Faculty of Agricultural and Nutritional Science

Christian-Albrechts-University Kiel
Institute of Animal Breeding and Husbandry

Using meat inspection data to improve pig health traits by breeding

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Session 40: Various topics in pig production
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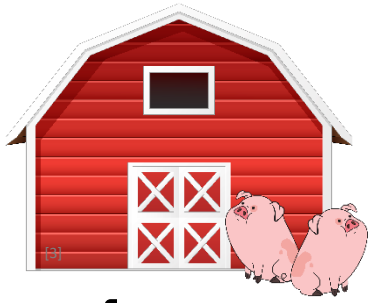
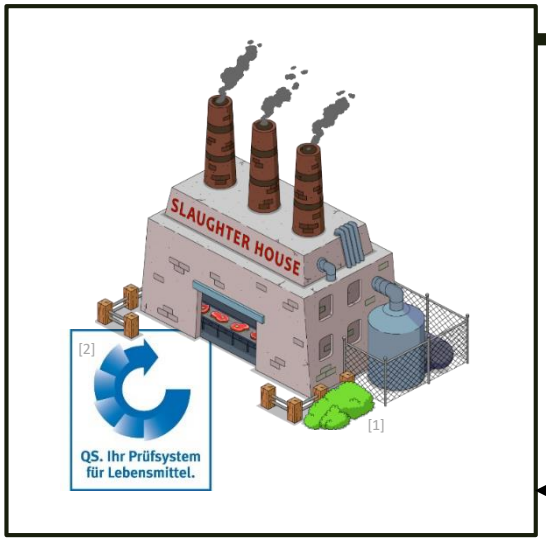
Meat inspection data

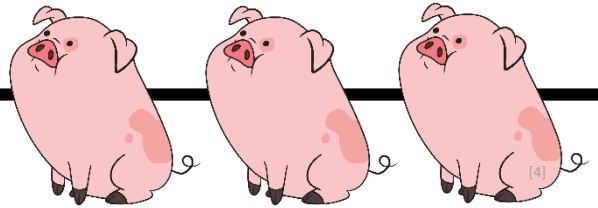
Current data-flow of recorded lesions

Feedback of recorded lesions
(German regulation AVV LmH)

Farm
Farmer & Veterinarian







Quality of data recording

Meat inspector

Alban et al. 2015
Bonde et al. 2010
Eckhardt et al. 2009

Abattoir

Stärk et al. 2014
Thomas-Bachli et al. 2012
Cleveland-Nielsen et al. 2002

Season

Scollo et al. 2017
Thomas-Bachli et al. 2012
Elbers et al. 1992

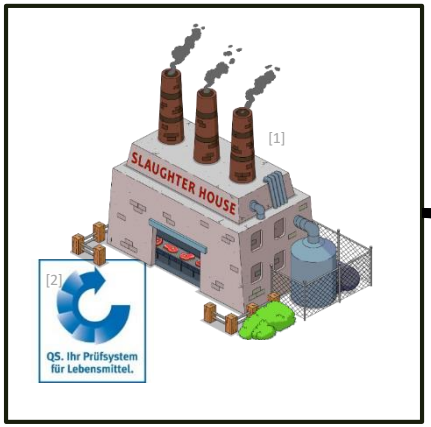
Farm

Ebke & Sundrum 2005
Bonde et al. 2010
Kongsted & Sørensen 2017

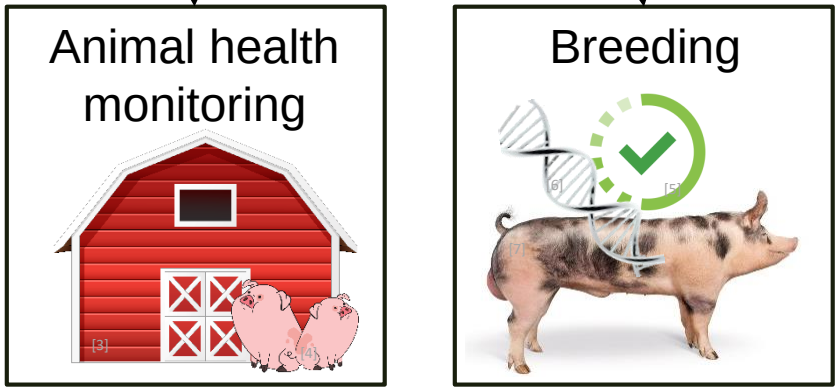
Variation **within** the abattoir

Variation **between** abattoirs

Study aim



How big are the differences between abattoirs actually?



