The impact of genotypic information on changes in breeding value accuracy for health traits in meat sheep

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bsas
2022
The role of animals
in human and planetary health

Footrot and mastitis

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- Hard to measure health traits
- Great influence on the welfare of the animals
- Can cause significant losses for the industry

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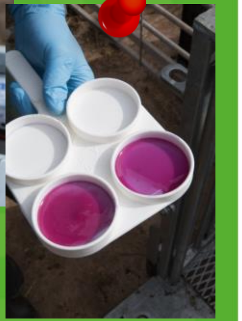
Footrot and mastitis – phenotypes

- Footrot
  - Each hoof scored: range 0 to 4
  - All four scores summed together: range 0 to 16

- Mastitis – as proxy trait: California Mastitis Test (CMT) – correlated with SCC up to 0.98
  - Milk sample from each side of the udder scored: range 0 to 4
  - Two scores from two sides summed together: range 0 to 8

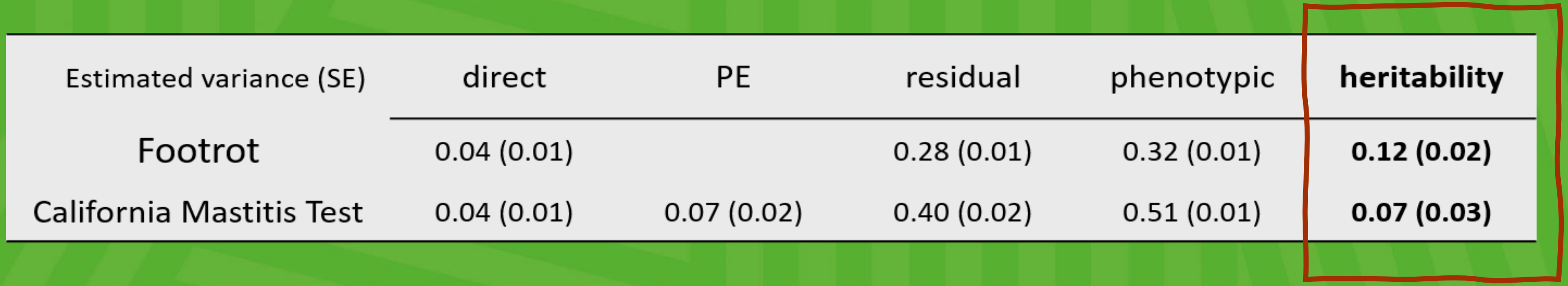
Footrot

CMT – California Milk Test



Is there a potential for selection?

- Phenotypes collected on 30 Texel Sheep phenotype partner farms between 2015 and 2019:
  - Footrot: 9,123
  - CMT: 4,787



Estimated variance (SE)	direct	PE	residual	phenotypic	**heritability**
Footrot	0.04 (0.01)		0.28 (0.01)	0.32 (0.01)	**0.12 (0.02)**
California Mastitis Test	0.04 (0.01)	0.07 (0.02)	0.40 (0.02)	0.51 (0.01)	**0.07 (0.03)**

