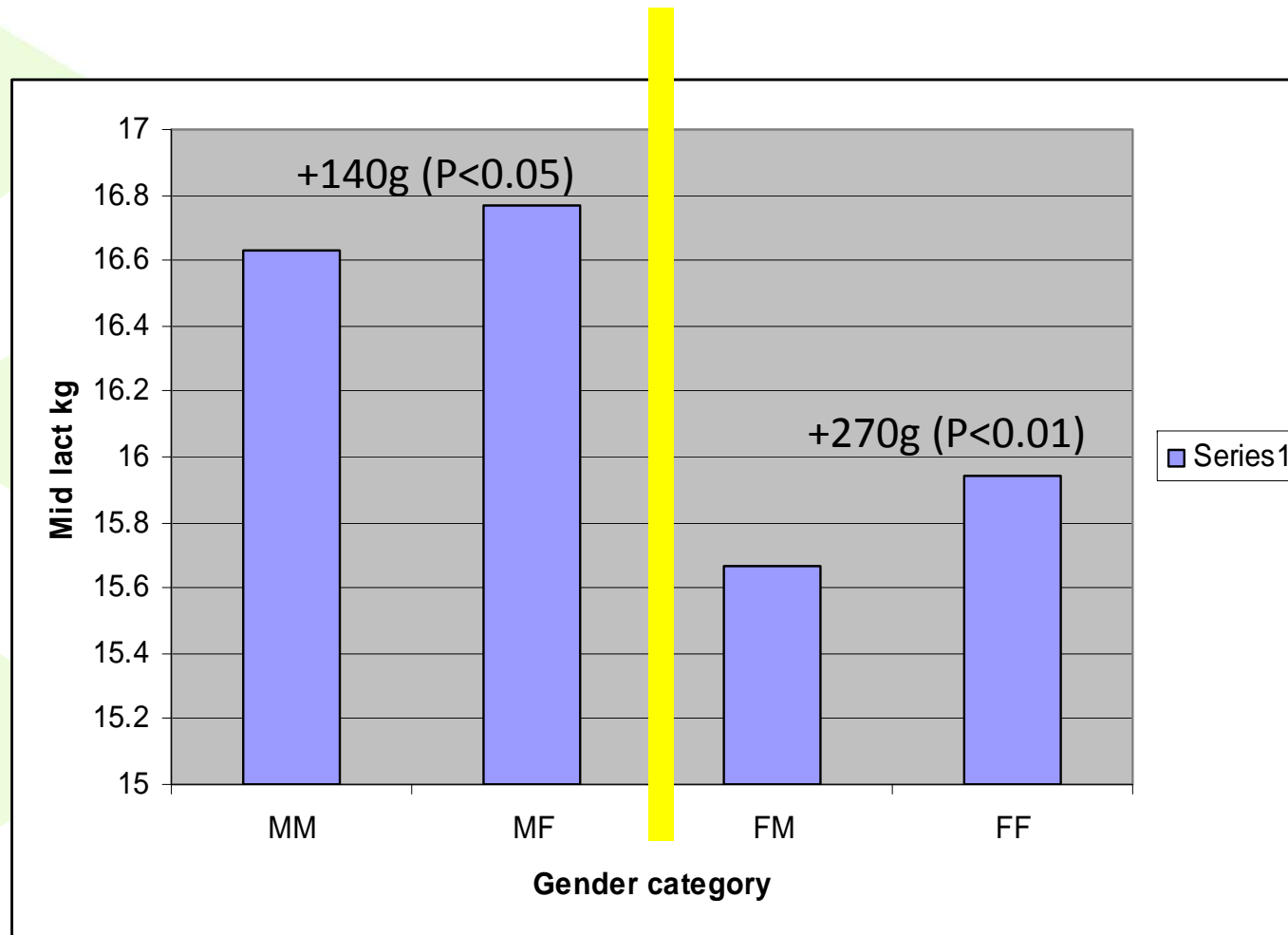
(Both comparisons are significant at $P < 0.01$)

Results – birth weight (+ live weight of co-twin)

