



Deriving genotypes of non-genotyped horses

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KWPN

- Studbook Netherlands-based, international oriented
- Breeding goal: breeding a competition horse that can perform at Grand Prix level
- 20,000 members
- 11,000 foals per year
- 4 breeding directions:
 - Jumping horses
 - Dressage horses
 - Harness horses
 - Gelders horses

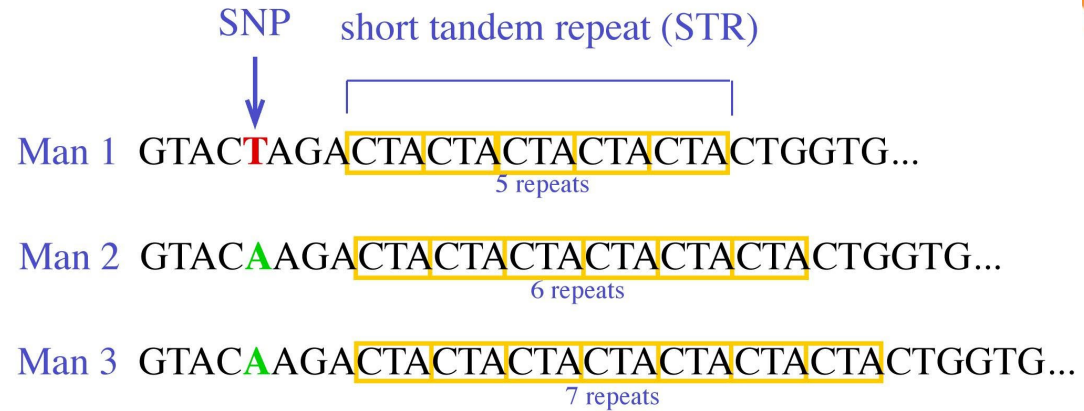


Scope

- Genotyping all live-born foals since 2019
 - Neogen: Illumina's Equine 70k SNP chip
 - Parentage verification
 - Breeding value estimation
 - Monogenic abnormalities
- Open population
 - Semen usage from competing studbooks
 - STR genotypes

STR vs SNP

- STR
 - Repeats
 - 9 mandatory markers
- SNP
 - More accurate
 - 197 SNPs



Research question

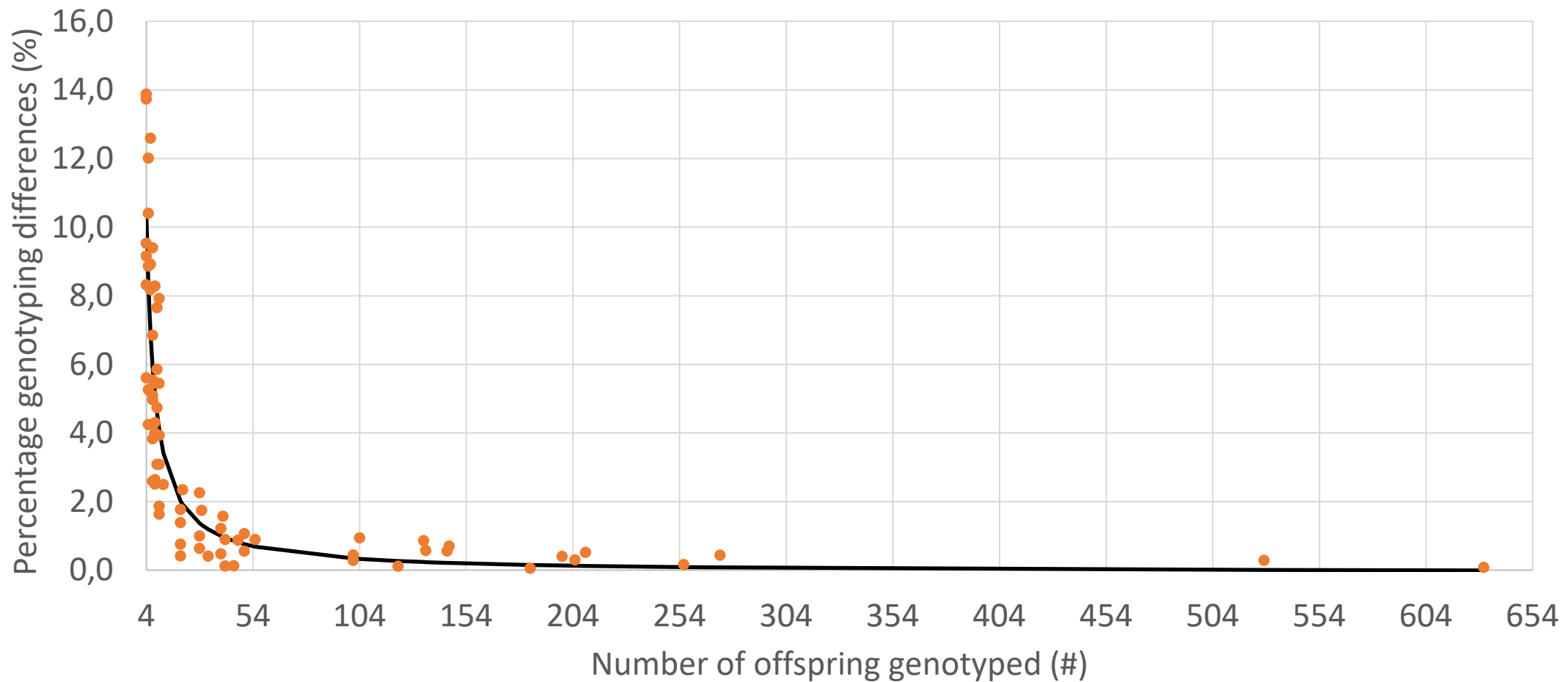
What number of genotyped offspring (NOFF), given the percentage of genotyped mates (%MG), is needed to obtain the minimum required accuracy of a derived genotype for use in further applications?