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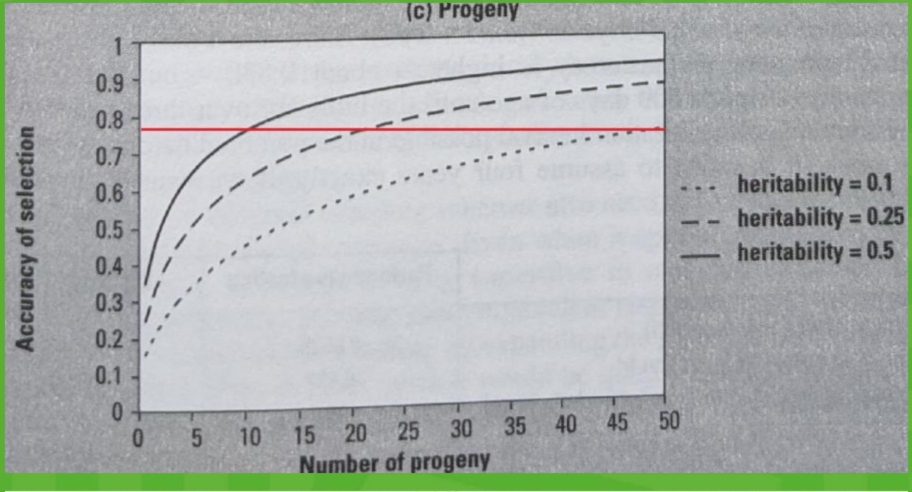
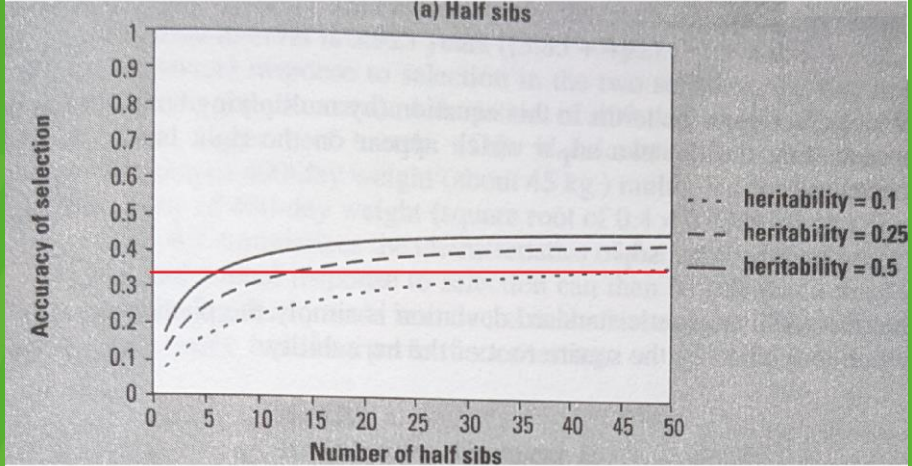
Accuracy of Estimated Breeding Values (EBVs)





G. Simm 'Genetic Improvement of Cattle and Sheep'

Conventional approach (pedigree + phenotypes):

- requires many phenotypes
- takes long time to achieve satisfactory (trustworthy) accuracy

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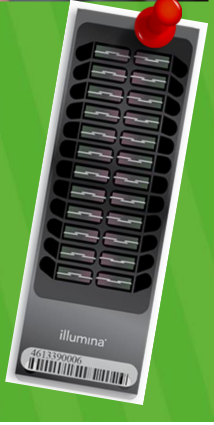
Can we speed up?

- 10,193 (**9,391** after Quality Control) Texel genotypes
- Reference population (genotyped + phenotyped)
  - footrot: 3,779
  - CMT: 2,909 animals

+Additional checks that can be done on genotypes: parentage, diseases, desirable genes



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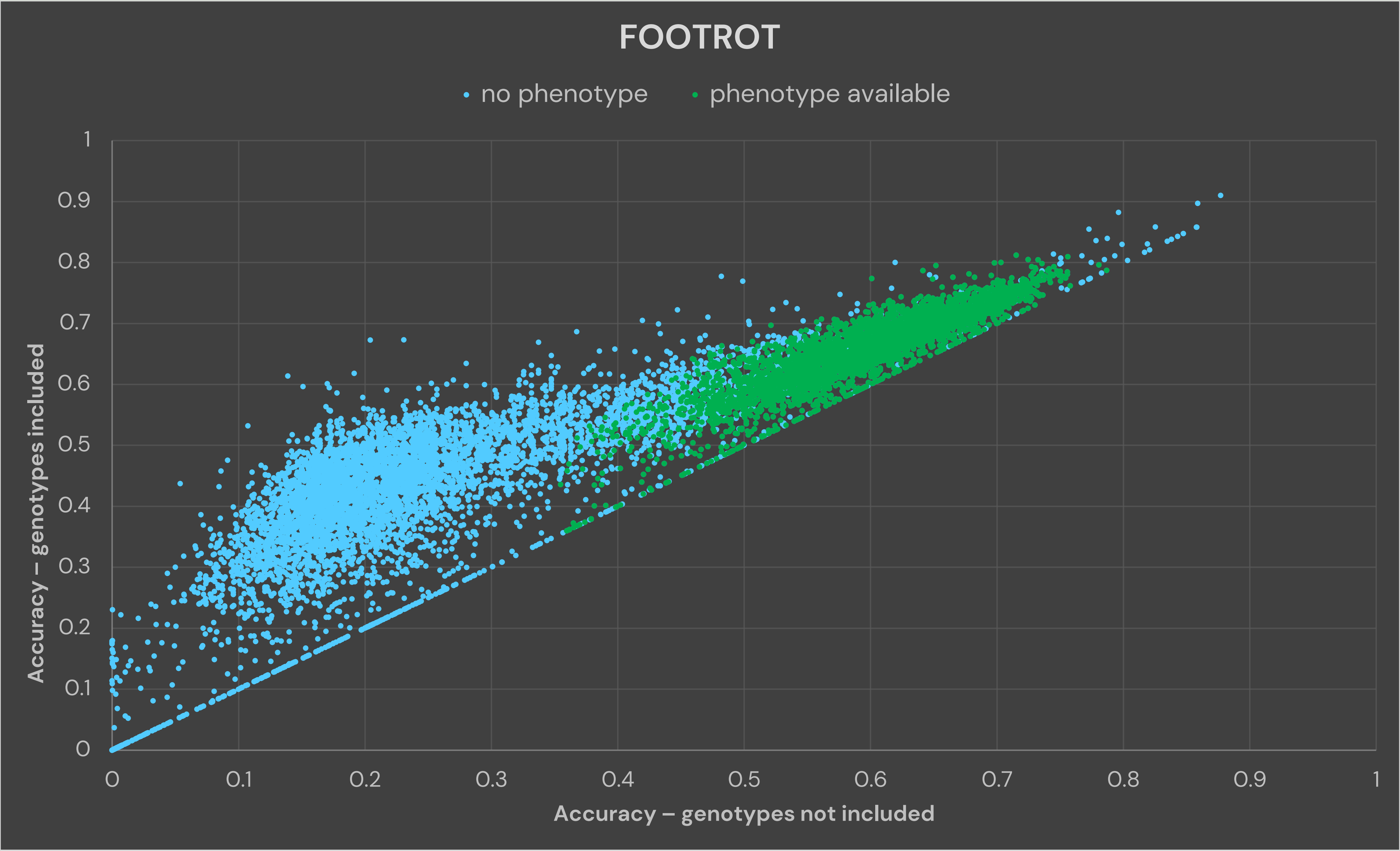