Data

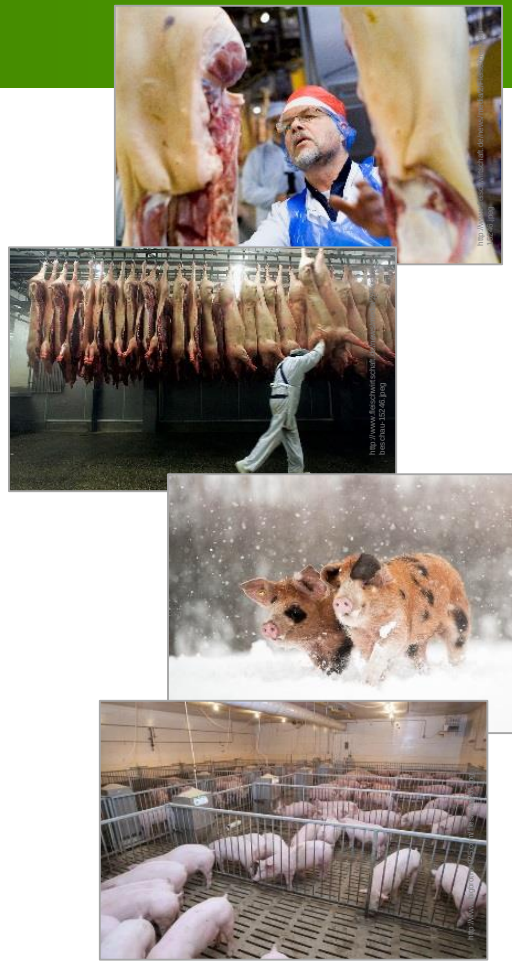
- Lesion recordings from German QS-Database
- Considered organs: **Lung, pleura, liver, heart**
  - Recording of lung and pleura: no/mild/ moderate/severe lesion (4 levels) summarized to lesion yes/no (2 levels)
  - Documentation code of all organs: 0/1
- Data period: 18 months
  - Subdivision into half-year periods (S1, S2, S3)
- Excluding of abattoirs from dataset, if…
  - Incomplete documentation
  - Sample size per abattoir < 1 million
  - Overall prevalence of an organ is 0 or >80%

Data structure

- Temporary sample size >29 million observations
- Modeling abattoir-specific effects
  - ➢ Problems in converting the model
  - ➢ Even though high data density available
  - ➢ Many factor-levels arise from the considering effects in the model

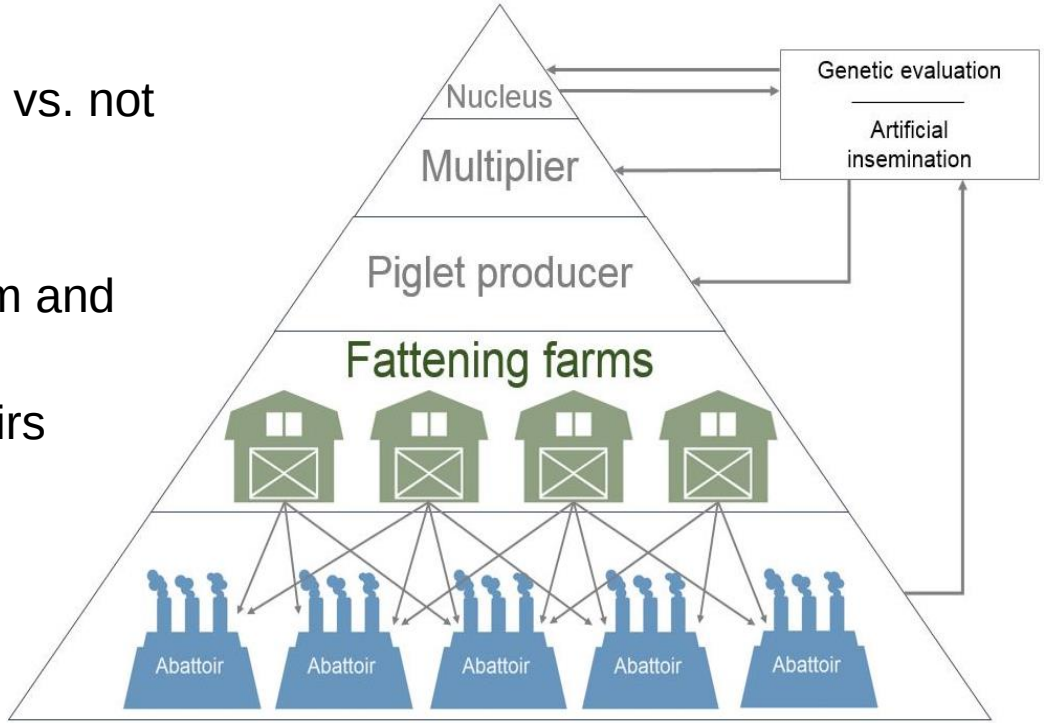
→ Many data-gaps with solely containing 0/1!