Material and methods

- FImpute (HiggsGene Solutions inc.)
 - Genotypes of sires were removed
 - Derived genotypes compared to observed ones
- 75 sires selected in wide range in terms of NOFF $\bar{x}$ =61 (4..631) and %MG $\bar{x}$ =32 (0..100)
- Criteria:
 - Call rate >95%
 - Sex chromosomes and the SNPs with a minor allele frequency < 1% were removed
 - 56256 SNPs remained
- Trait of interest: percentage of SNPs that differed between the observed and the imputed ones (%DIFF).
- For establishing the prediction equation for %DIFF, a multiple regression analysis was performed where the reciprocal of NOFF and its interaction with %MG were used as independent variables.

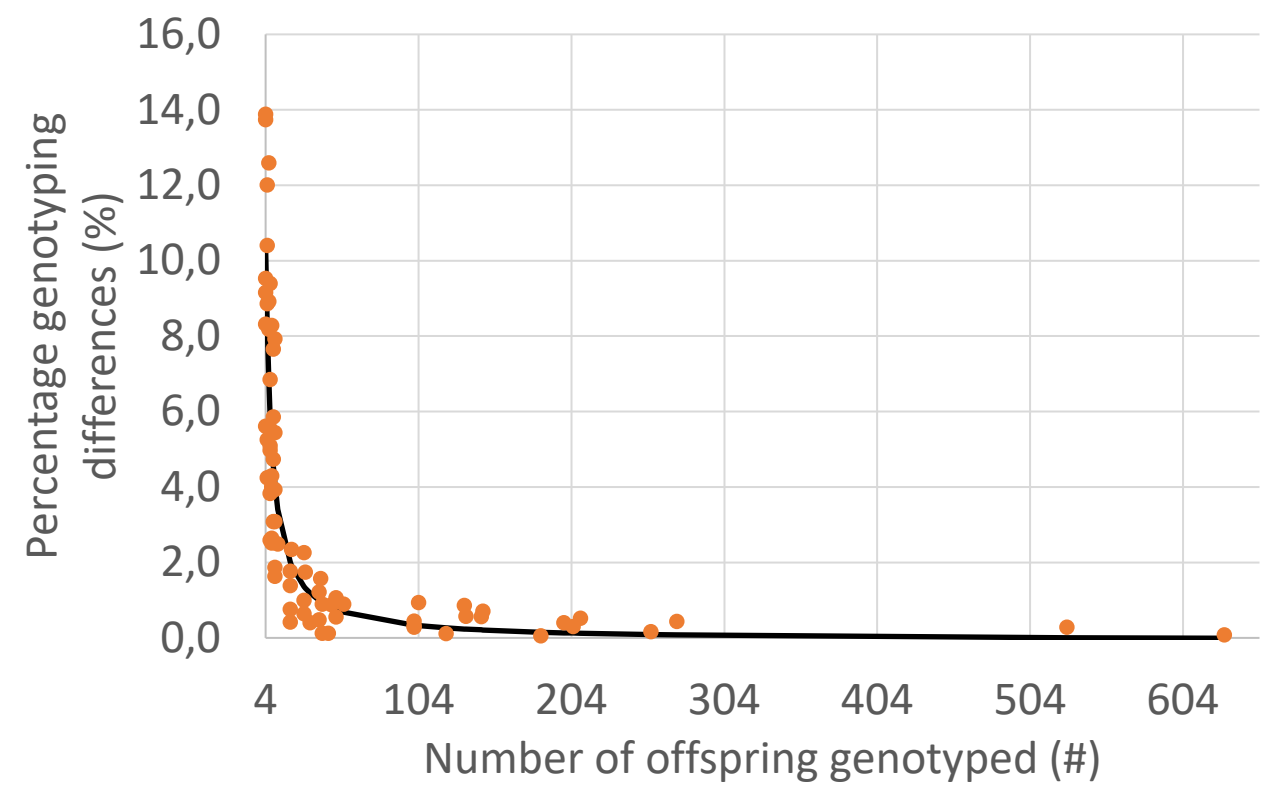
Results

- %DIFF = 0 → 50 NOFF and 100 %MG
→ 127 NOFF and 0 %MG