Heritability 12%

Max change:

- +0.18 with phenotype
- +0.47 no phenotype

K.Kaseja et al. (2021)

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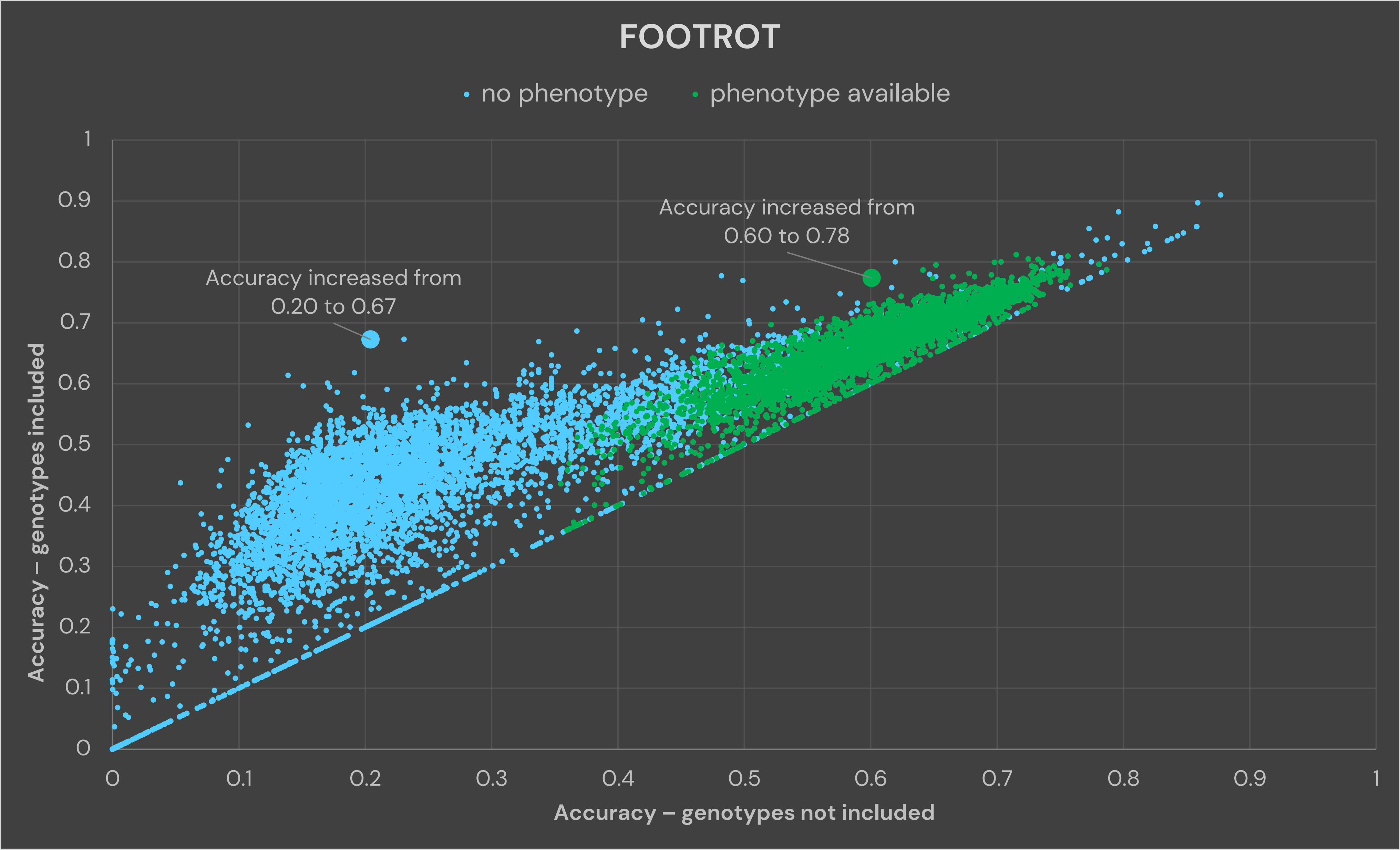