→ Low data-link between farm and abattoirs



Improving data structure

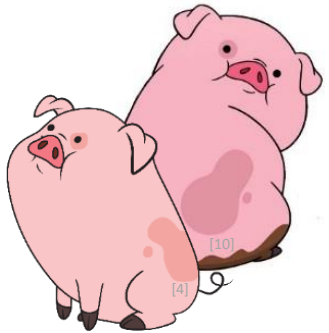
- Pragmatic approach is data filter
- Conflict: Improving data structure vs. not loosing too many observations
- Applied data filter
  - ➢ 40 animals minimum per farm and slaughter day
  - ➢ Delivery per farm to 2 abattoirs minimum
  - ➢ Minimum 6 deliveries per farm and half-year period



- Final sample size of dataset:
  9 abattoirs, >8 million observations

Statistical analysis

- Calculation of daily and half-year prevalence of each abattoir (SAS 9.4)
- LSMeans from generalized, linear, mixed model (R-packet lme4)
  - Applied on single animal data (binary data – 0/1)
  - Fix effect: abattoir (A1, A2, …, A9)
  - Random effects: farm and slaughter day (nested in abattoir)
  - Link function= logit



Statistical analysis

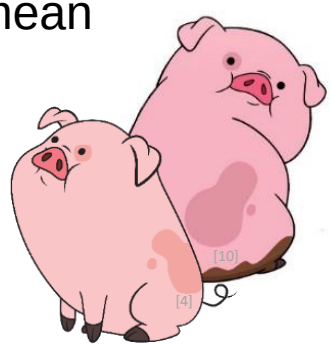
Comparability of abattoirs

Currently no reference available or determinable (e.g. equivalence testing)

- How to justify determination?

Grand mean test of significance

- Which abattoirs differ significantly from reference value?
- Reference value: Weighted grand mean of data
- Using 90%-CI to test difference between abattoir and grand mean
- Graphic illustration of each abattoirs contrast to grand mean

