



Validation of a Piétrain sire breeding program on crossbred piglets' vitality and congenital defects

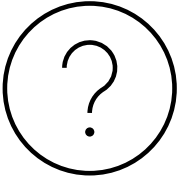
Wim Gorssen, C. Winters, R. Meyermans, L. Chapard, K. Hooyberghs, J. Depuydt, S. Janssens and N. Buys

Session 22 "Innovation in pig genetics"



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Background



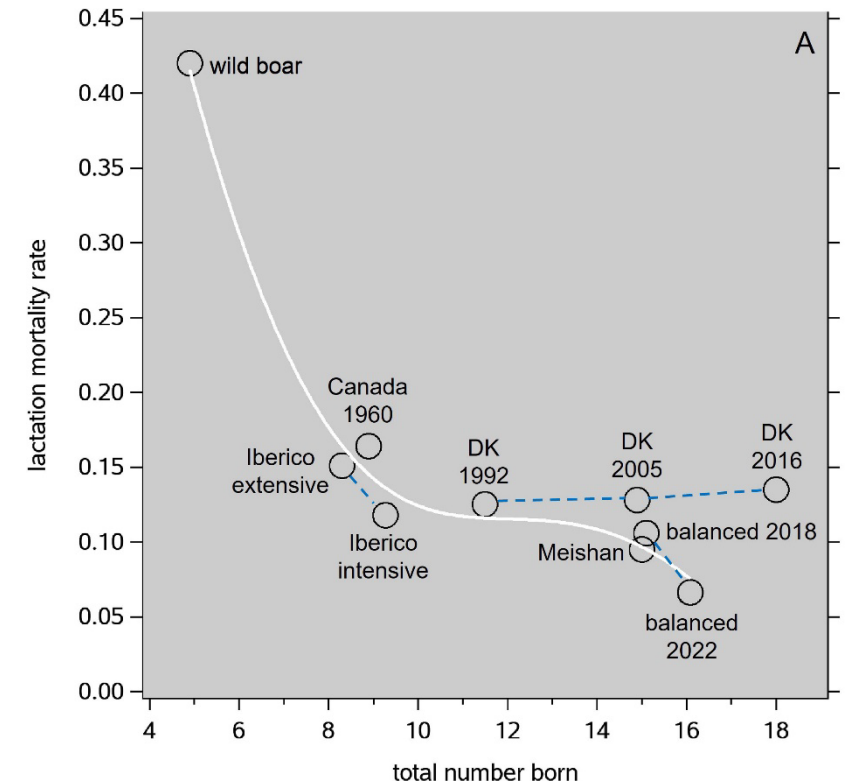
Balanced breeding to improve piglet vitality in sow populations

- Break negative genetic relationship between litter size and mortality

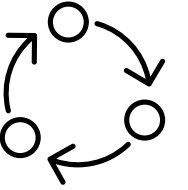
Congenital defects have prevalence of 1-3%

- Link with mortality

Less weight on these traits in paternal pig breeding programs



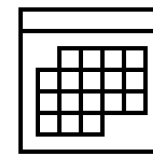
Research objectives



Validation of a Piétrain sire breeding program on crossbred piglets' vitality and congenital defects from 2019 → 2024

