Estimates of genetic correlations between pelvic measurements and calving ease for Australian Angus

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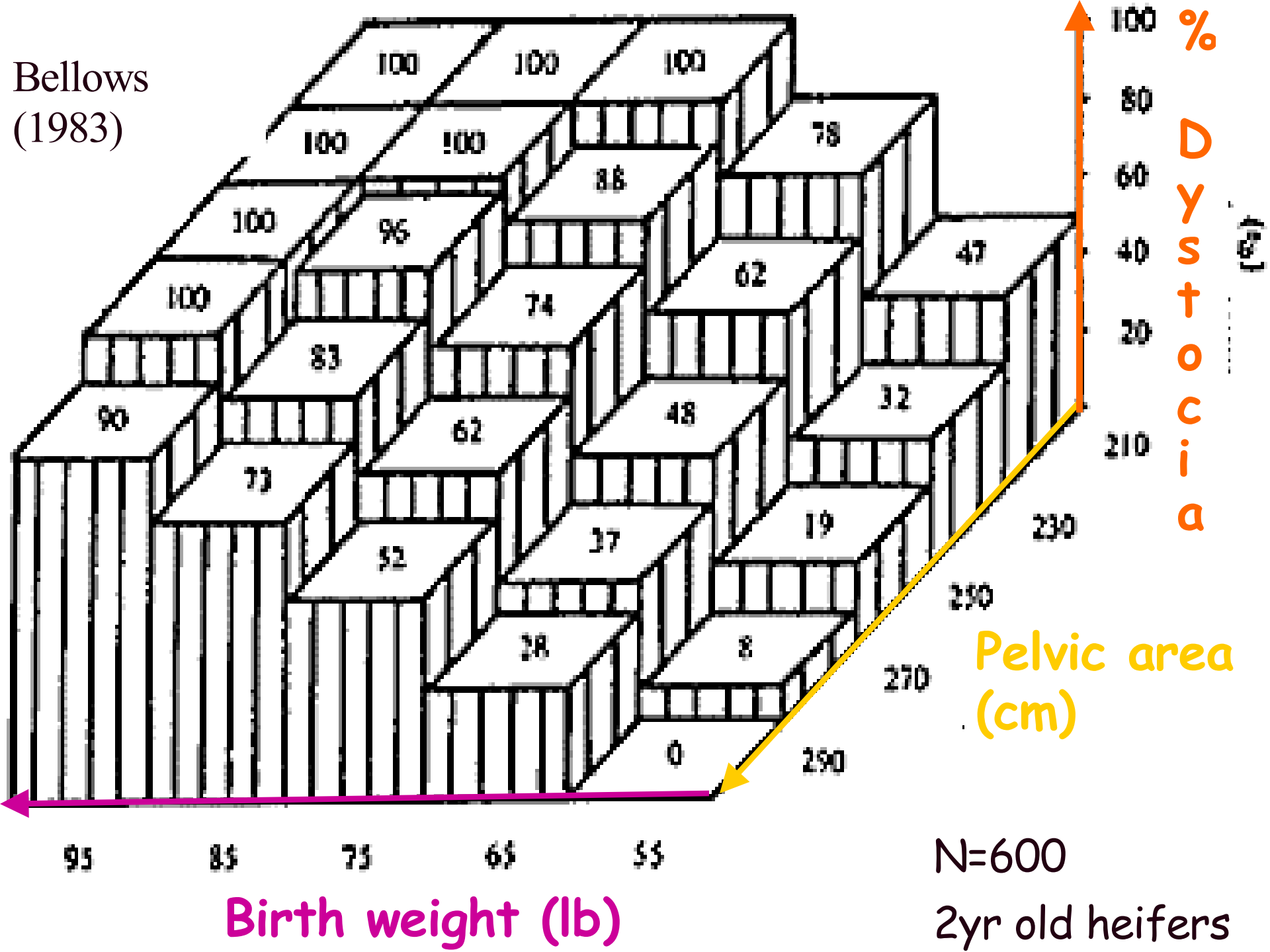
AGBU