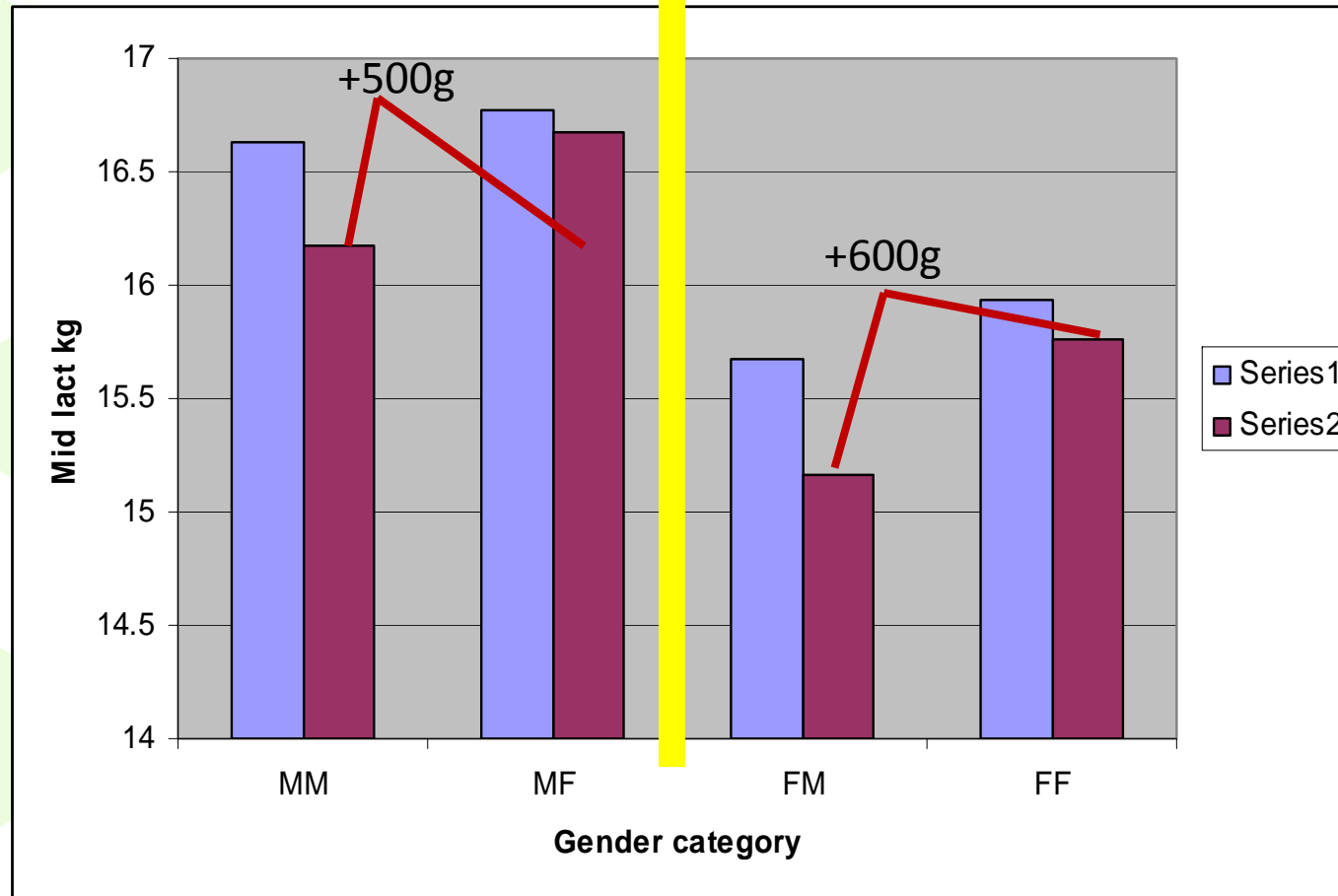


(Both comparisons are significant at $P < 0.01$)

Results – mid lact weight

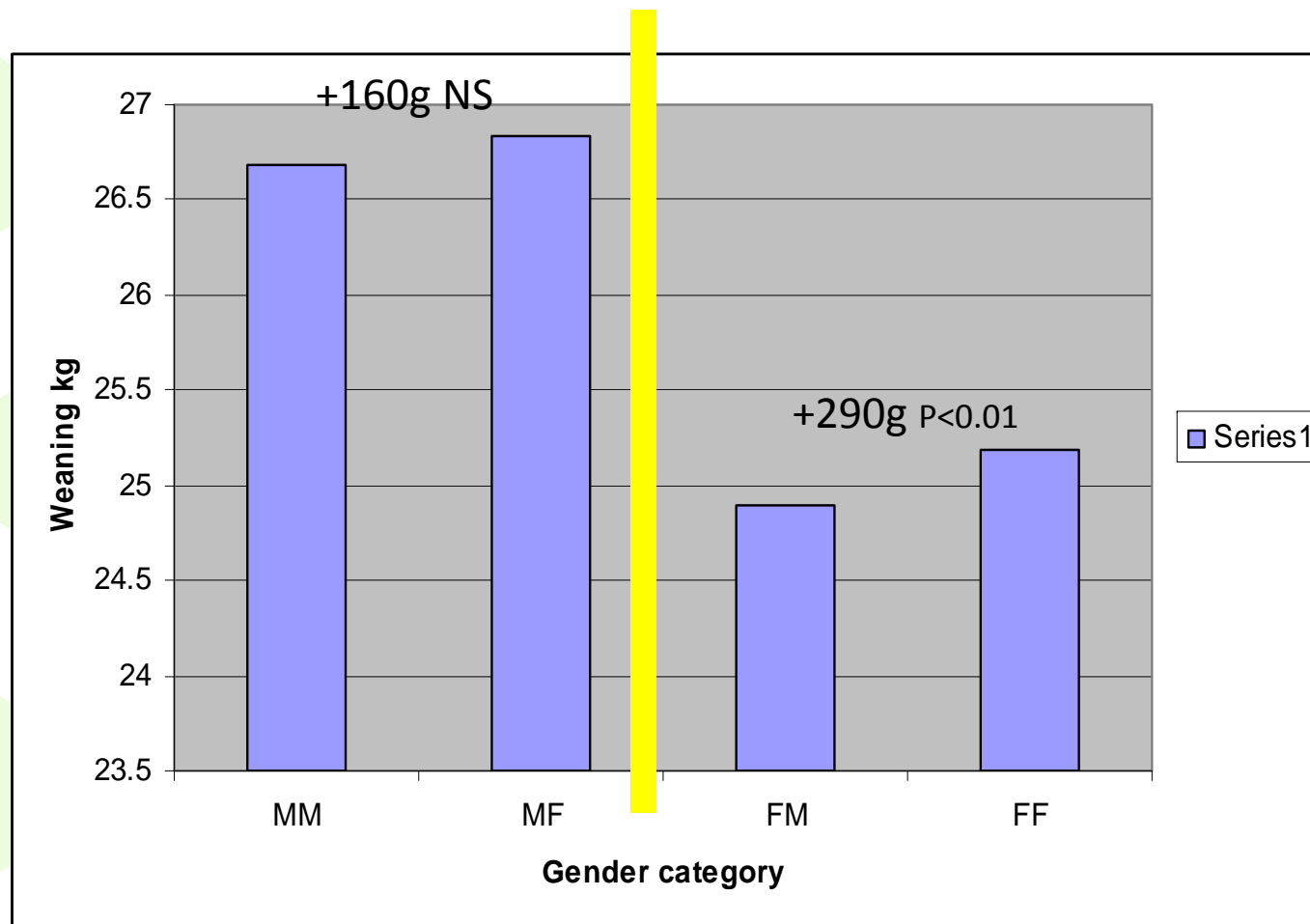


Results – mid-lact weight + (+ live wt of co-twin)