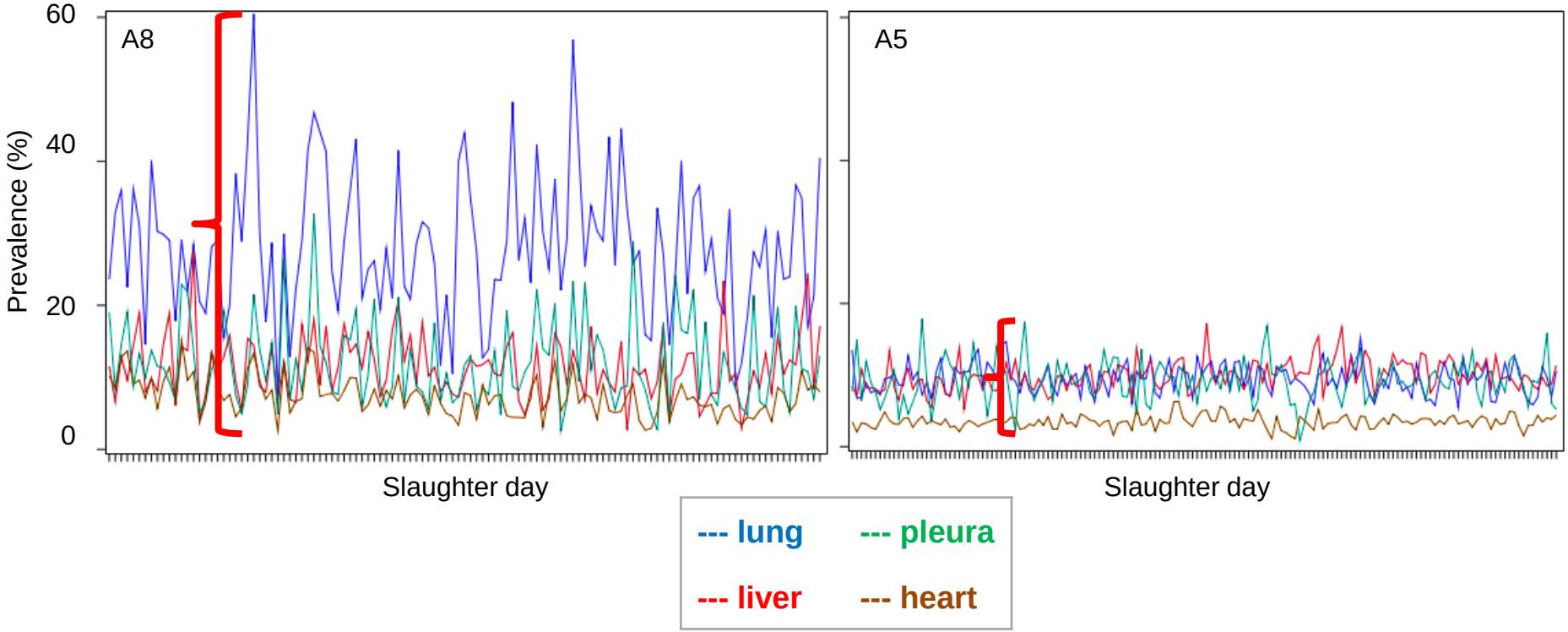


[10]

[4]

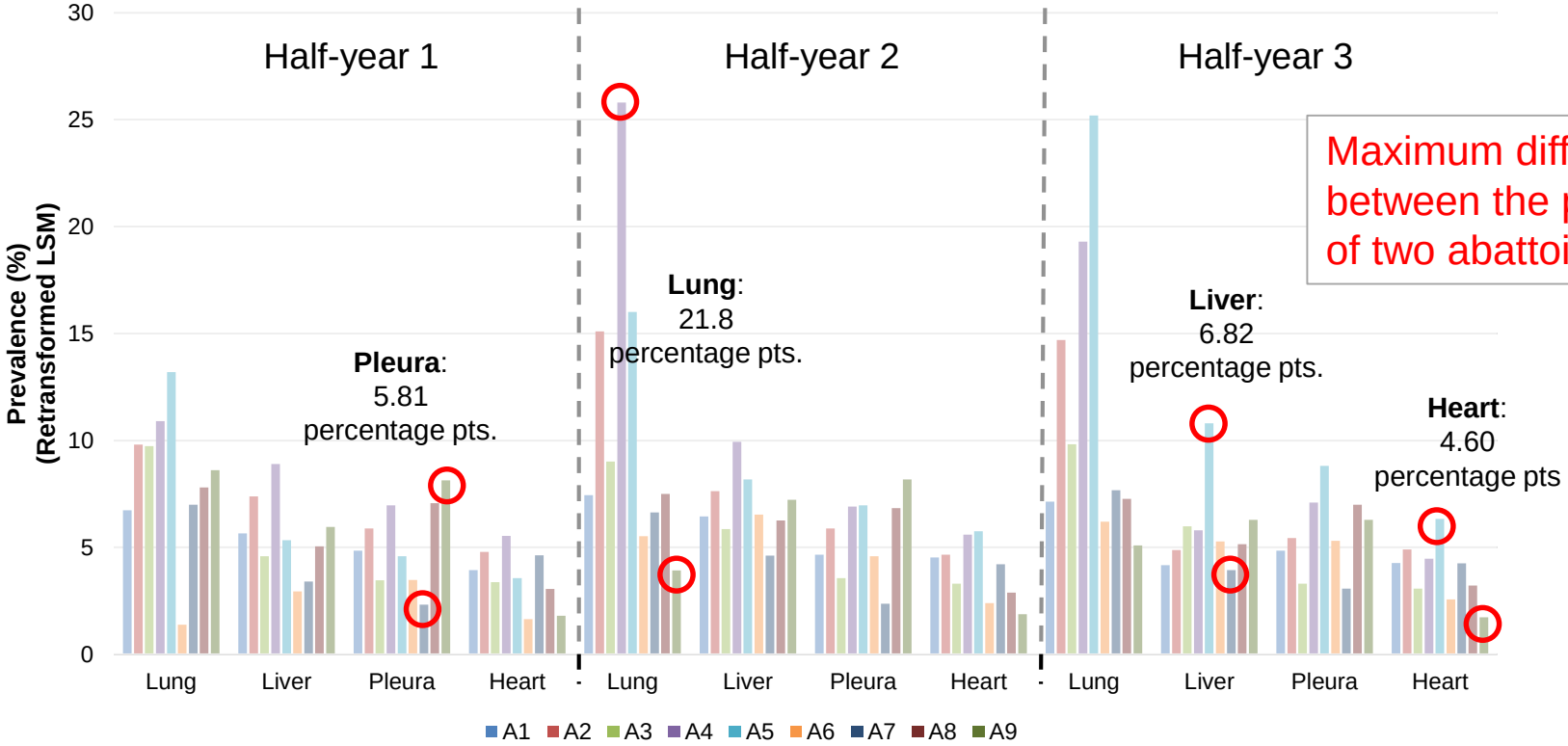
Results & Discussion

Differences in recorded lesions of selected abattoirs based on daily prevalence (%)