MEAT & LIVESTOCK AUSTRALIA

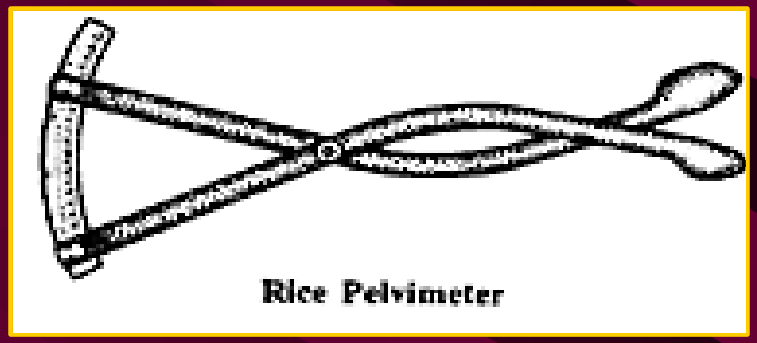
Introduction

- Calving difficulties : discrepancies
  - size & shape of calf
  - size & shape of pelvic opening of dam
- Pelvic measurements useful to reduce incidence of difficult calvings ?
- Auxiliary selection criterion ?
  - heritability & variability
  - genetic correlation with calving ease


Bellows
(1983)
100
100
100
100
100
78
100
96
86
47
100
74
62
83
90
73
62
48
32
52
37
19
28
8
0
95
85
75
65
55
100
80
60
40
20
210
230
250
270
290
% Dystocia
Pelvic area (cm)
Birth weight (lb)
N=600
2yr old heifers

Data

- Pelvic measurements taken in 'validation herds' 1991-1994
  - 300 to 700 days of age
  - Rice pelvimeter
    - internal measurement
    - invasive procedure



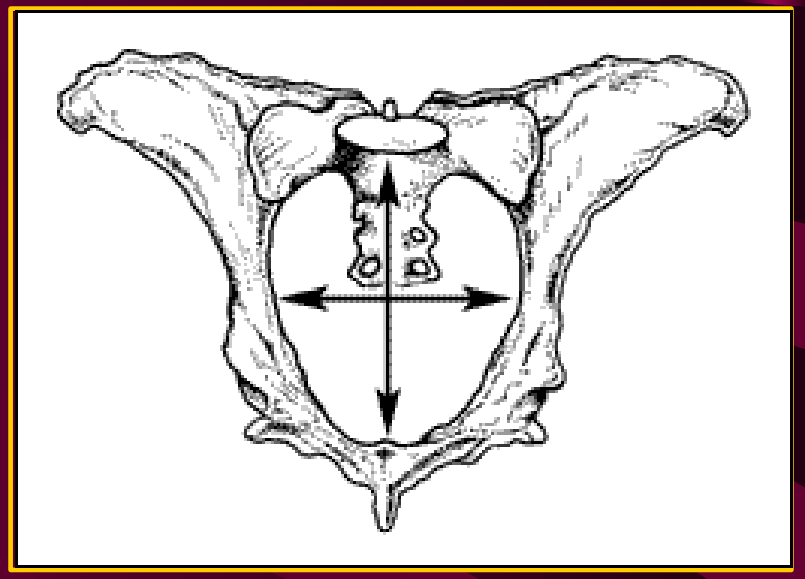
- Earlier results (Bunter & Upton 1995)
  - PM moderately to highly heritable
  - strong, positive genetic correlation between PM on males & females

Data - 2

- Need records on calving performance of heifers measured to assess correlation with calving ease
  - now available
- Calving ease scores (1-5)
  - 21,191 Angus calves born 1989-96
  - low incidence of difficult calvings
    - 1.85% of birth “assisted” (2)
    - 0.76% of birth “difficult” (3)
    - 6 births “veterinary assistance” (4)

Traits

- Measured on heifers
  - **PH** : pelvic height (cm)
  - **PW** : pelvic width (cm)
  - **PA** : pelvic area (cm^2)
  - **HH** : hip height (cm)
- Treated as trait of the calf
  - **CE** : calving ease (score 1-5)