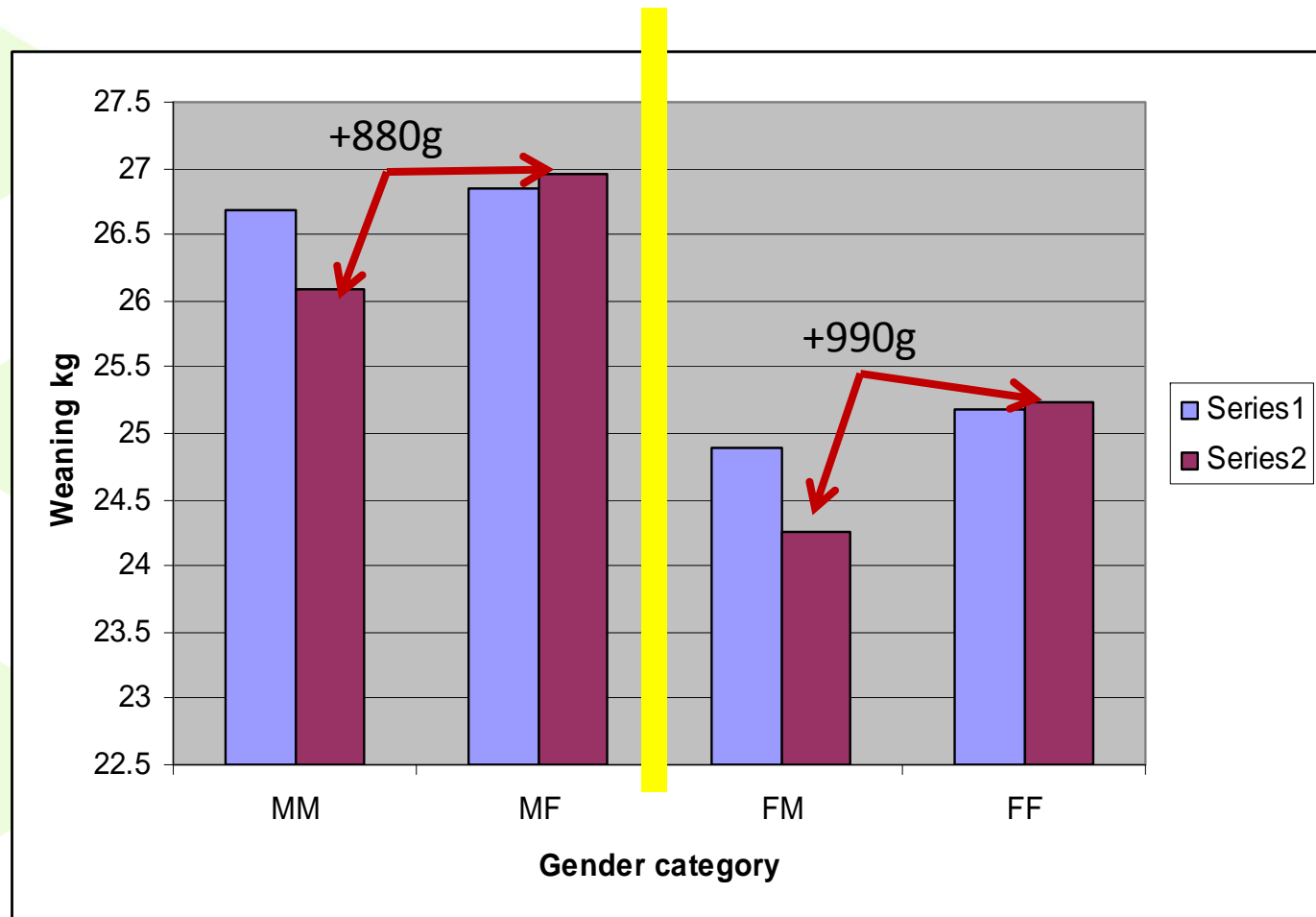


(Both comparisons are significant at $P < 0.01$)

Results – weaning weight



Results – weaning weight + covariate live wt of co-twin



(Both comparisons are significant at $P < 0.01$)

What are the implications for farmers?



- Preferentially manage male lambs?

- Pick female replacements from F-F twin cohorts



- Do the differences persist into adulthood & are other (maternal?) traits affected?

Signet/EBLEX- funded R&D



Lamb gender – what are the implications for their survival?

Can we include lamb survival as a breeding goal trait ?

Lamb survival -background



- Pre-weaning lamb mortality 10-30% - most within 1st 3 days of life
 - Major source of inefficiency
 - Key to profitable sheep farming
- Increasing lamb survival from 1.3 to 1.4 lambs reared/ ewe is worth ~**£126M** in UK

What did we do?



- Blackface data from Signet's *Sheepbreeder*
- 173,895 lamb records 1976 - 2011
 - 53,593 dams, 4,184 sires, 70 flocks



Definition of lamb survival?