1. Genetic parameters
2. Phenotypic evolutions
3. Validation of findings with independent dataset

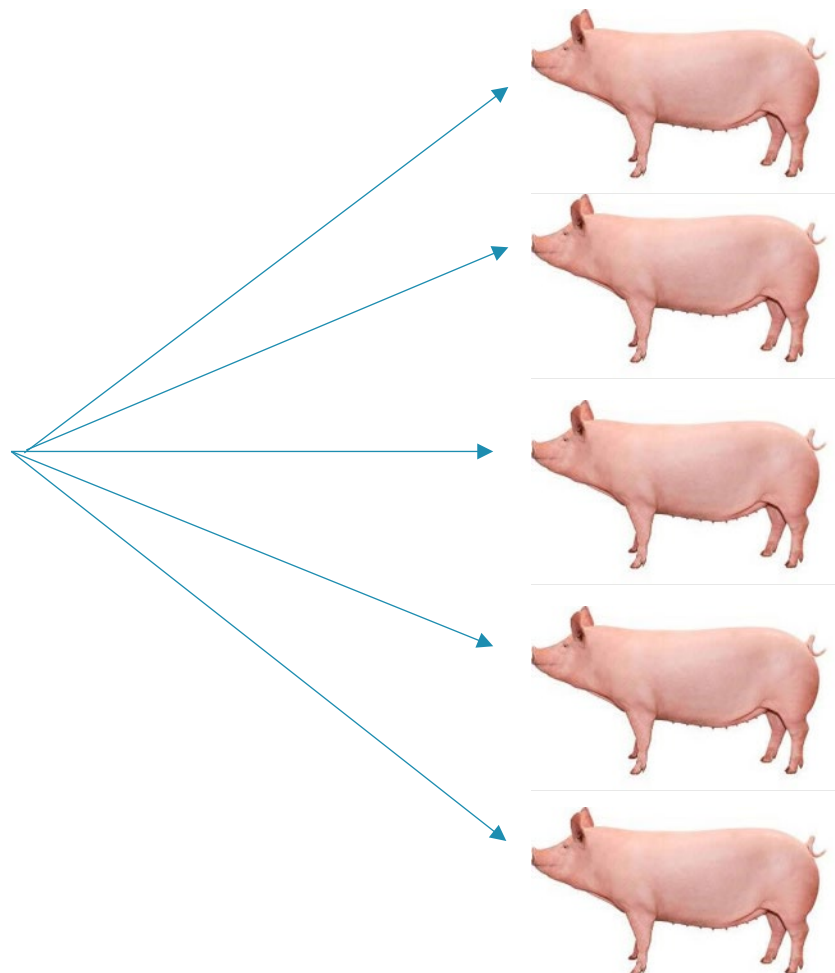
Progeny testing scheme Flanders (Belgium)



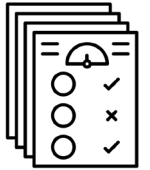
Commercial sows inseminated

- VPF: ~5 sows/boar, ~300 boars/year
- ILVO: ~12 sows/boar, ~80 boars/year

Boars genotyped (50K SNP chip)



Crossbred litters scored by farmers



Vitality

- Vitality score from 1 (low) to 5 (high)

Reproductive capacity and mortality

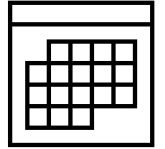
- Number piglets born alive, stillborn, weaned
- Pre-weaning mortality

Congenital defects

- Splay legs
- Scrotal hernias



Dataset



419 common boars in both datasets

Ongoing data collection, started in 2015

Trait	N records
Scored litters	17,390
Scored litters with pre-weaning mortality	14,715
Scored litters with congenital defects	12,225
Piétrain sires	2,025
Genotyped sires	1,317
Hybrid sows	4,831
Farms	4



Methods



5-trait sire-dam genetic model via remlf90 software:

$$y = Xb + Za + Yd + Wc + e$$

Sire effect (a) with pedigree and genotypes

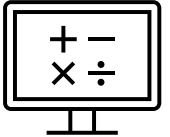
Dam effect (d) with pedigree

Fixed effects (b)

- Parity
- Farm
- Gestation length
- Litter size
- Weaning age

Common sow group effect (c)

Genetic parameters

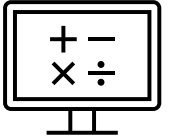


Low heritability estimates (5,2 to 15,6%)

Substantial maternal effects

	Heritability	Variance explained by dam	Variance explained by common sow group
Vitality score	8.1% (2.0)	10.6% (0.9)	2.9% (0.5)
Scrotal hernia	12.2% (2.4)	7.1% (0.8)	1.6% (0.4)
Splayleg	15.6% (2.3)	10.6% (0.8)	1.4% (0.4)
Pre-weaning mortality	11.8% (1.9)	17.0% (0.9)	2.3% (0.4)
Number stillborn	5.2% (1.2)	17.9% (0.8)	3.3% (0.3)

Genetic correlations

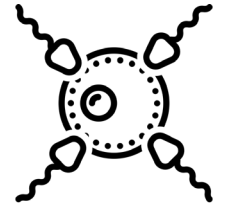


Favorable correlation between vitality scores, splaylegs and pre-weaning mortality

Positive correlation between vitality scores and scrotal hernias?