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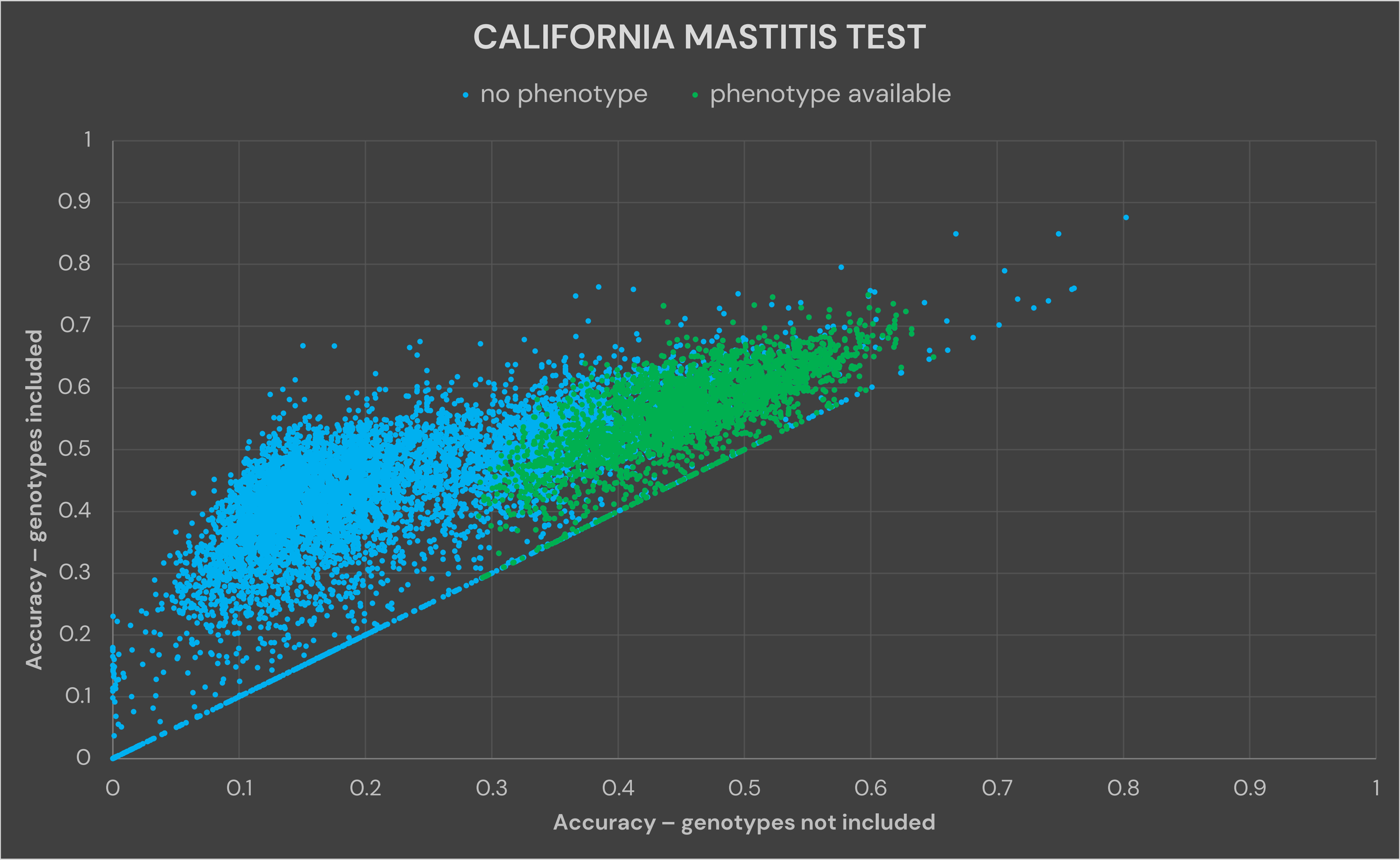