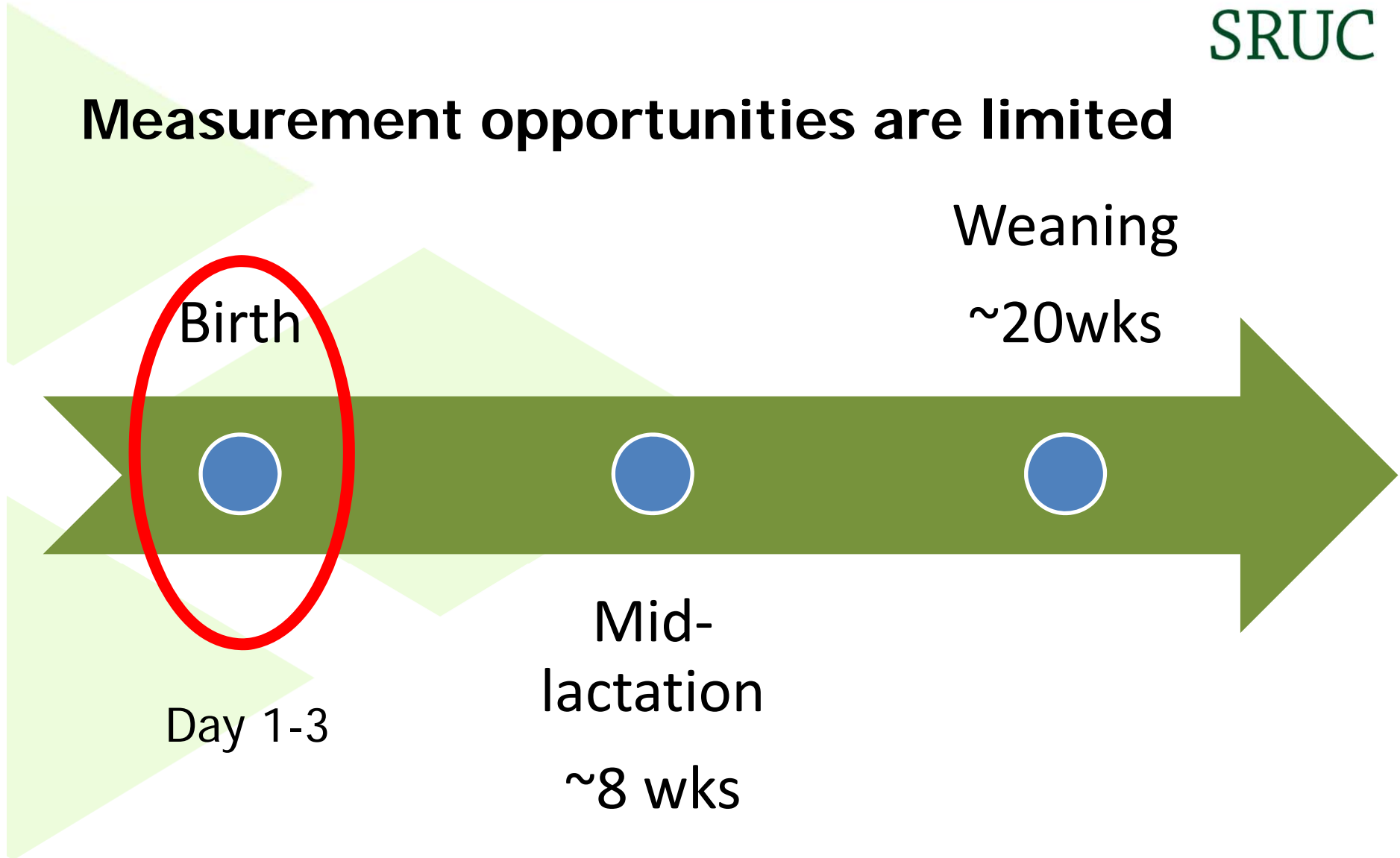
Measurement opportunities are limited

Weaning
~20wks

Birth

Day 1-3

Mid-
lactation
~8 wks



Lamb survival definitions



	0	1	2
SURV01	Dead - Born dead and lambs born alive but no subsequent live weights	Alive – lambs with live weights	-
SURV12	Dead - Born dead only	Dead -Born alive but no subsequent live weights	Alive – lambs with live weights