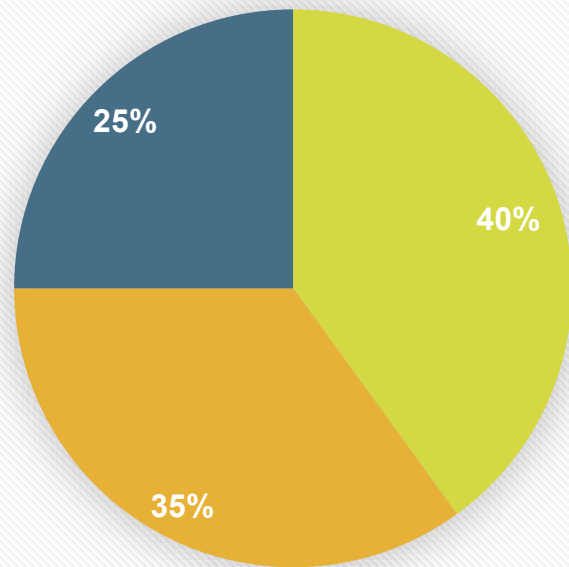
Trait	Scrotal hernia	Splayleg	Pre-weaning mortality	Number stillborn
Vitality score	0.31 (0.20)	-0.59 (0.14)	-0.52 (0.14)	-0.17 (0.23)
Scrotal hernia		0.05 (0.16)	-0.05 (0.16)	0.06 (0.25)
Splayleg			0.43 (0.13)	-0.23 (0.18)
Pre-weaning mortality				0.24 (0.18)

Breeding program VPF



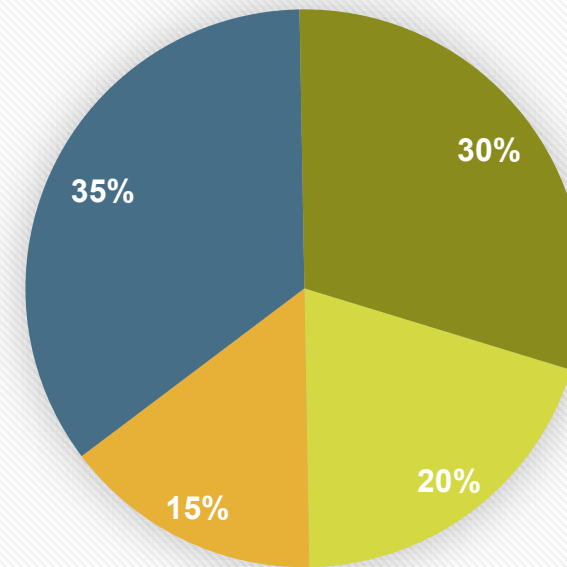
Farrowing house index introduced in 2019, updated in 2024

Index until 2024



■ Splaylegs ■ Scrotal Hernia ■ Vitality score

Index from 2024



■ Splaylegs ■ Scrotal Hernia ■ Vitality score ■ Prewearing Mortality

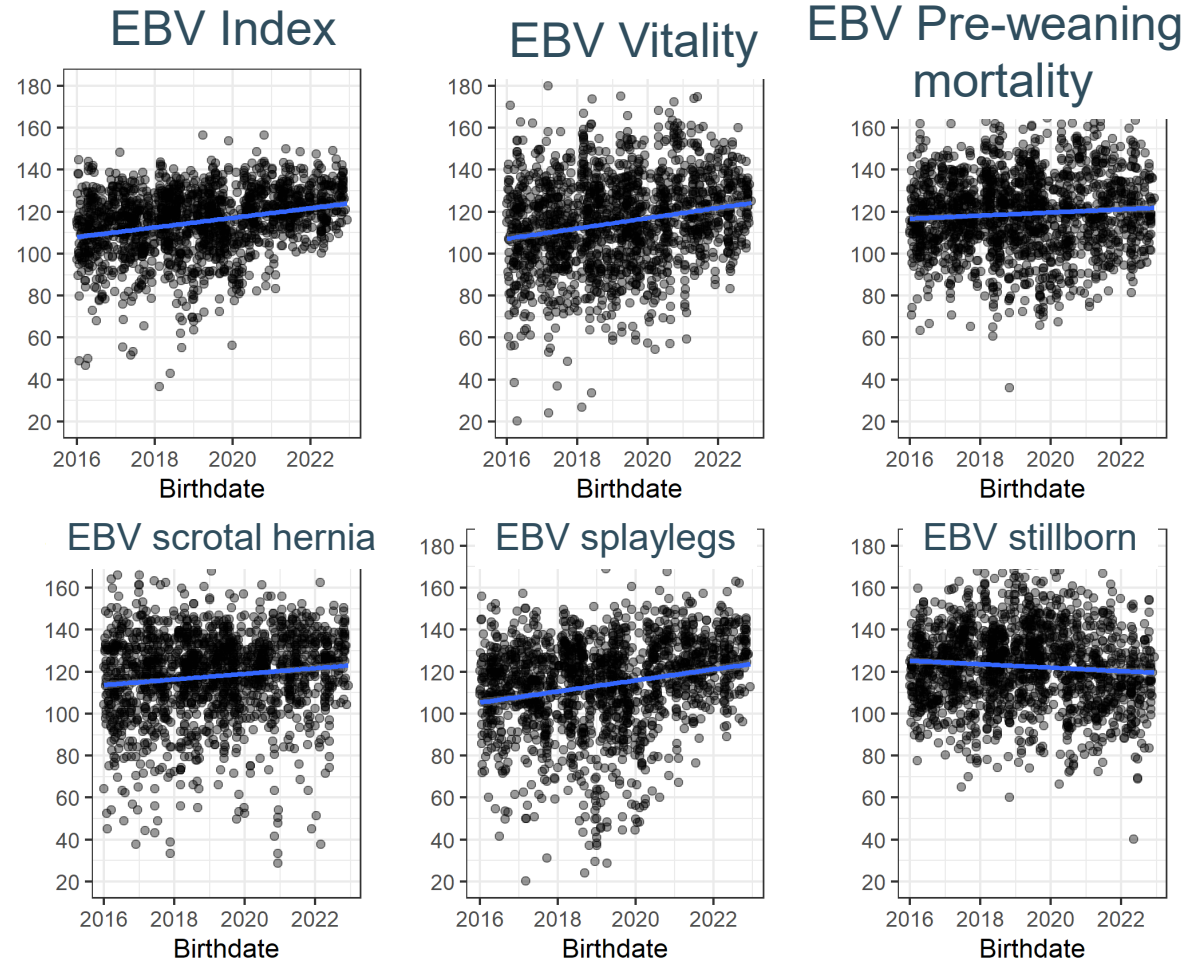
Favorable evolution in EBVs progeny tested sires



