Genetic parameters for health traits in a multi-breed sheep population

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Sheep industry in Ireland

- 2.4 million breeding sheep
  - Majority are crossbreds
- 58,000 tonnes meat produced in 2015
  - 80% was exported
  - Exports worth >€230 million

Sheep Health

Welfare implications

Social perception

Dagginess → Lambs penalised at slaughter
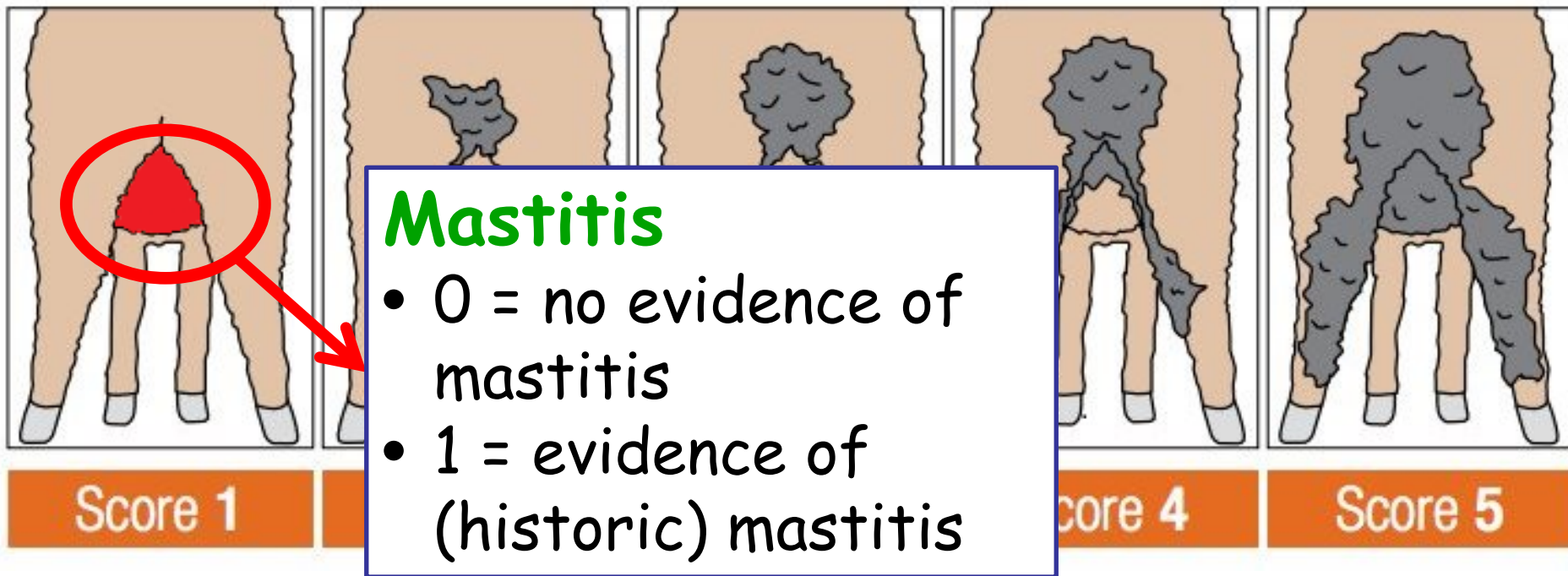
Lameness → Cost €5 m per year

Mastitis → Largest single reason for culling ewes

Phenotypes

Dagginess

Lameness

Mastitis
- 0 = no evidence of mastitis
- 1 = evidence of (historic) mastitis

Score 1   Score 4   Score 5

Data

49 493 observations

↓

402 flocks

↓

2009 → 2015

5 main breeds

Belclare

Charollais

Texel

Suffolk

Vendeen

Major data edits

- Rams and ET ewes
- Breed proportion
- No repeated records
- Age at first lambing
- Age of animal
- ≥5 animals per contemporary group
- Known sire
- Ewe parity
- Contemporary group
  - Type of animal
  - Flock of inspection
  - Date of inspection