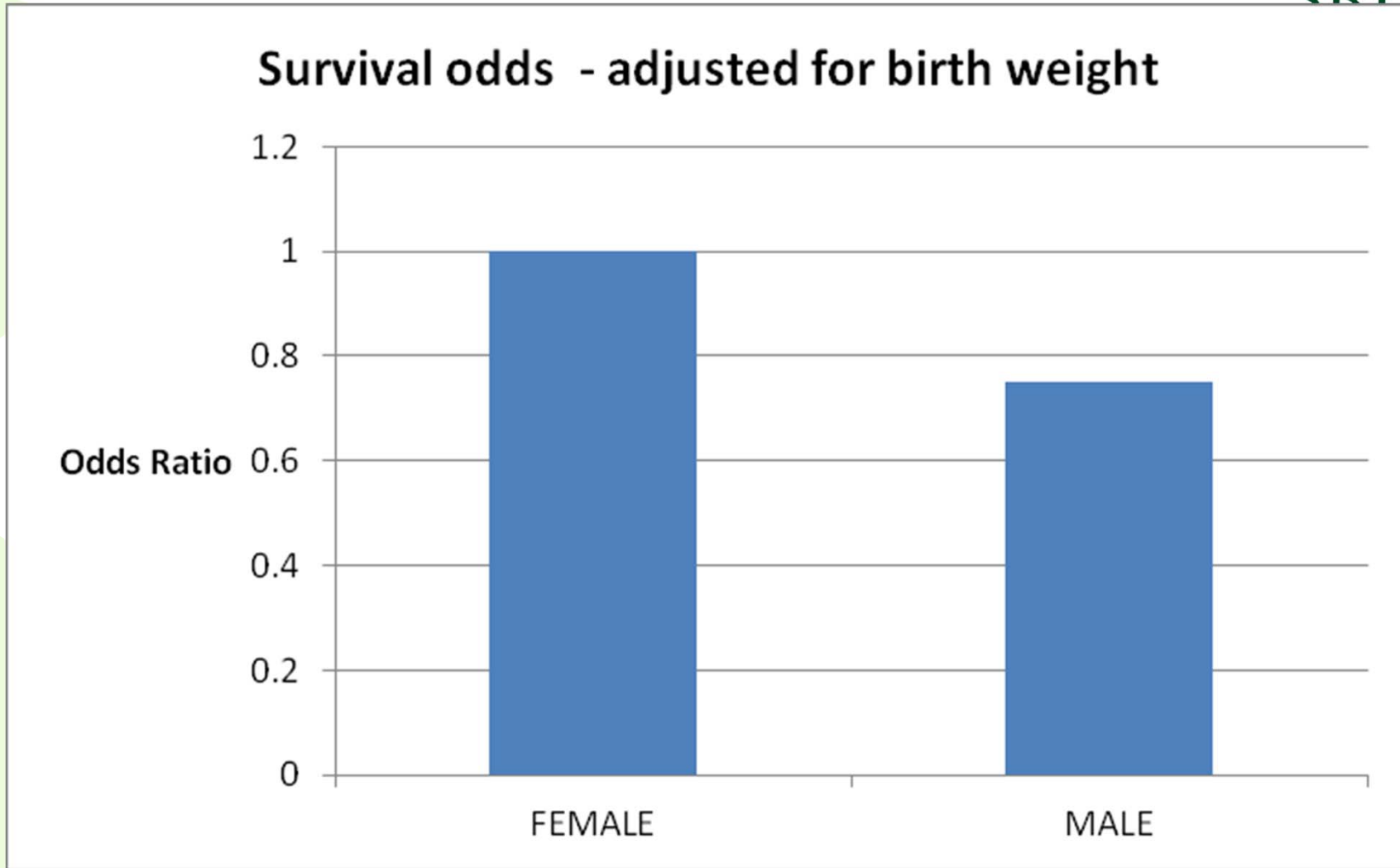
Results -% in each category



	0	1	2
Surv 0/1	12.2	87.8	-
Surv 0/1/2	5.5	6.7	87.8

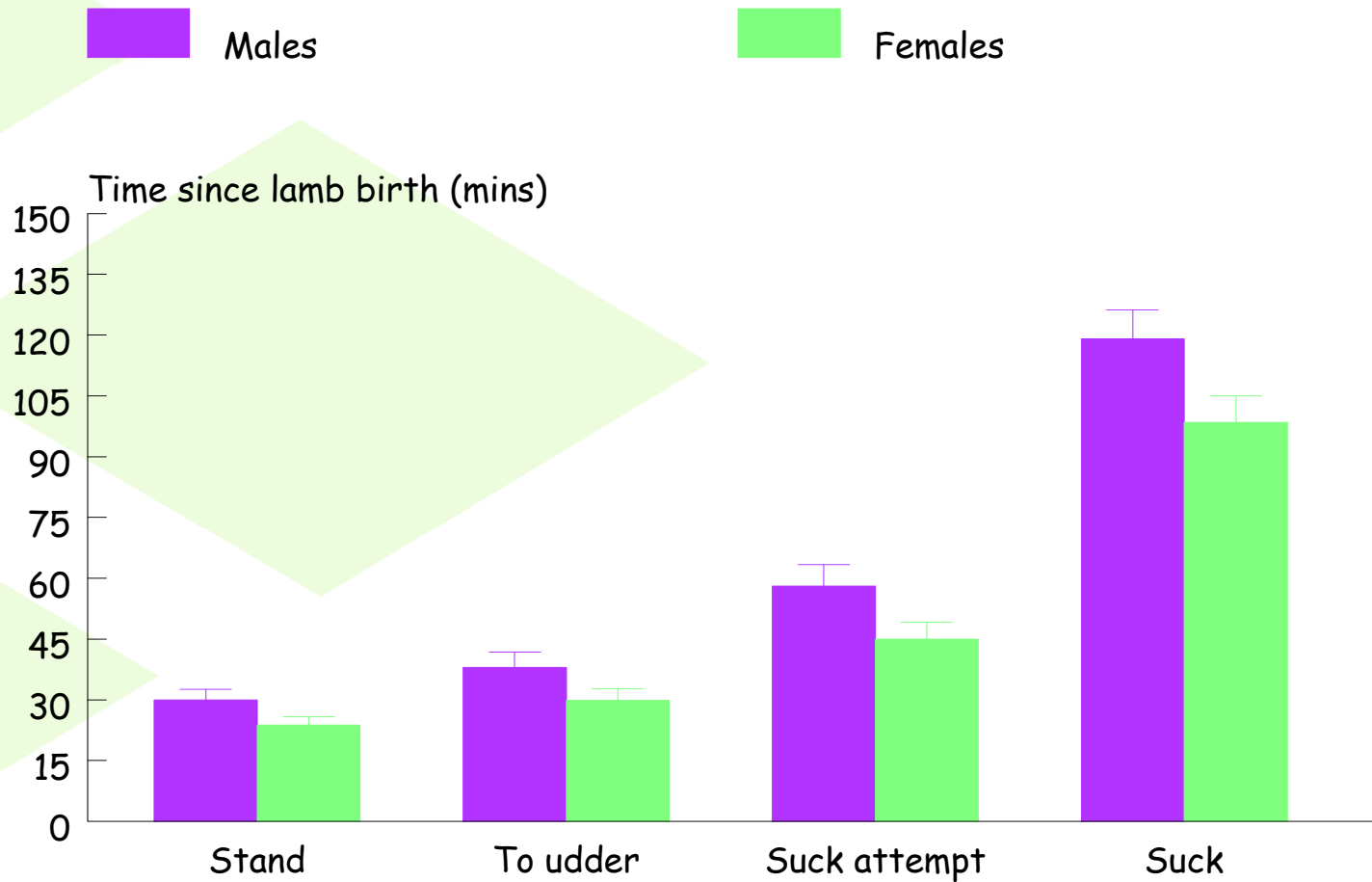