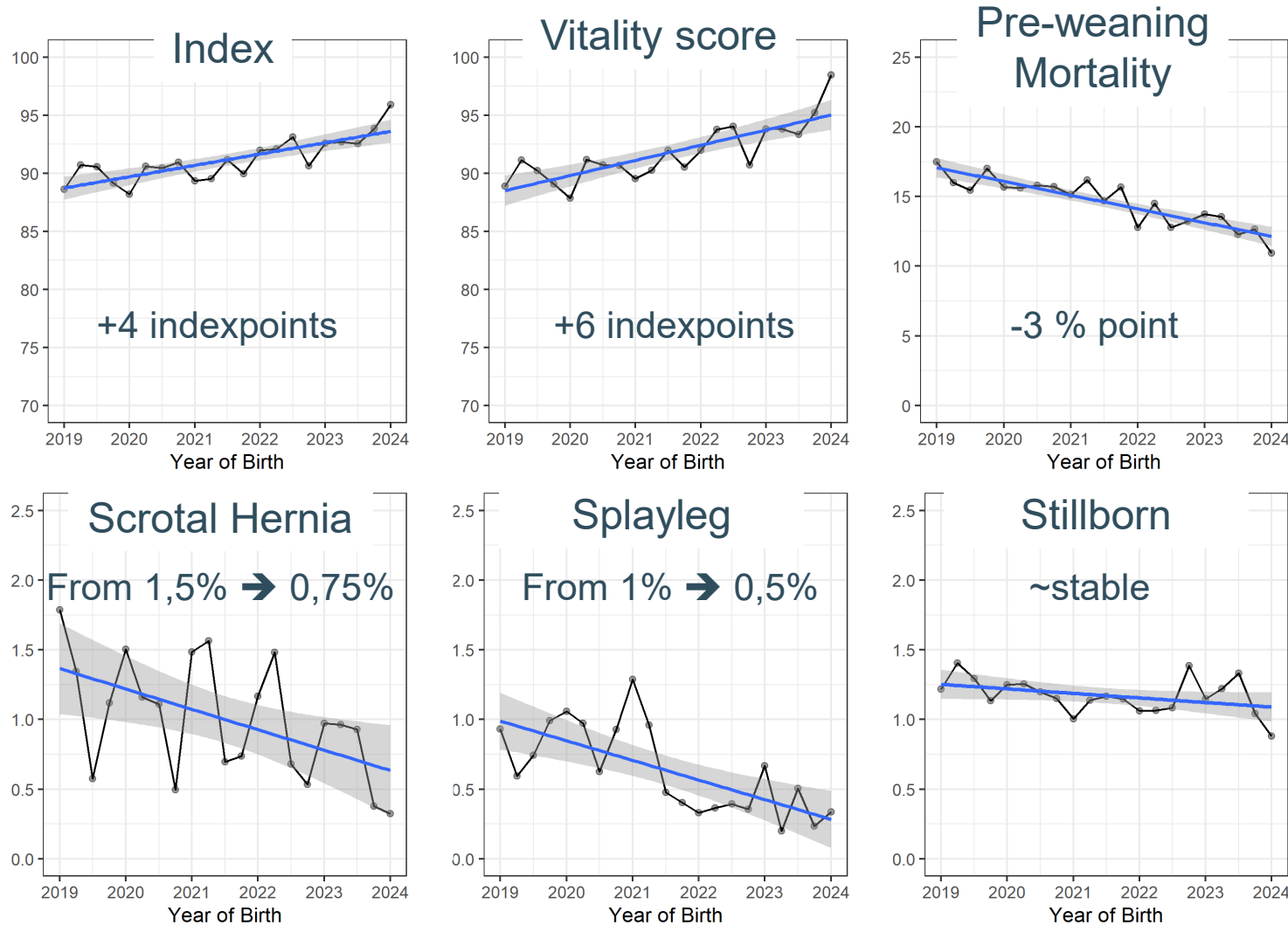
Little evolution in pre-weaning mortality