No. of records - PM

	400 d	600 d
PH, PW, PA	6034	1952
with CE score	3952	943

Means - PM

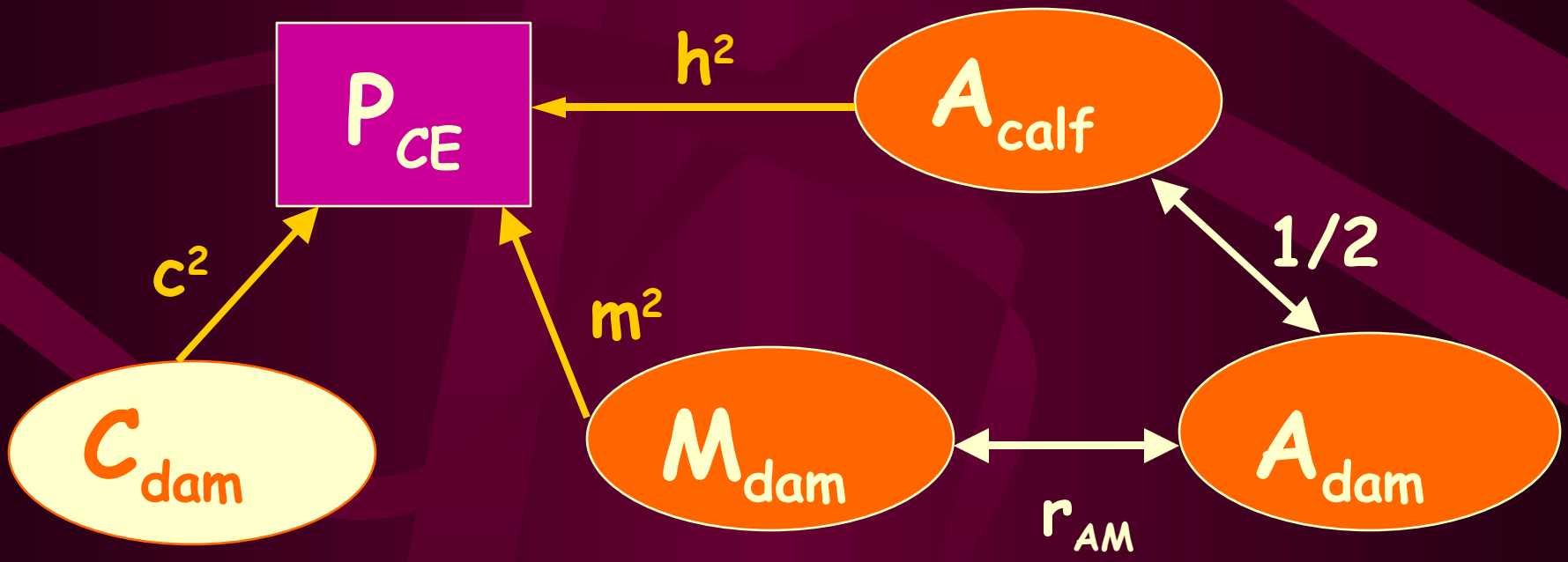
	PH	PW	PA	HH
400 d	14.4	12.1	175	118
600 d	16.0	13.5	216	125

CE : Univariate analyses

- REML, animal model
  - pedigree info up to 2 generations back
- examine importance of maternal eff.s
  - genetic
  - permanent environmental
- Fixed effects
  - contemporary groups
  - “heifer factor” (age of dam class)
  - dam age as linear & quadratic covariable