Females have survival odds 1.3 that of male lambs



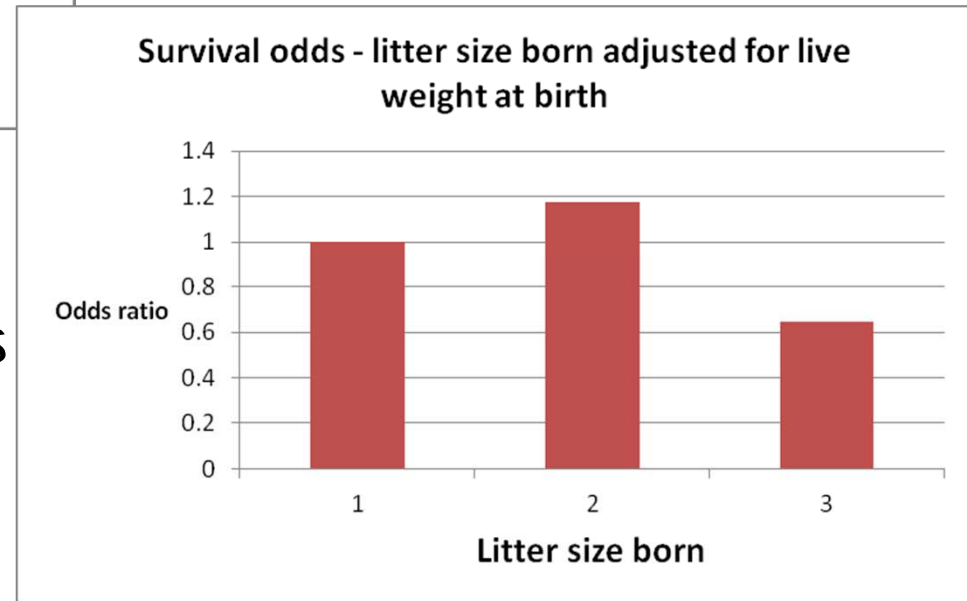
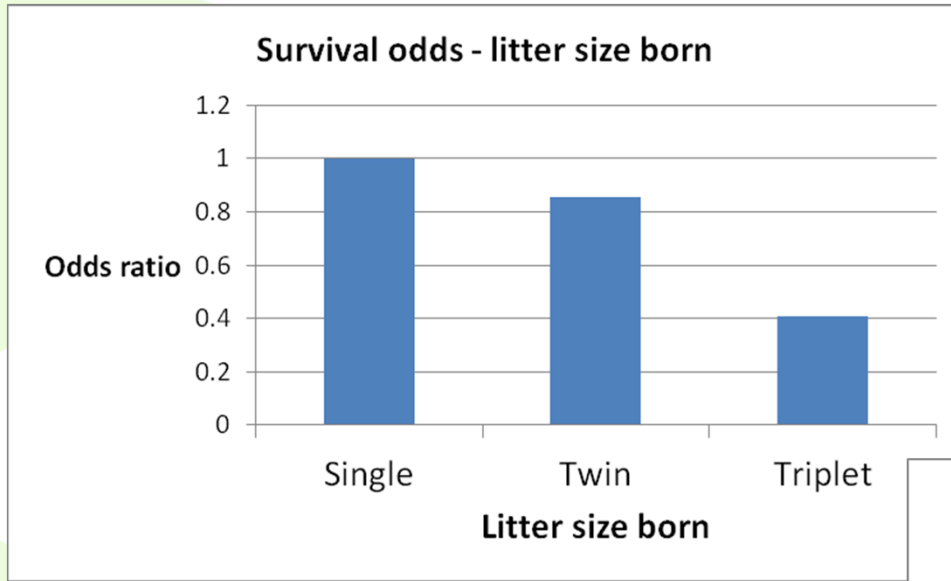
lcl= 0.70, ucl=0.79, s.e.d.= 0.03