- only recently included

Negative outliers decreasing



Favorable phenotypic evolutions!



Validation with independent dataset



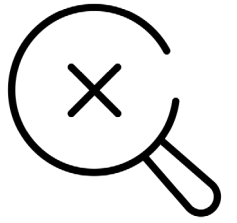
Pre-weaning mortality and splaylegs highest correlations

- Translatable from one environment to another

➔ Paternal Piétrain breeding program can improve vitality and decrease congenital defects in crossbred piglets!

	Phenotypical correlation mean phenotype	Genetic correlation
Index	0.18	0.39
Vitality score	0.12	0.14
Scrotal hernia	0.10	0.44
Splayleg	0.28	0.84
Pre-weaning mortality	0.13	0.59
Number stillborn	0.00	0.27

Limitations of the current study



Purebred-crossbred genetic correlation?

Simultaneous improvements in dam genetics and/or management?

Phenotypes recorded by farmers at litter level

- Phenotyping accuracy?
- Added value of individual records?

Findings translatable to non-intensive (organic) systems?

Take-home message



A paternal Piétrain breeding program can be effective in improving crossbred piglets' vitality and decreasing congenital defects!

- Heritability of 5-16%
- Favorable evolutions in time
- Validation with independent dataset

Phenotype and include these traits as well in paternal pig breeding lines!