CE : Univ. analyses - 2

- Treat CE
  - as continuous trait
  - as trait of the calf born



CE : Results

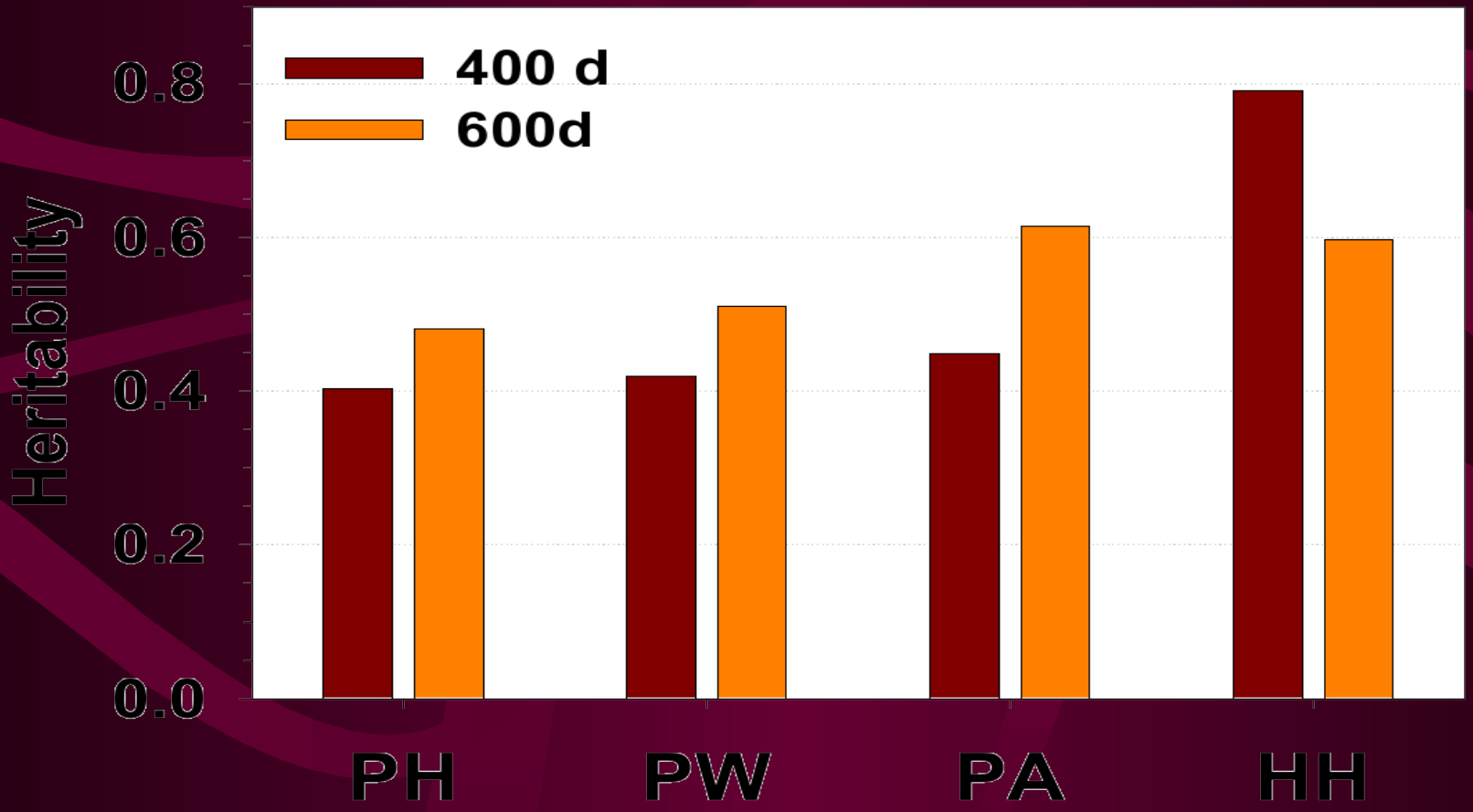
- Model fitting genetic & p.e. maternal effects assuming $r_{AM} \neq 0$ fitted best
  - Direct heritability $h^2 = 0.05$
  - Maternal heritability $m^2 = 0.04$
  - Permanent environmental maternal effect $c^2 = 0.33$
  - Direct-maternal genetic correlation $r_{AM} = -0.47$
    - antagonistic relationship plausible (size)
    - some↓ bias ?

CE + PM : Bivariate analyses

- PM : Fit direct genetic effects only
- CE : Fit
  - direct & maternal genetic effects
  - maternal perm. environmental effects
- Estimate correlations CE & PM
  - direct genetic correlation
  - direct-maternal genetic correlation
  - residual