After edits

39 315 observations

↓

264 flocks

↙ ↘

Ewes
n = 8,046

Lambs
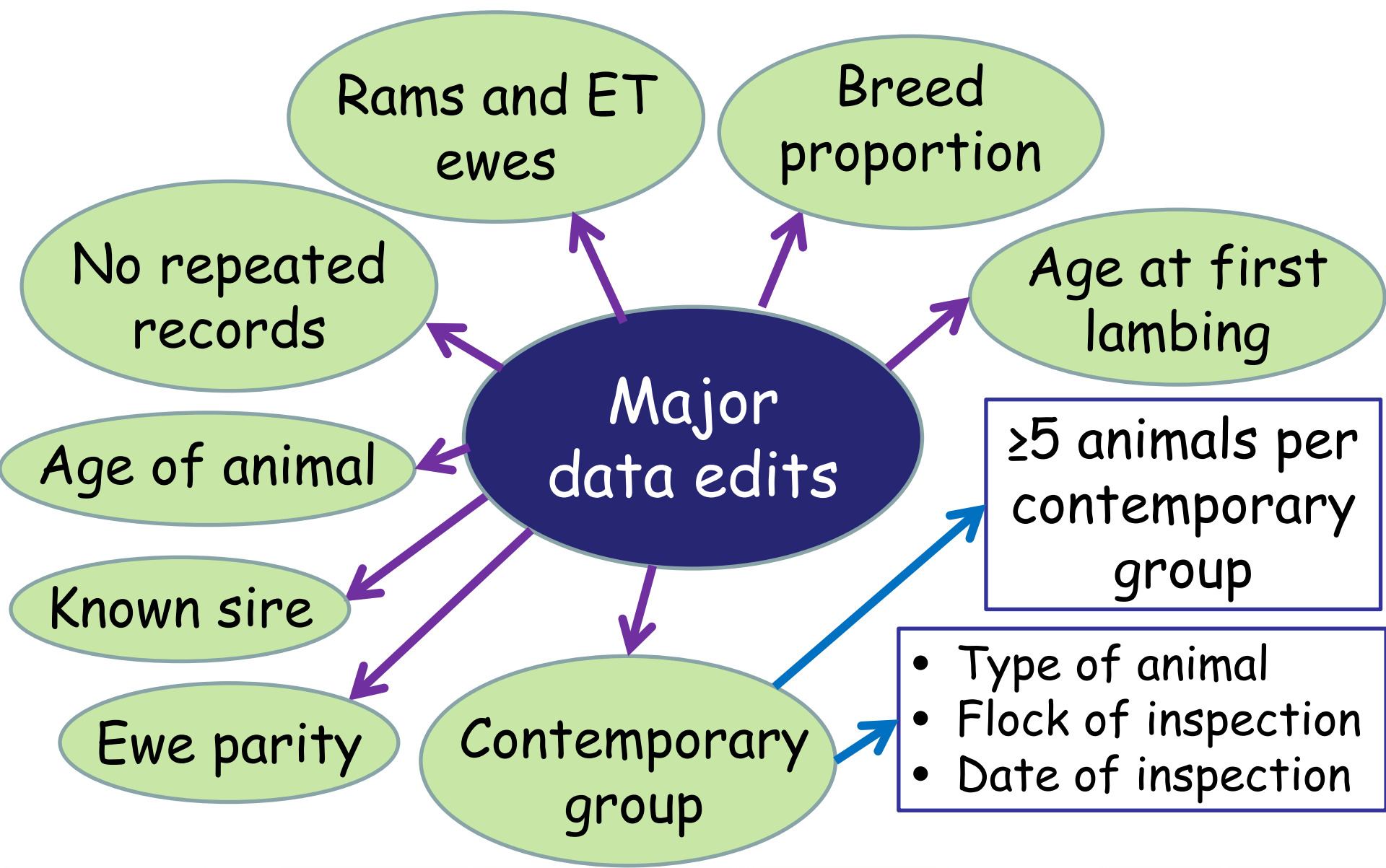n = 31,269
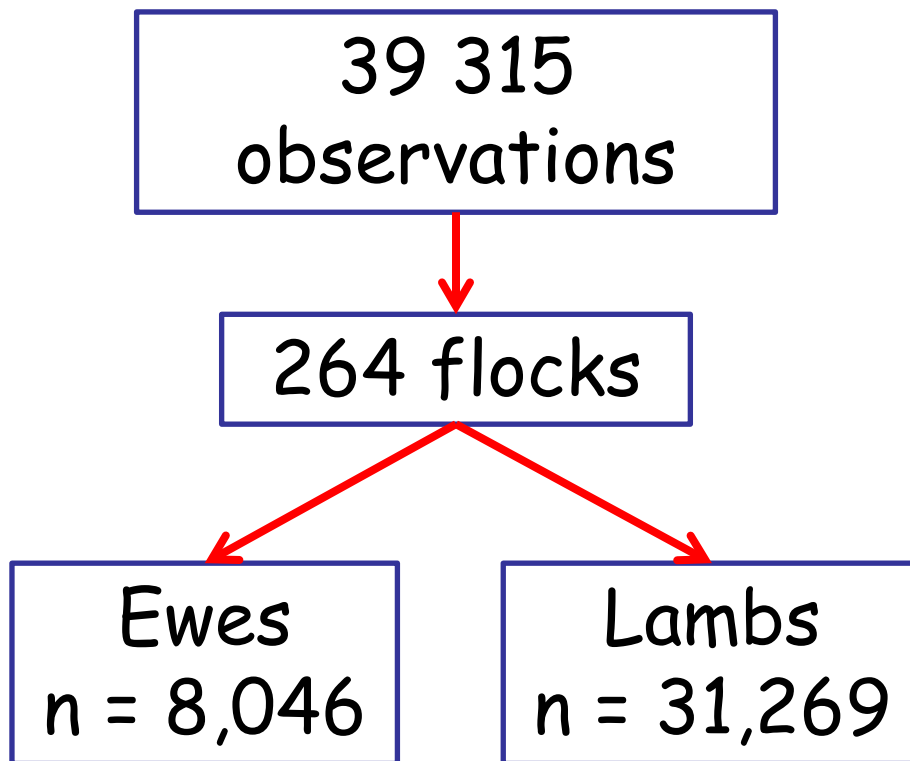
Model