Acknowledgments

- Data providers



- Funding



Grant ID: 1104320N

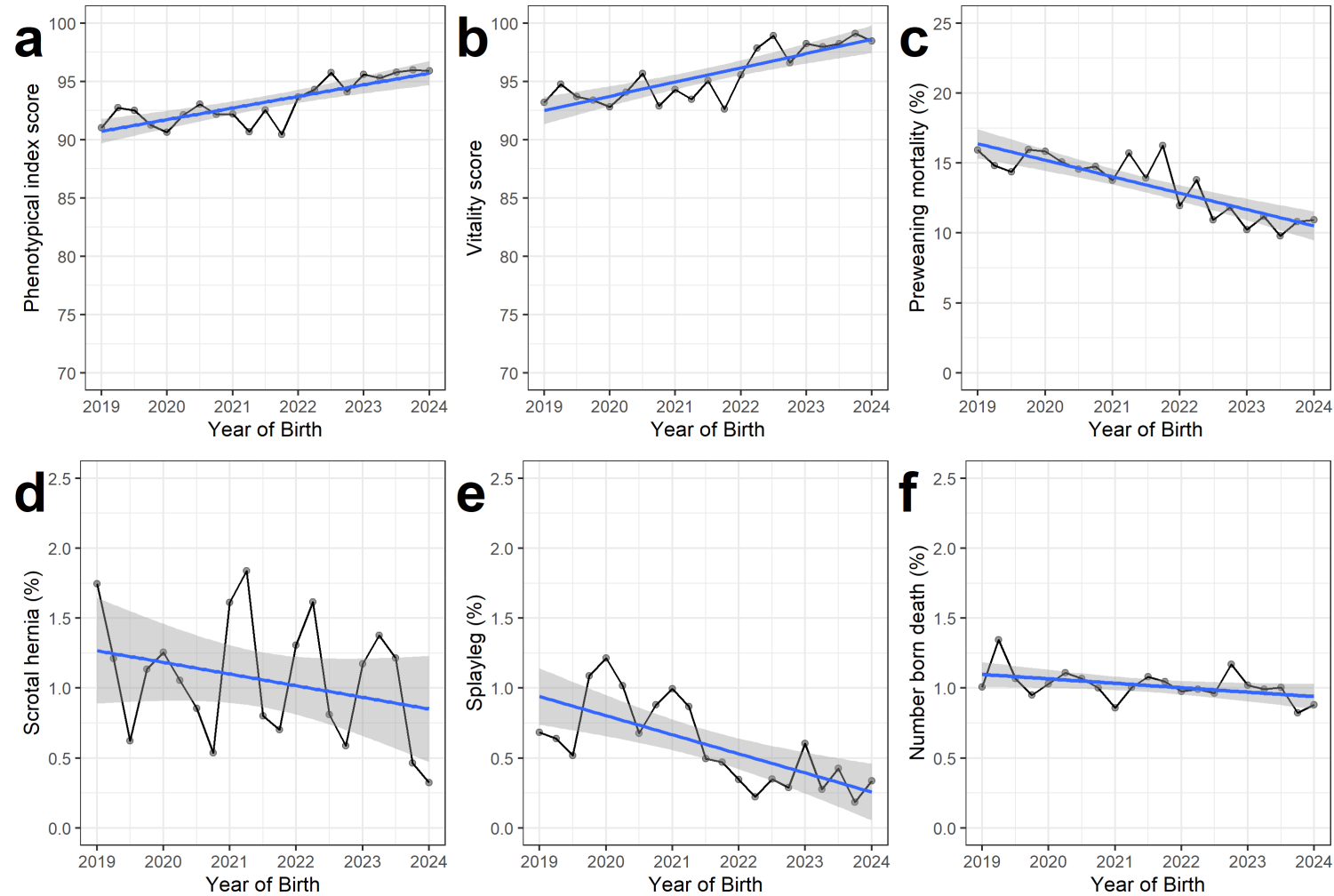
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