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Heritability 7%

Max change:
- +0.30 with phenotype
- +0.52 no phenotype

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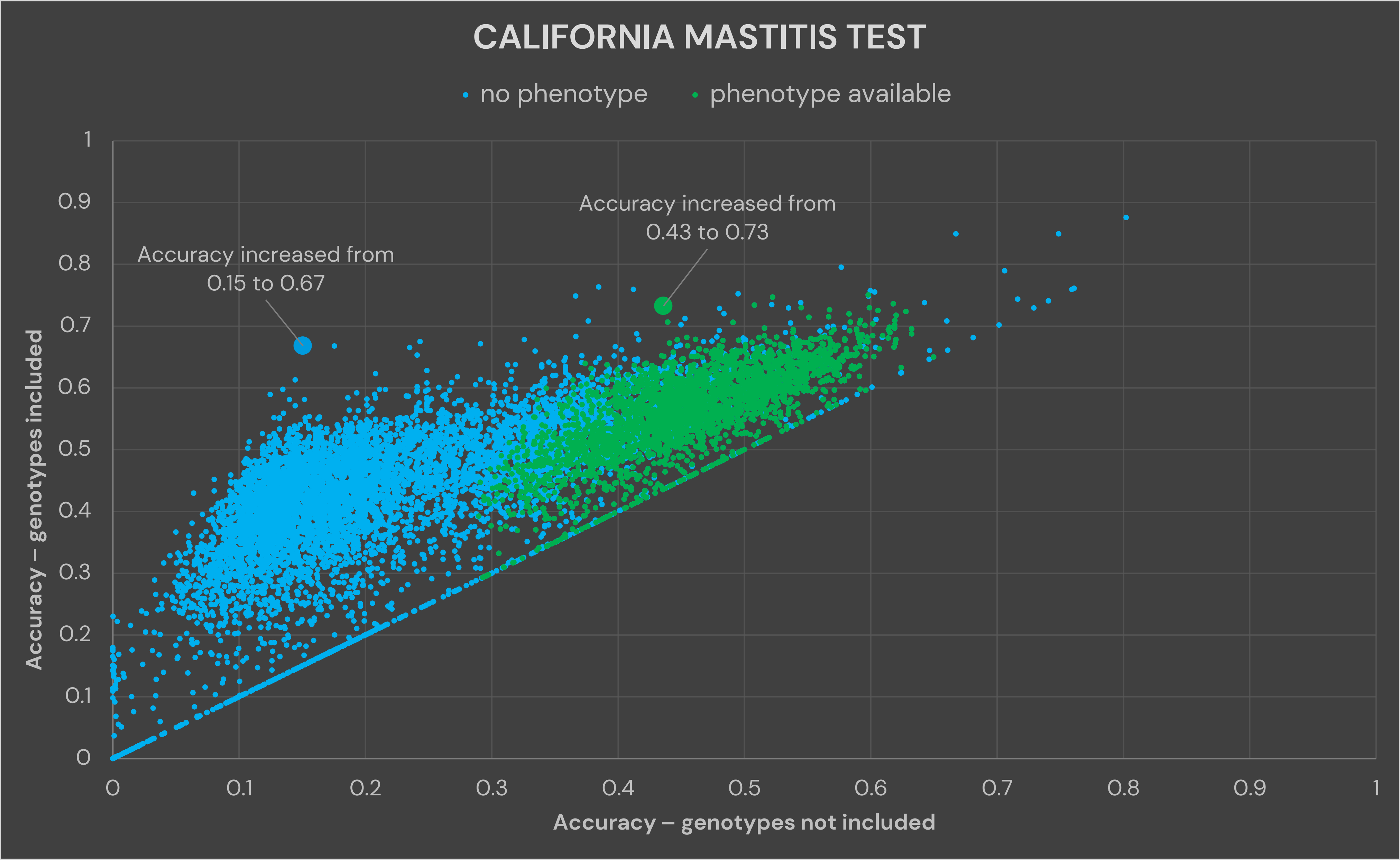
CALIFORNIA MASTITIS TEST