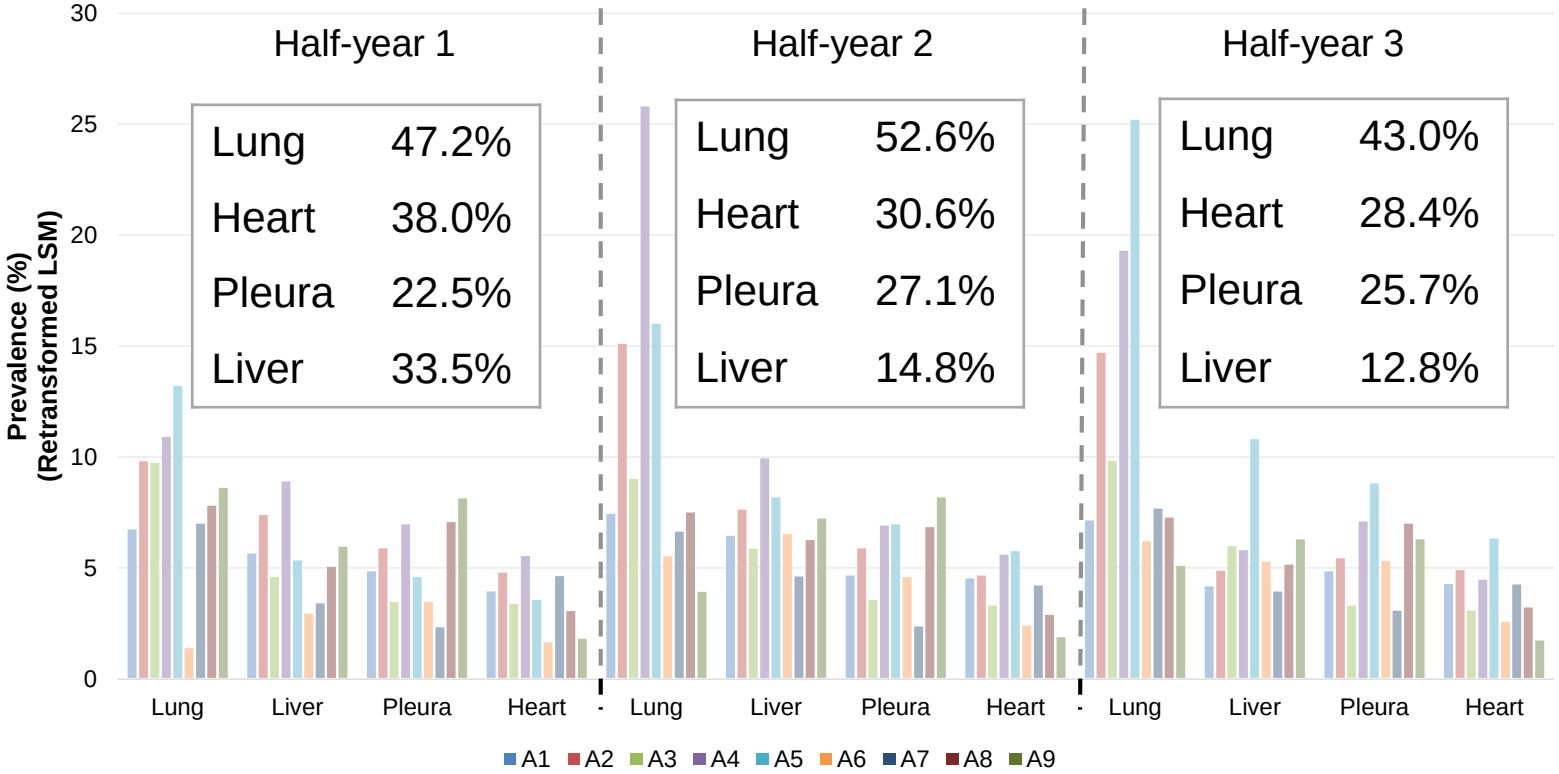
Results & Discussion

Retransformed LSMeans of half-year prevalence (%) of all abattoirs



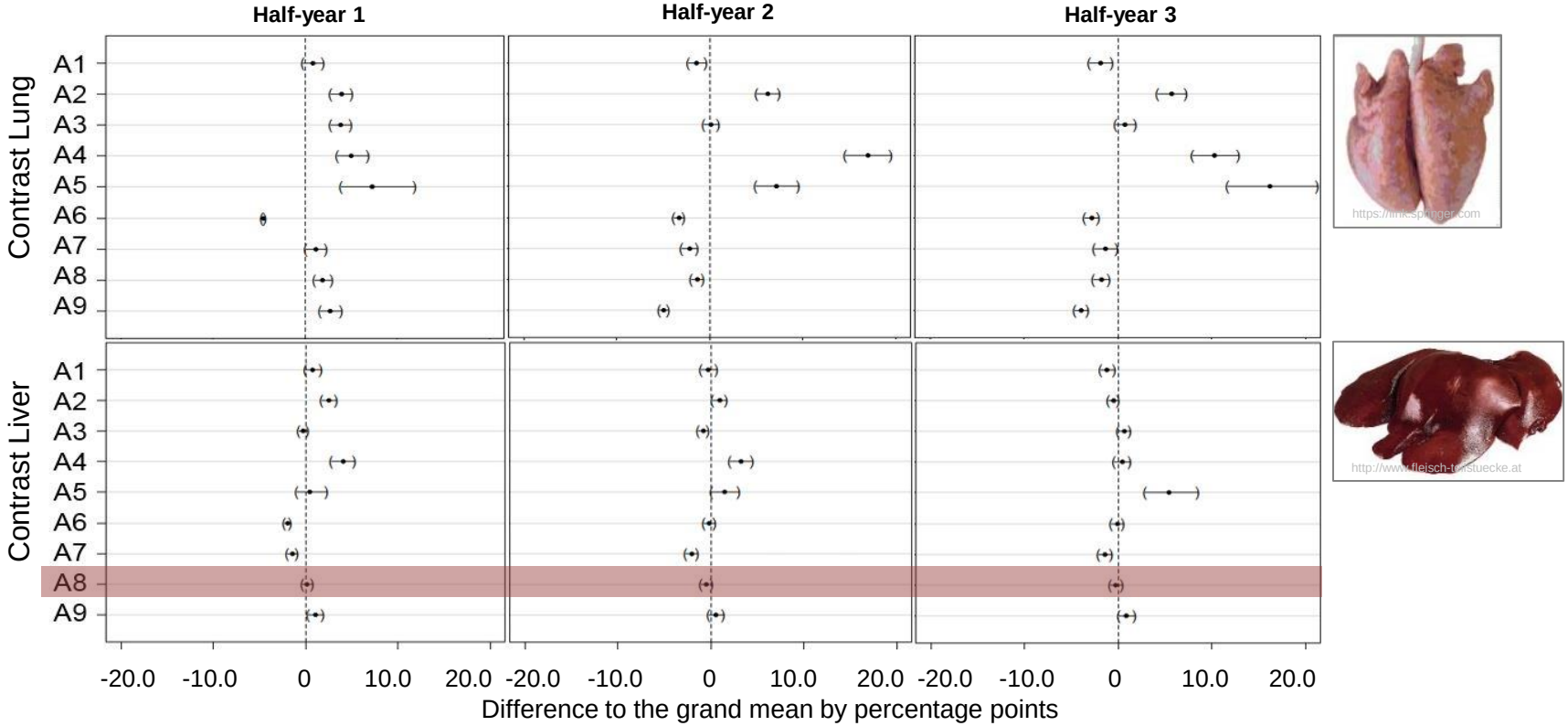
Results & Discussion