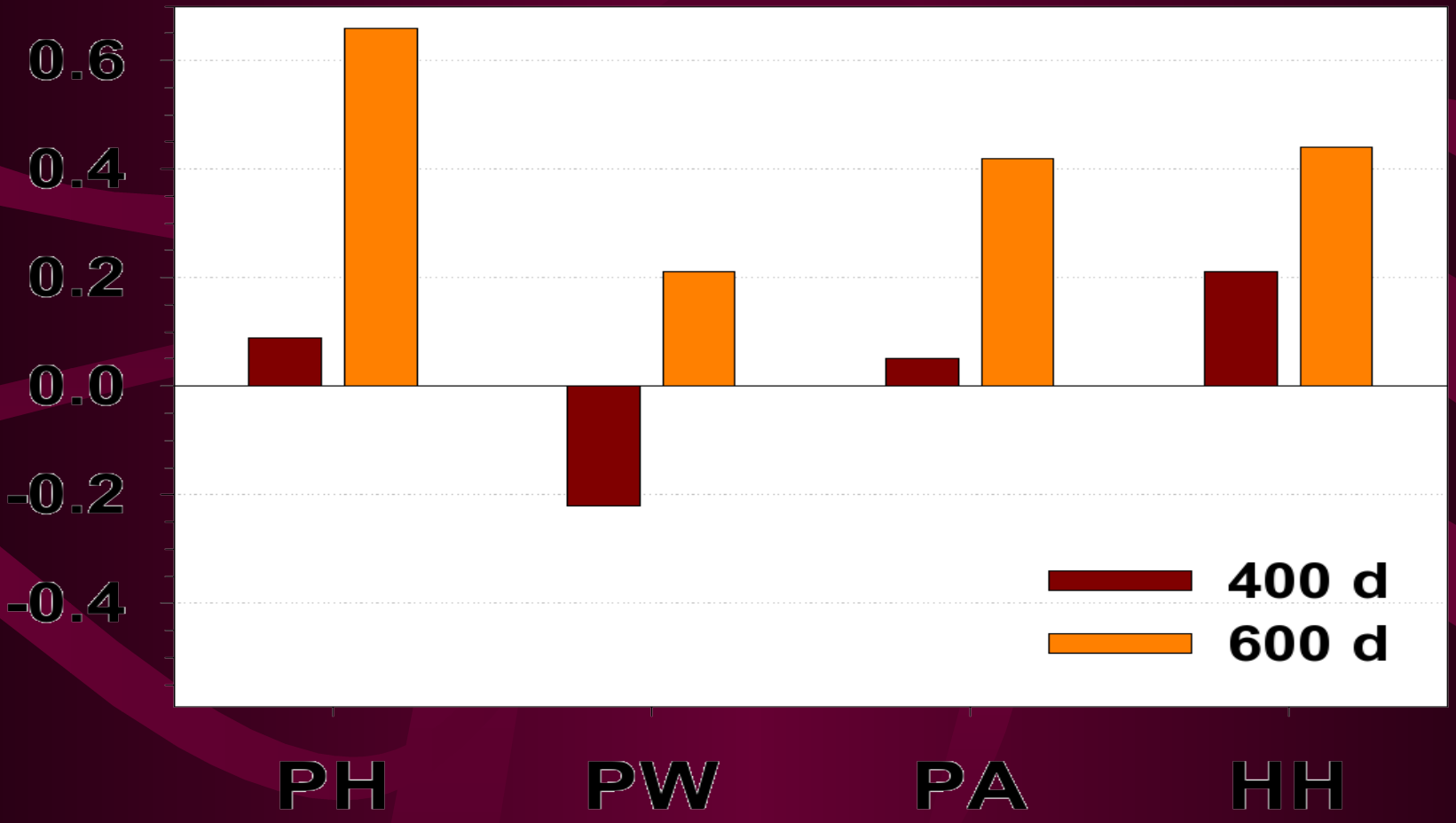
CE + PM : Estimates -1

Direct heritability estimates for PM



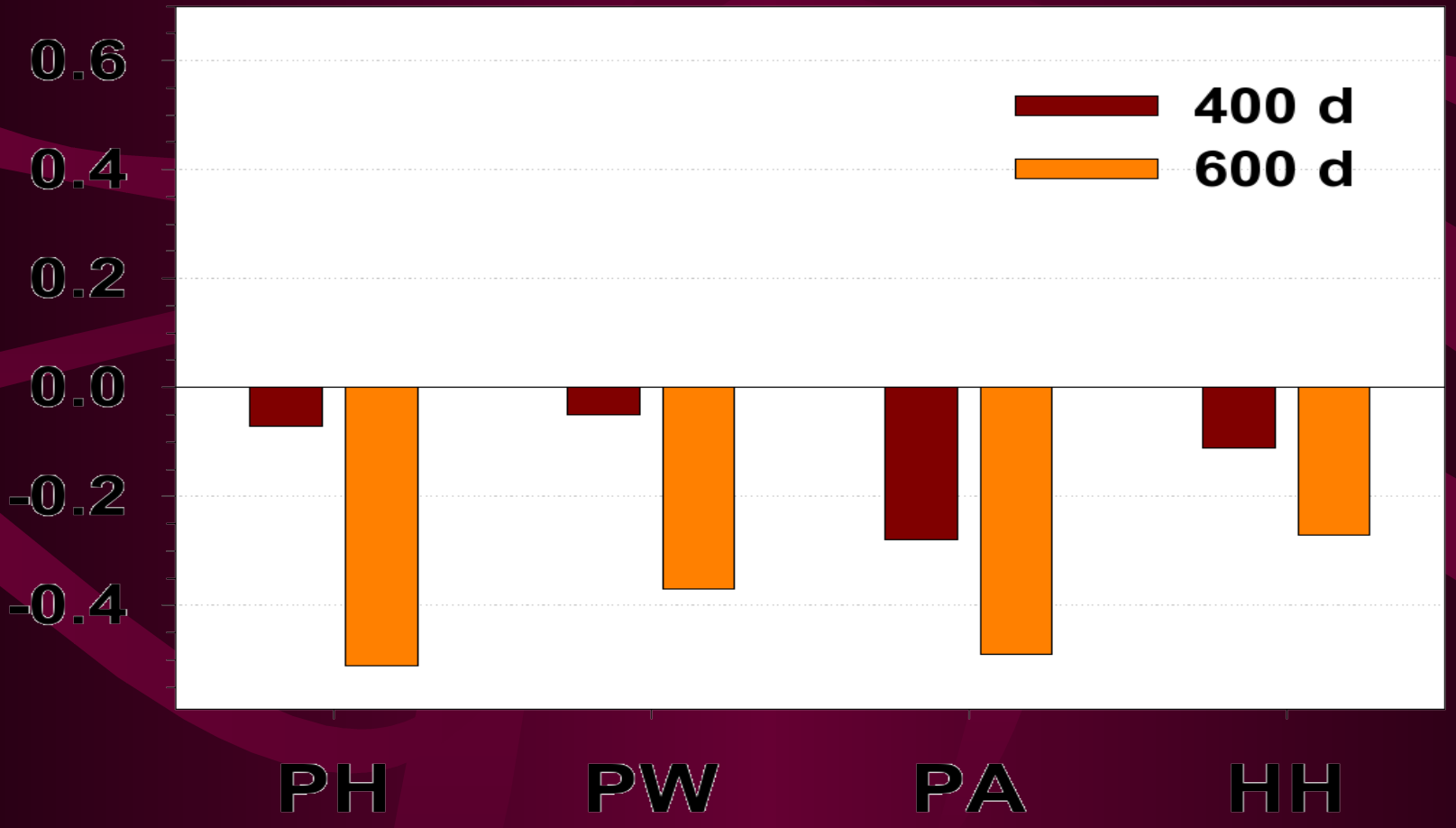
CE + PM : Estimates -2

Direct genetic correlations



CE + PM : Estimates -3

Correlations between direct effects for PM & maternal effects for CE



Results

- Low correlations for records at 400 d
- Records at 600 d :
  - Low to moderate, antagonistic direct genetic correlations (0.2 to 0.6)
    - calves with larger PM tend to have more difficult birth
  - Low, favourable direct-maternal genetic correlations (-0.3 to -0.5)
    - cows with larger PM tend to have calves born with lower CE scores

Conclusions

- PM *can* assist in selection against calving difficulties ...
- But :
  - Invasive procedure
  - Correlations are low !
    - different for breeds with higher incidence of calving difficulties ?
- Recommend :
  - selection based on EBVs for CE, BW & GL