Variance adjustments and Mendelian Sampling tests

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INTERBULL TECHNICAL WORKSHOP, AUG 26, 2018

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Topics

- Quick review of variance adjustment methods
- Traits using variance adjustments in USA
- Examples of breed-sex-traits not passing Mendelian Sampling variance test
- Review of USA results for MS variance test
- Comparison of new vs. previous MS test software

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Variance adjustment methods

- Simple scaling such as mature equivalent (phenotypic mean and SD are proportional by age)
- Pre-adjustment for phenotypic and / or genetic var
  - Time group, breed, region, herd, heritability
- Simultaneous variance adjustments within model
- Nonlinear (threshold) models for categorical data

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References on variance adjustment

- Kendrick, 1941. Standardizing Dairy Herd Improvement Records in Proving Sires. Bureau of Dairy Ind. Mimeo. Circ. 925.
- Gianola and Foulley, 1983, Harville and Mee, 1984
- Wiggans and VanRaden, 1991
  - $y^* = \mu + (y - \mu)\ \sigma_{base} / \sigma_{herd.year}$
- Meuwissen et al., 1996, Gengler et al., 1999

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Adjustment of U.S. traits

Trait group	Adjusted since:	Variance adjustment method
Production	1941	Mature equivalent (multiplicative)
Production	1992	Pre-adjust for herd variance
Somatic cell score	2009	Pre-adjust for herd variance
Calving traits	1985	Sire-MGS threshold model
Conformation (minor breeds)	1998	Adjusted in model until 2016, now pre-adjusted for better convergence
Cow livability	2016	Pre-adjust
Health traits	????	Pre-adjustments being tested

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Example of USA test results

- 60 breed-sex-trait tests conducted, 53 tests passed
  - 5 breeds x 8 traits for males, 4 traits for females
- Variance adjustments designed to stabilize cow MS:
  - HOL MS trend tests: -0.1 milk, +0.1 fat, -0.7 protein
- But a few bull trends exceeded the +-2.0 limit
  - HOL bull tests: +2.5 milk, +1.3 fat, +1.2 protein
- Why the difference? Perhaps bull preselection

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MS trends outside limits

Breed	Sex	Trait	Adjusted Trait?	MS trend limit	MS trend	Failed[1] original	Failed[1] revised
HOL	Male	milk	Yes	+-2.0	2.5	1	n/a
HOL	Male	int	No	+-2.0	2.1	0	2
JER	Male	fat	Yes	+-2.0	2.2	0	0
BSW	Male	scs	Yes	+-2.0	-2.9	0	n/a
RDC	Female	milk	Yes	+-2.0	-3.4	0	5
RDC	Female	pro	Yes	+-2.0	-2.9	0	5
RDC	Female	scs	Yes	+-2.0	-2.2	0	1

[1]Number of individual year tests that failed. For HOL milk the last year deviated from the trend.