Accuracy increased from 0.15 to 0.67

Accuracy increased from 0.43 to 0.73

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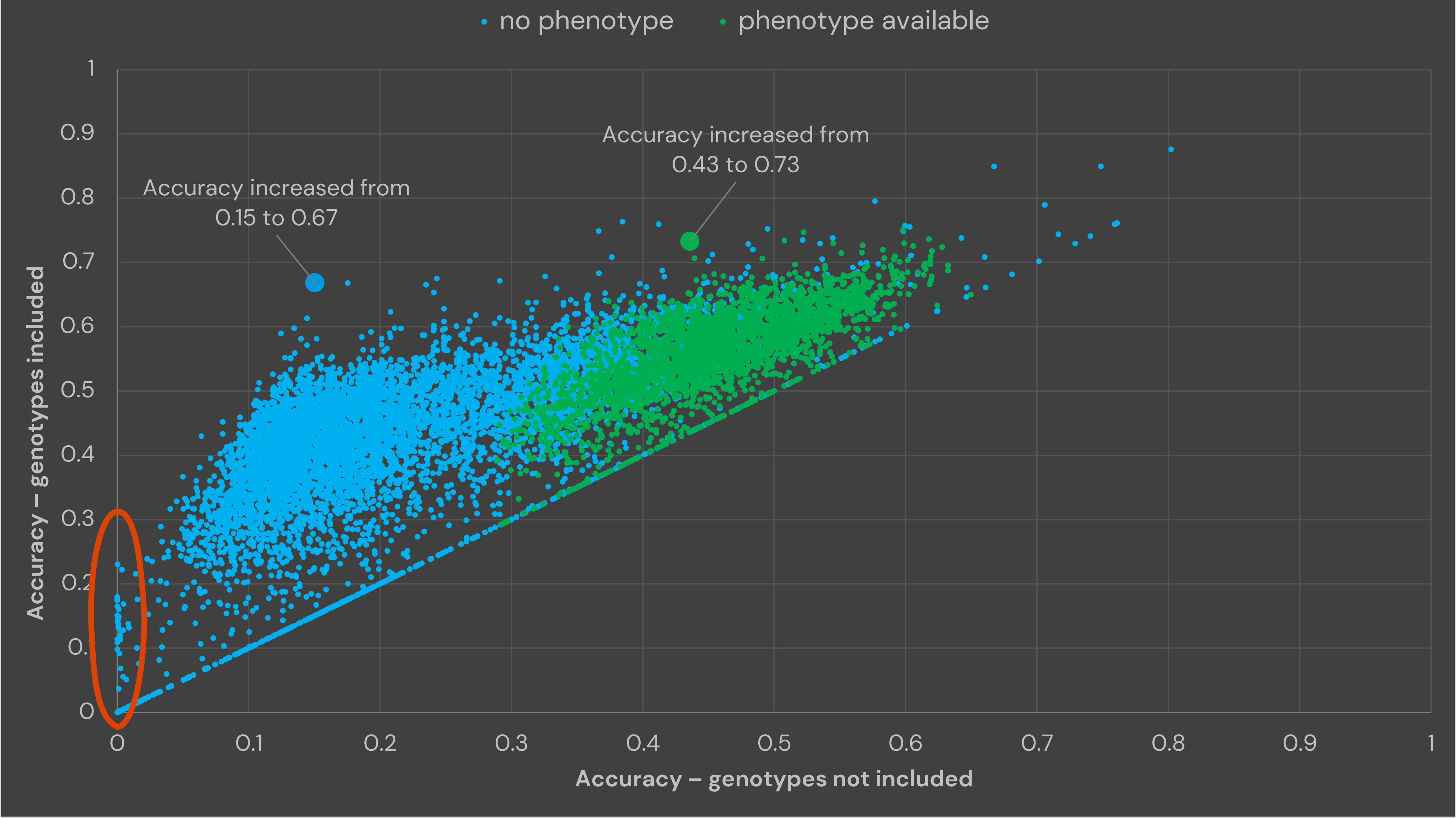

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conclusions

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- Animals without phenotypic data gain the most in EBV accuracy when genotypic information is included
- Improving both genotyping and phenotyping would enhance the accuracy of genetic evaluations

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