Breed proportion

$$Y = \text{contemporary group} + \sum_{i=1}^{5} \text{Breed} + \text{heterosis} +$$

$$\text{recombination} + \text{age} + \text{gender} + \text{parity} +$$

additive genetic effect + residual effect

Maternal model
- Random maternal genetic effect
- Within-litter permanent environmental effect
- Across litter, within ewe permanent environmental effect

Lambs only

Ewes only

Results

Heritability

	Direct heritability (h^2)		r_g - lambs and ewes
	Lambs	Ewes	
Dagginess	0.14 (0.02)	0.15 (0.03)	0.38 (0.13)
Lameness	0.12 (0.02)	0.06 (0.02)	0.05 (0.25)
Mastitis		0.04 (0.03)	

Dagginess in lambs had a maternal heritability of 0.05 (0.02)

Genetic correlations

	Dagginess	Lameness
Dagginess		0.14 (0.09)
Lameness	0.35 (0.22)	
Mastitis	-0.19 (0.28)	0.25 (0.25)

A correlation of -0.70 (0.11) existed between maternal lamb dagginess and direct lamb dagginess

eagasc
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Breed effects

Belclare → Ewes – least risk of dagginess

Charollais → Intermediate for all traits

Texel → Lambs – least risk of dagginess

→ Ewes – greatest risk of mastitis

Suffolk → Lambs – greatest risk of dagginess

Vendeen → Lambs – greatest risk of lameness

Conclusions and implications

- Dagginess, lameness and mastitis
  - Displayed genetic variation

- Each trait should be included in a breeding goal as they each fulfil the criteria
  1. Exhibit genetic variation
  2. Socially or economically important
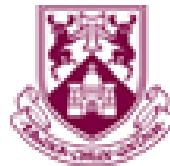 3. Measurable on a large scale

Acknowledgements

Thank you for your attention

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