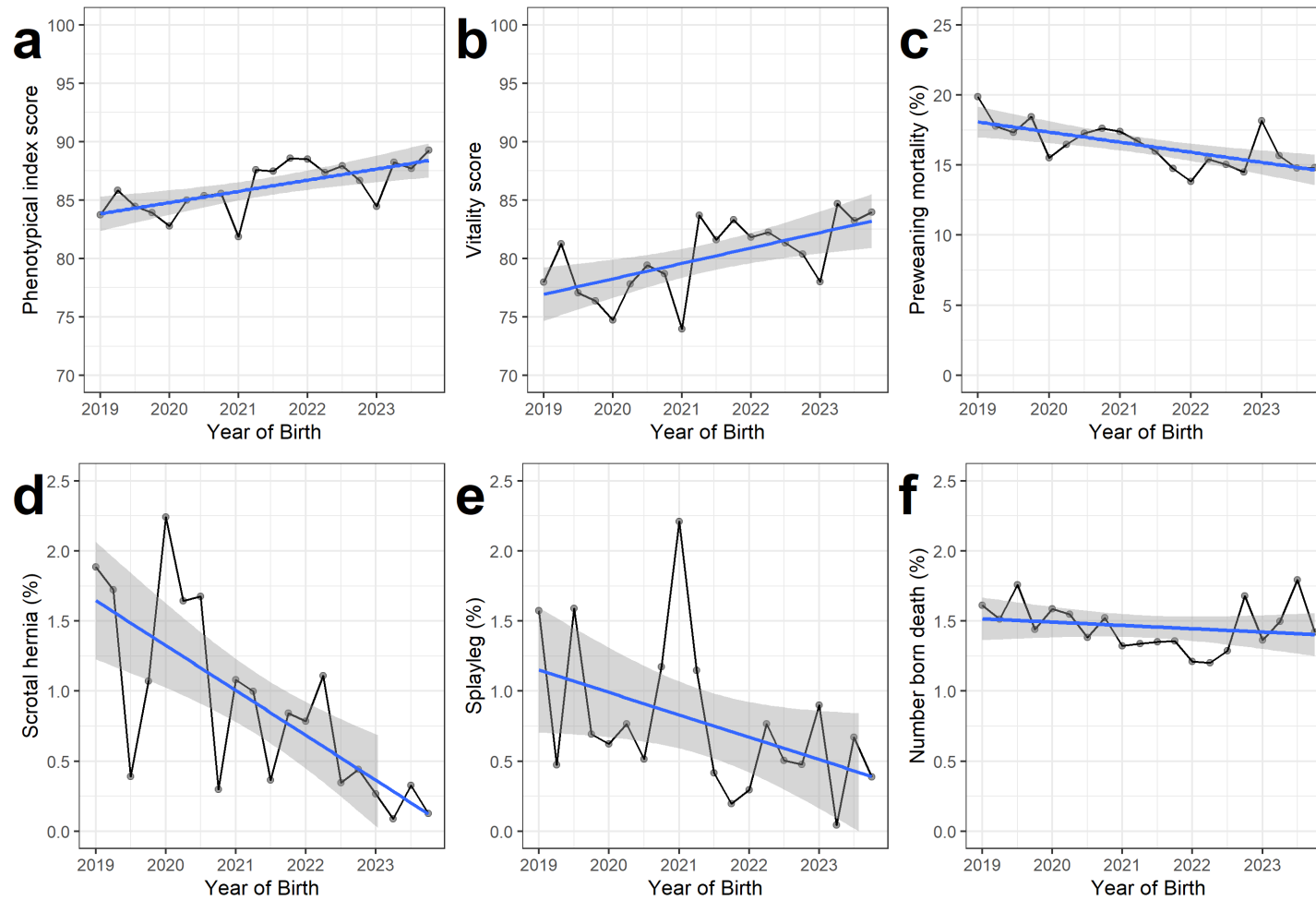
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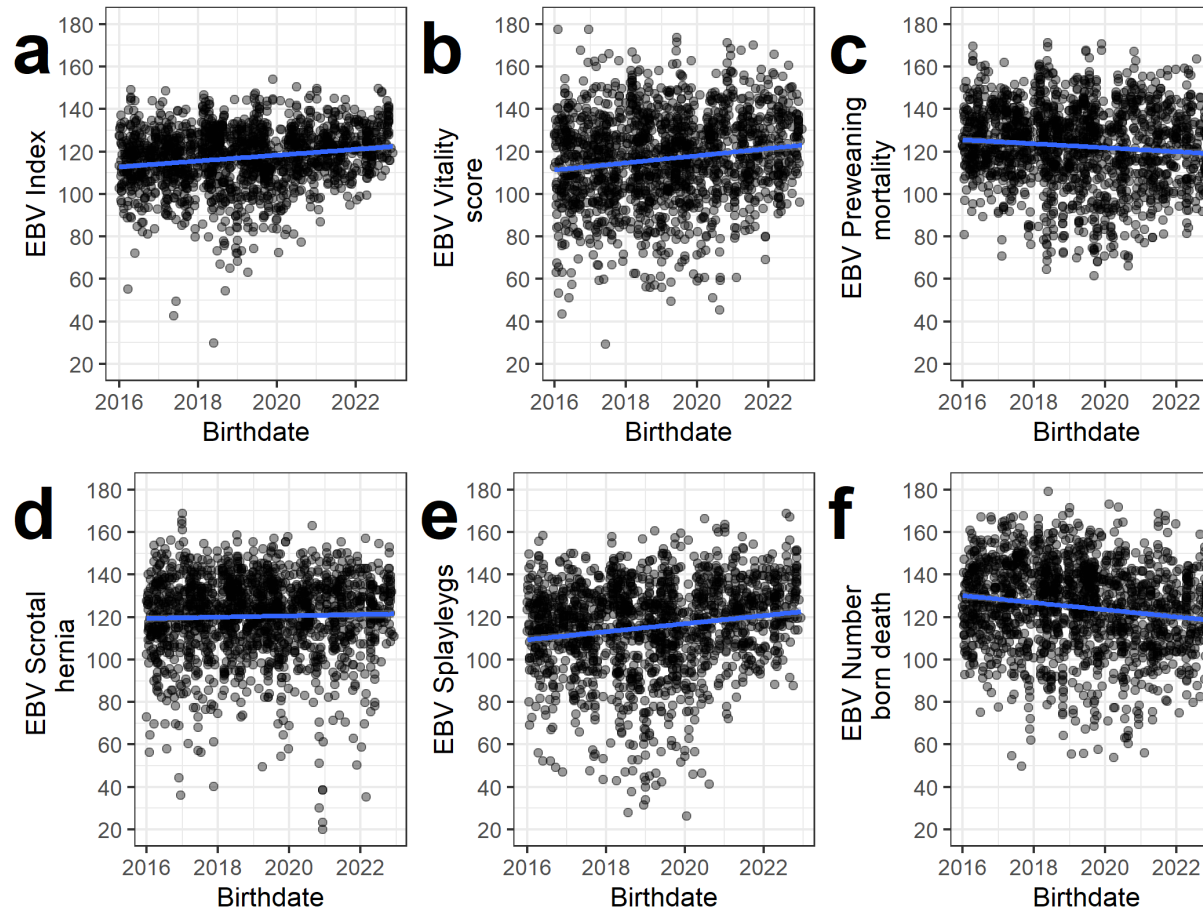
Phenotypic evolutions VPF only