Variance (%) of the recording of all abattoirs within half-year



Results & Discussion

Grand mean test of significance of lung and liver prevalence



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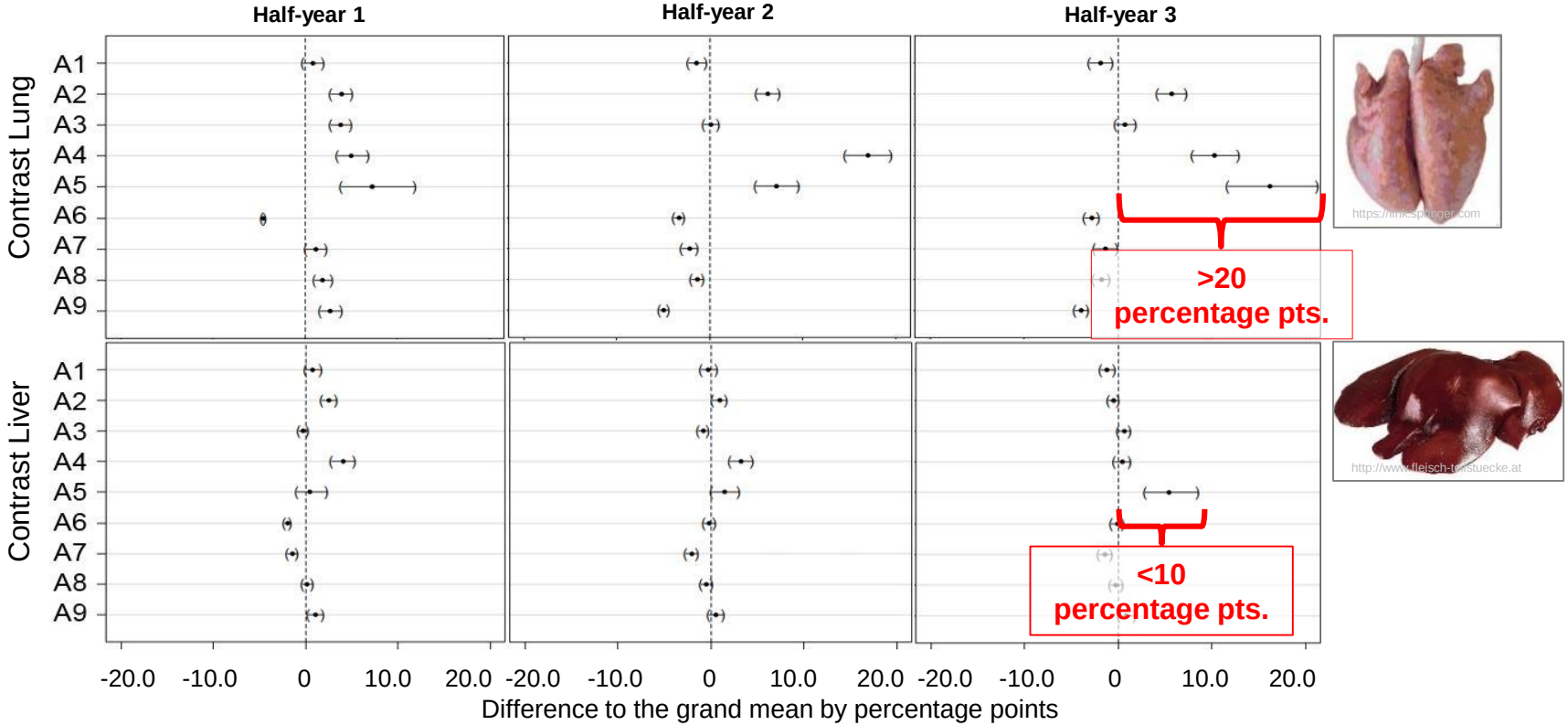