Lamb behaviours - Sex effects



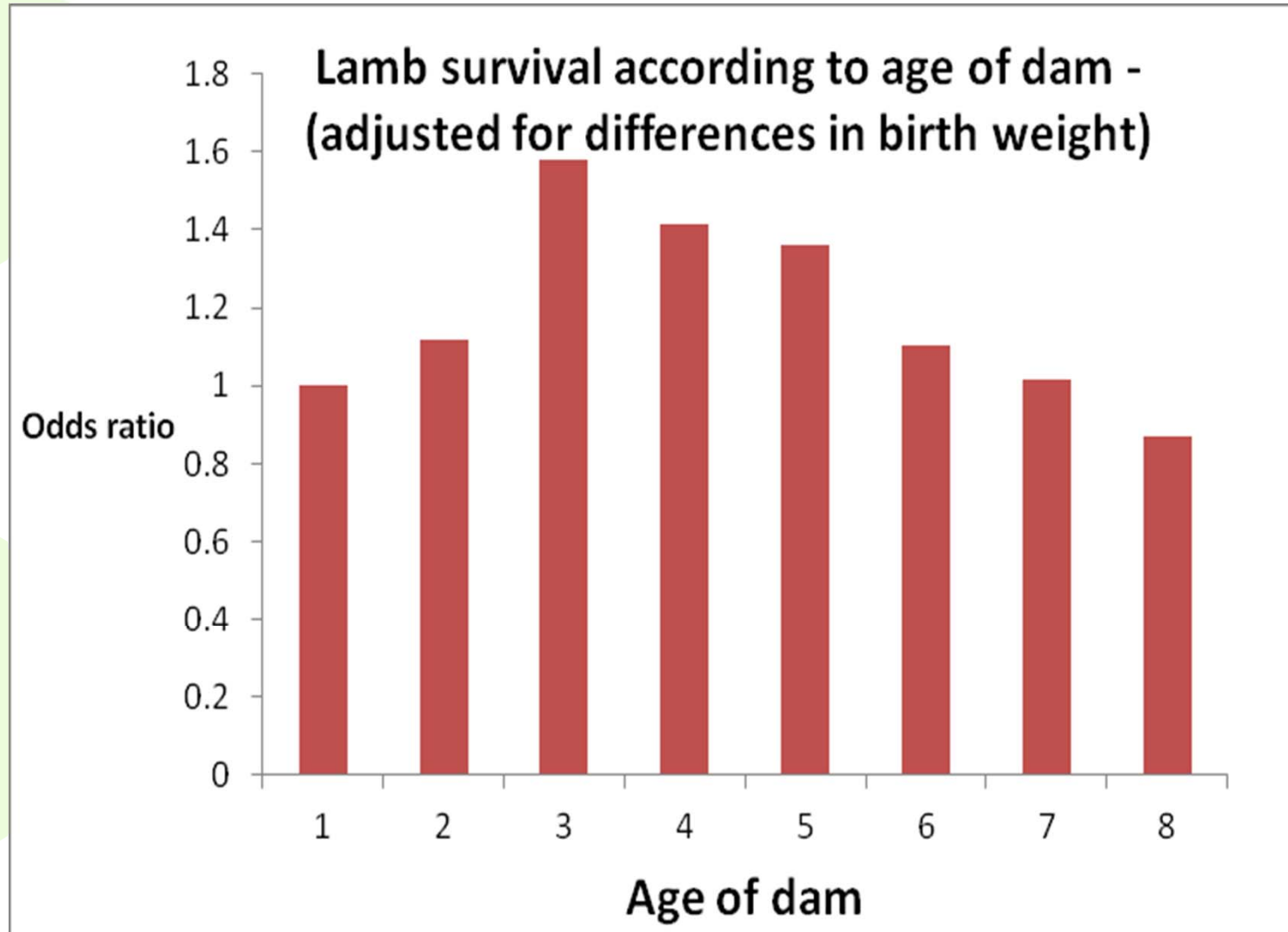
Dwyer, 2003

Accounting for birth weight changes survival odds



Probably reflects preferential treatment of twins in hill flocks

Age of dam & survival



Survival heritability 0.09

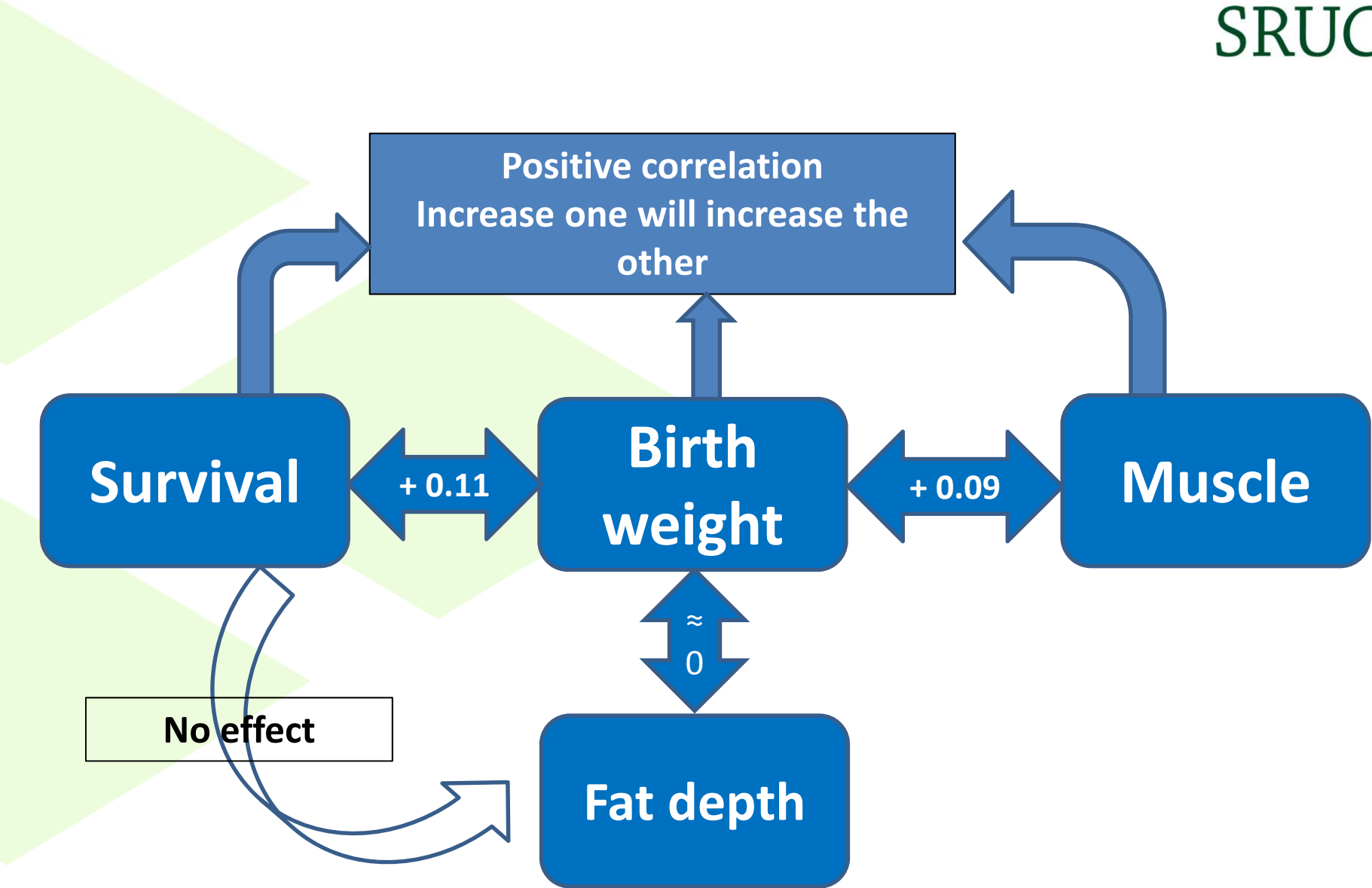


Model	direct	maternal
Direct & maternal genetic	0.01	0.08

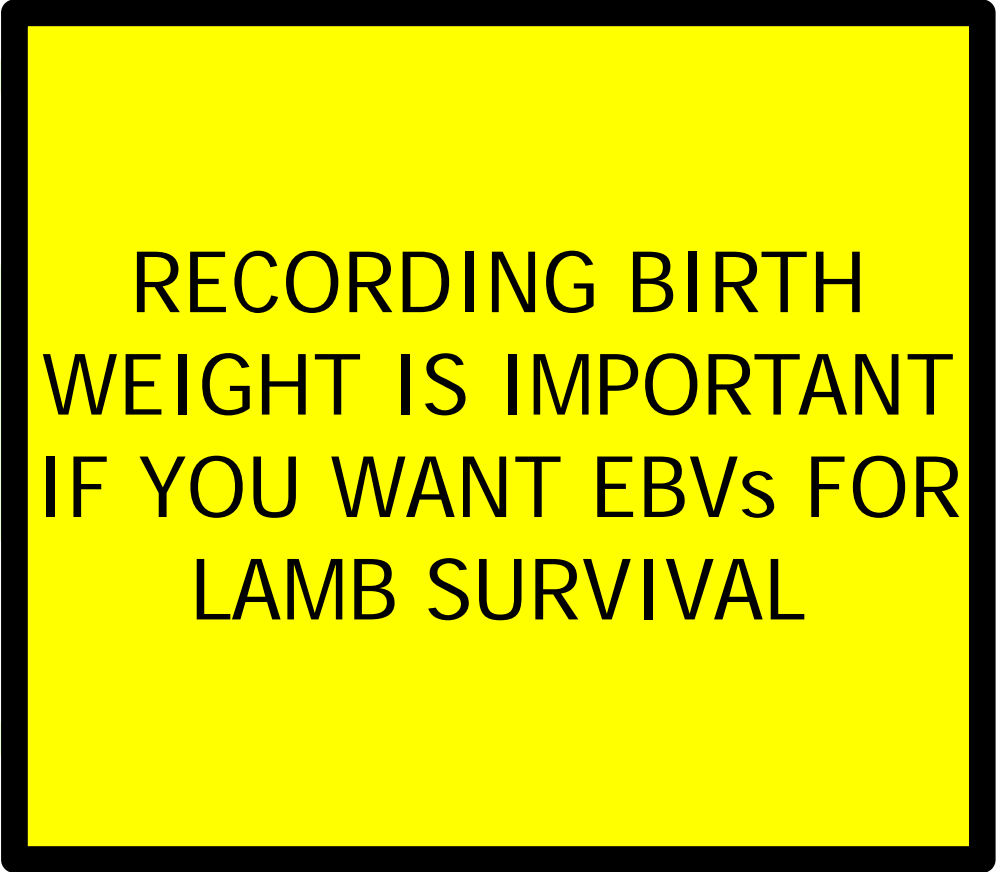
No difference between 0/1 and 0/1/2

Maternal component of lamb survival important.