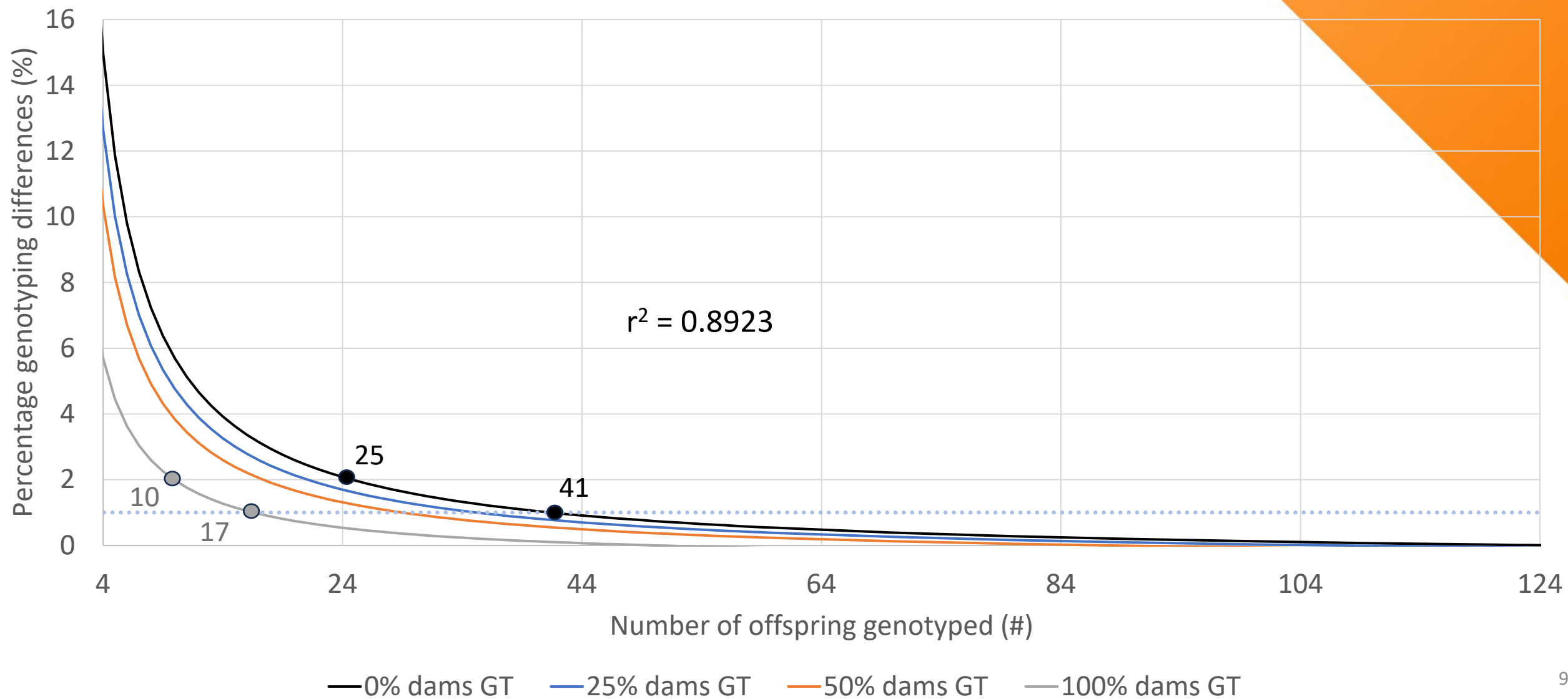


Results

- %DIFF = 0 → 50 NOFF and 100 %MG
→ 127 NOFF and 0 %MG
- The r^2 of the prediction equation was 0.89
- Both independent variables were significant ($p < 0.0001$).
- Accuracy of derived genotypes is bigger than for observed genotypes.
- %DIFF = 2 → 10 NOFF and 100 %MG
→ 25 NOFF and 0 %MG



Results



Into practice

- Sire only has STR profile
 - ~1100 foals per year are genotyped for both STR and SNP
 - Double costs
- Create routine to impute missing genotypes

Opportunities

- Parentage verification KFPS (Frisian horses)
 - Started end 2023
 - STR is needed
 - Colour traits, Hydrocephalus and Dwarfism
- Lowers the bar to switch to SNP genotyping for other studbooks



Thank you for your attention

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