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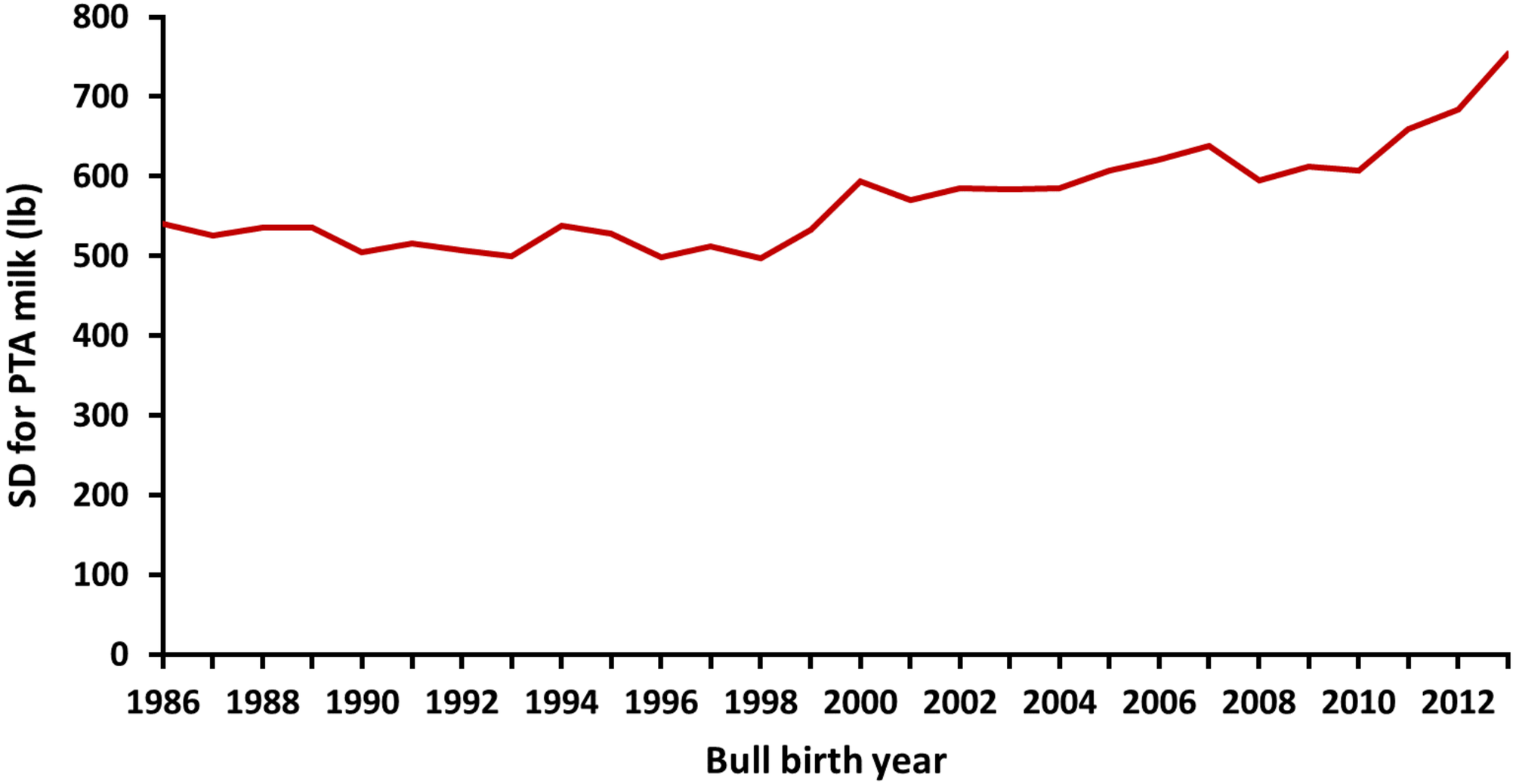
Interbull verify output for bull SD (U.S. HOL milk yield)