Genetic links with other traits

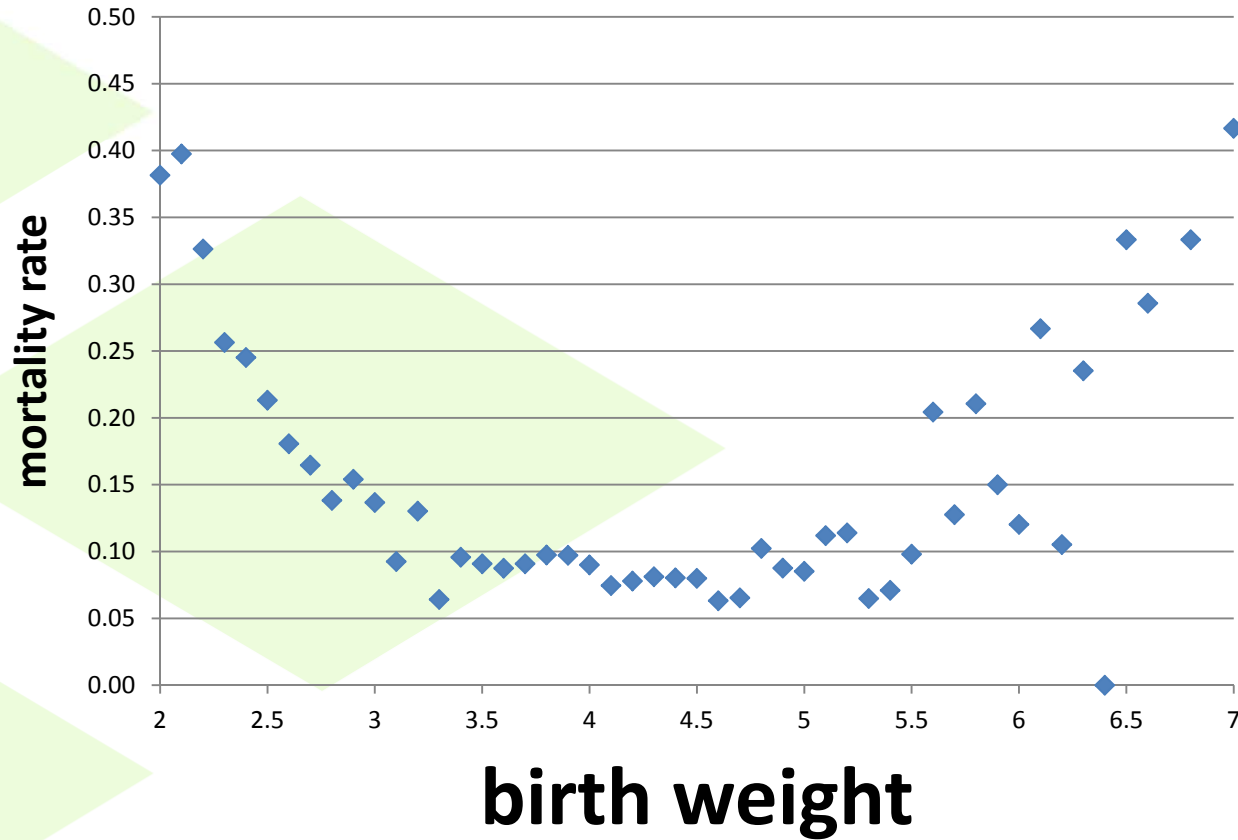


Genetic links with other traits



RECORDING BIRTH
WEIGHT IS IMPORTANT
IF YOU WANT EBVs FOR
LAMB SURVIVAL

Lamb birth weight and mortality



Implications ?



- Genetic basis to lamb survival is low but within published estimates for fitness traits
- Maternal genetic component important
 - maternal EBVs should be estimated for breeders
 - No adverse effect on other traits

Implications (2)



- Increasing ewe longevity → higher lamb mortality
 - NB for low carbon farming systems
- Where possible, male lambs should be given preferential treatment
 - Similar to that already in place for twins?

And finally..



- Making the most of what you've got means
 - Understanding which are the more 'vulnerable' lamb cohorts
 - Taking steps to overcome weaknesses

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 - Understanding which are the more 'vulnerable' lamb cohorts
 - Taking steps to overcome weaknesses

AND

We now have indisputable proof which is the weaker sex ! 😊

Acknowledgements



Many thanks to participating Blackface breeders

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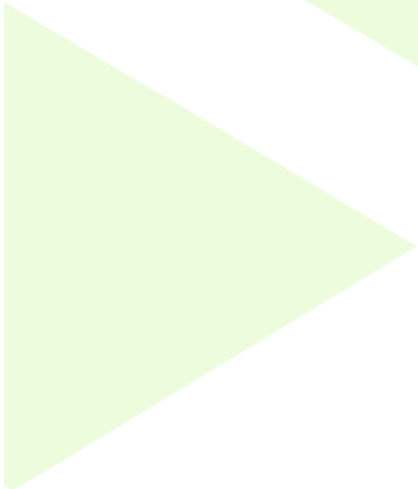
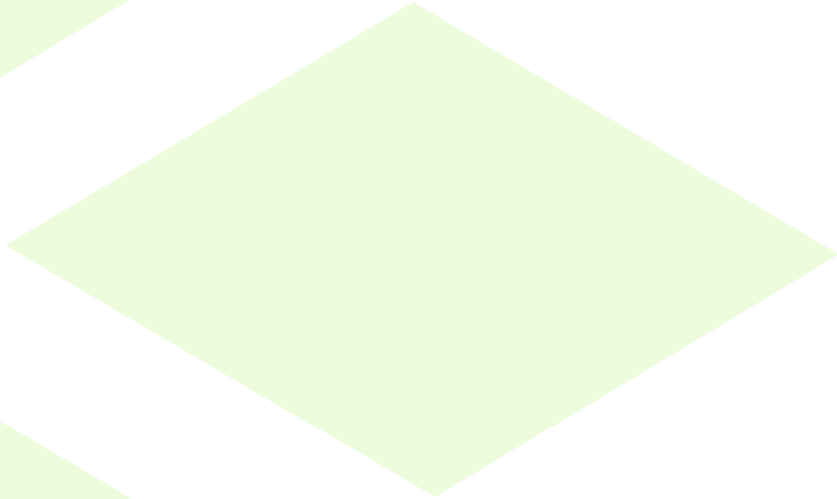
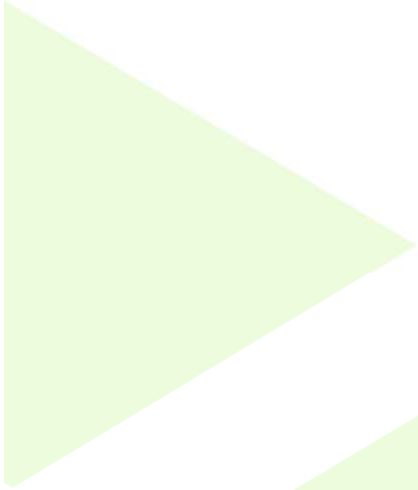


**The Scottish
Government**

eBLEX English Beef and
Lamb Executive

Signet





Methodology



- GLMM in GENSTAT for binomial trait distribution
 - Regression fitted generates coefficients to predict a logit transformation of the probability of lamb survival

$$\text{Logit}(p) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 \dots b_nX_n$$

X_1 = flock-year-season

X_2 = sex

X_3 = dam age

X_4 = litter size

X_5 = covariate lamb birth wt



Actual mortality rates



- Male = 11%
- Female = 15%
- Castrate 8.3%