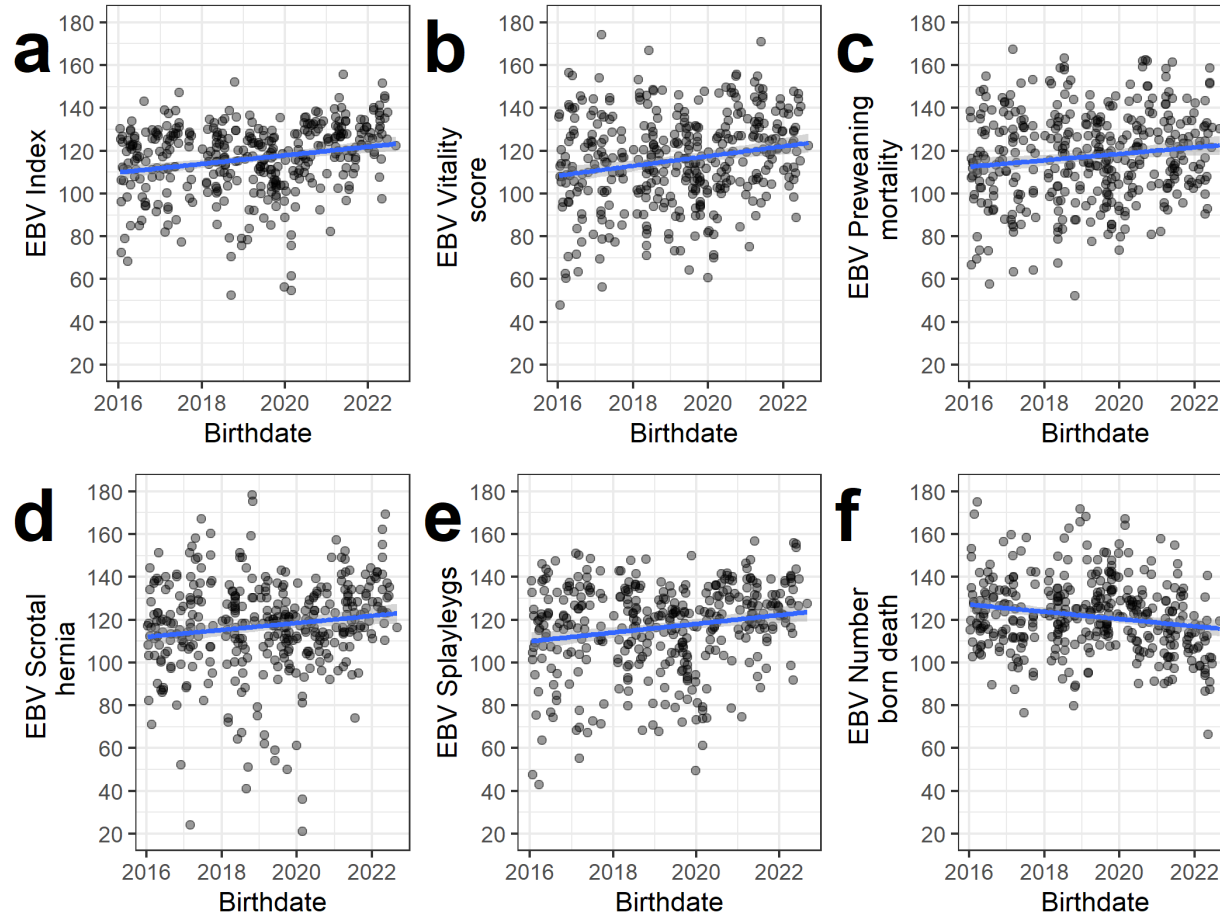
Phenotypic evolutions ILVO only



EBV evolutions VPF only



EBV evolutions ILVO only





The 75th EAAP Annual Meeting

1/5 September 2024 - Florence, Italy

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