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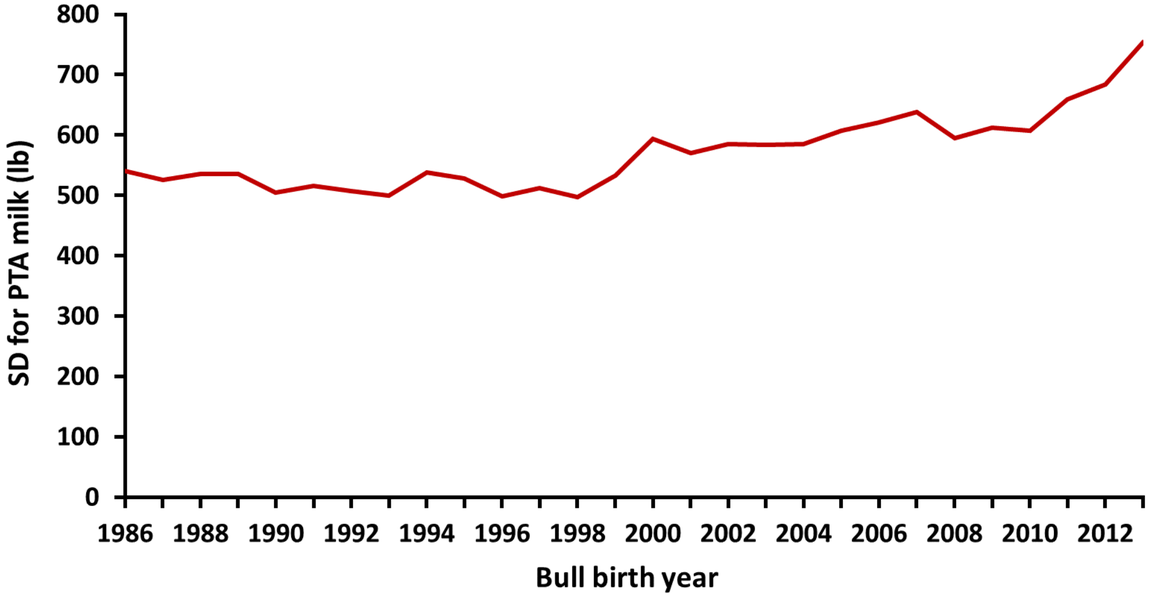
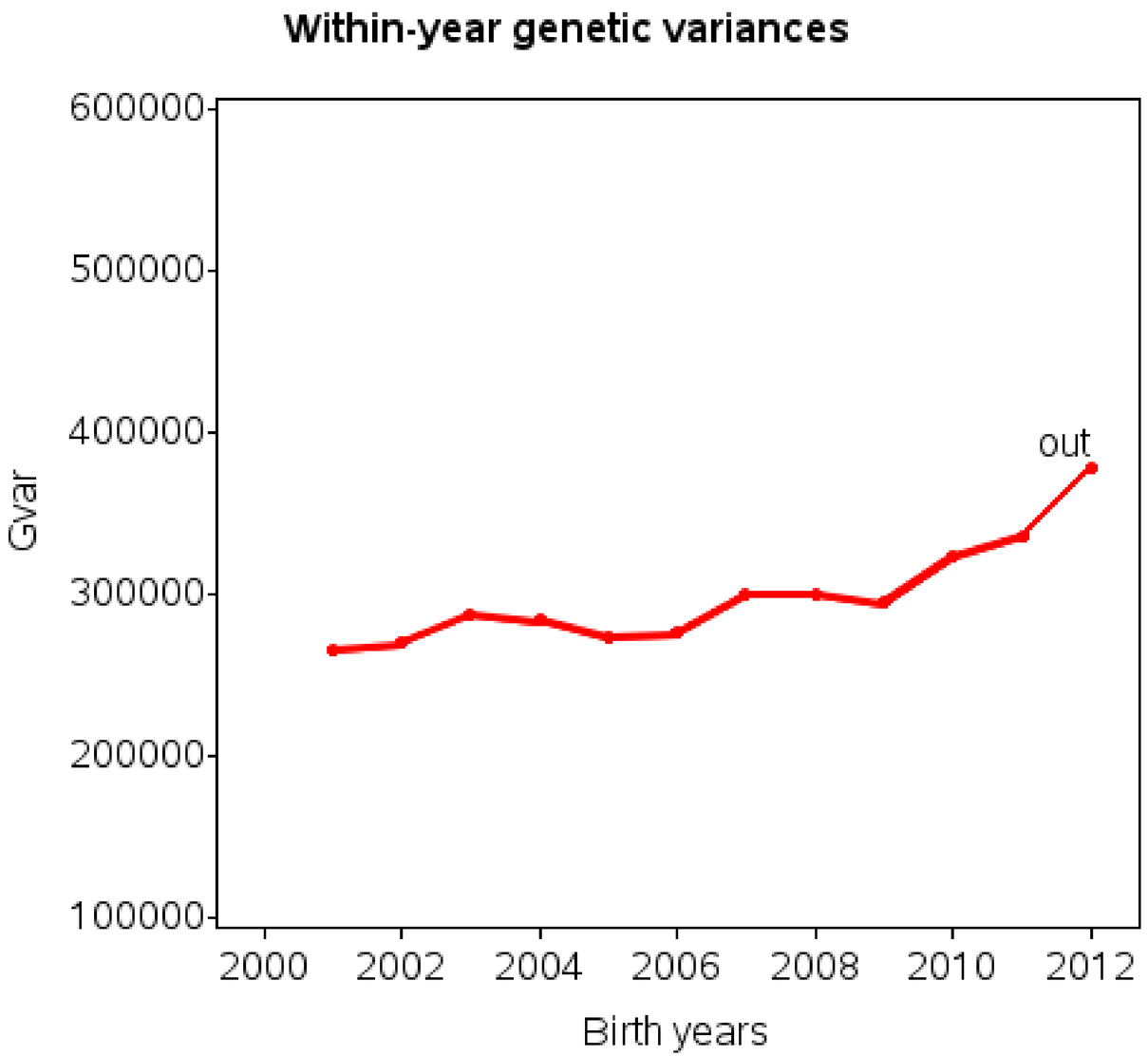
Interbull Verify vs. MS validation (U.S. HOL milk yield)





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Conclusions

- About 10% of USA breed-sex-trait tests failed
- All but 1 were for variance-adjusted traits
- Difficult to change bull variance if cow variance OK
- RDC testing is difficult because of crossbreeding
- Computation was reasonable even for HOL cows
- Individual year tests are better in the new version

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Acknowledgments

- Mel Tooker
- Tyrisevä *et al* provided the software
- U.S. dairy data providers

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