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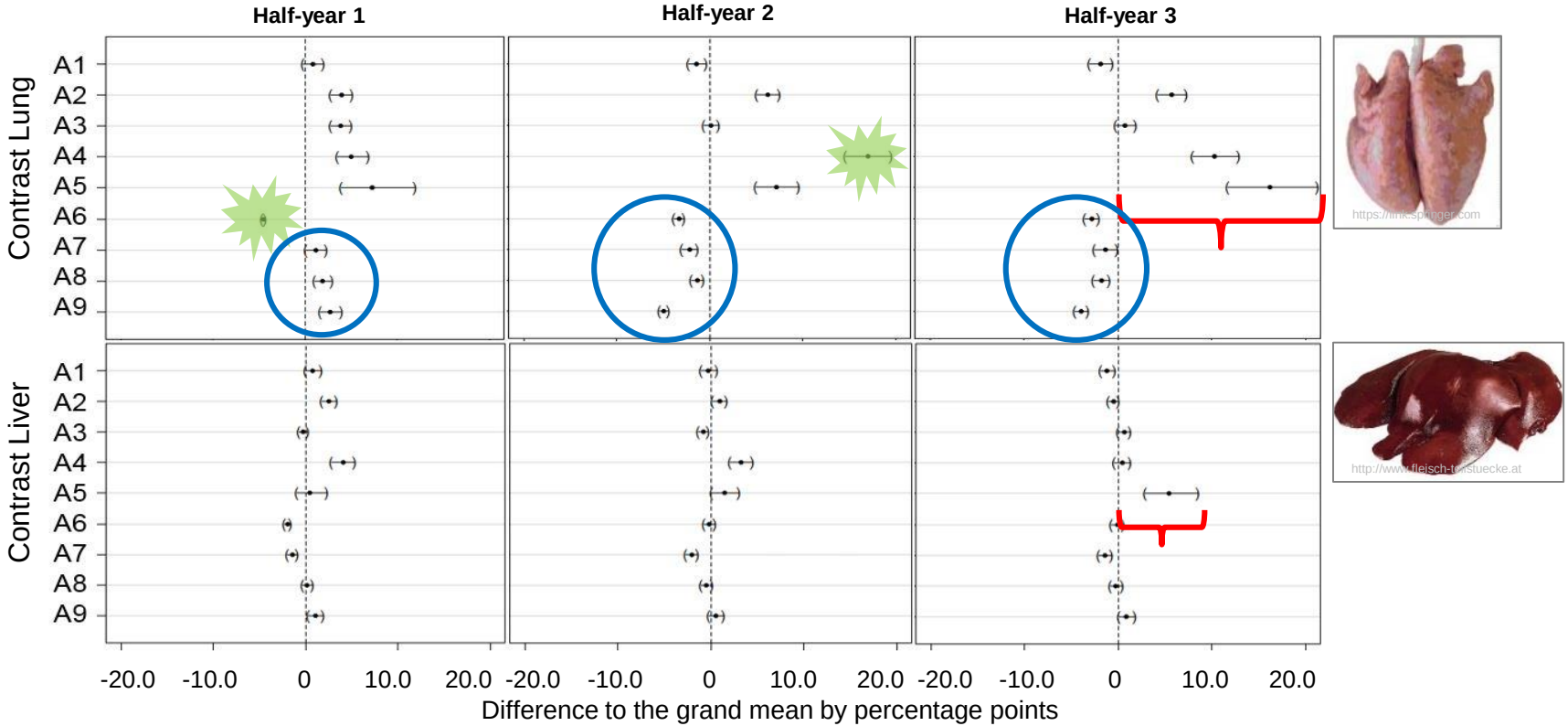
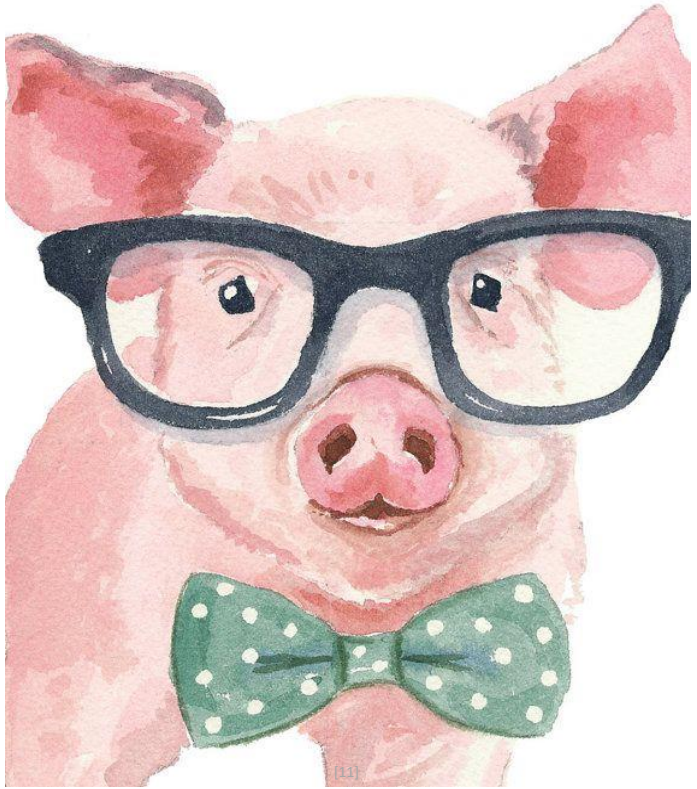


Conclusion & Outlook

- Big differences within and between abattoirs
- Visualizing differences
  - ➢ Determining reference value
  - ➢ Using grand mean of the data
- Comparability between abattoirs
  - ➢ Training measures at national level
  - ➢ Auxiliary statistical approach: Improving data connection between farm and abattoir
- Animal health monitoring and/or breeding purposes
  - ➢ Establishing to what proportion lesions are affected by on-farm management and which lesions are modifiable by breeding (h^2)?

Thank you for your attention!



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H. W. Schaumann Stiftung

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[1] https://imgbin.com/png/Wwm54gd0/the-simpsons-tapped-out-lunchlady-doris-sideshow-bob-lunch-lady-slaughterhouse-png
[2] https://pictures.attention-ngn.com/portal/30/44718/logo/1479368778.6125_3_o.jpg
[3] https://www.kisspng.com/png-pig-farm-cartoon-barn-695649/
[4] https://www.pngocean.com/gratis-png-clipart-enbah
[5] https://www.kisspng.com/png-computer-icons-progress-bar-desktop-wallpaper-symb-1396499/download-png.html
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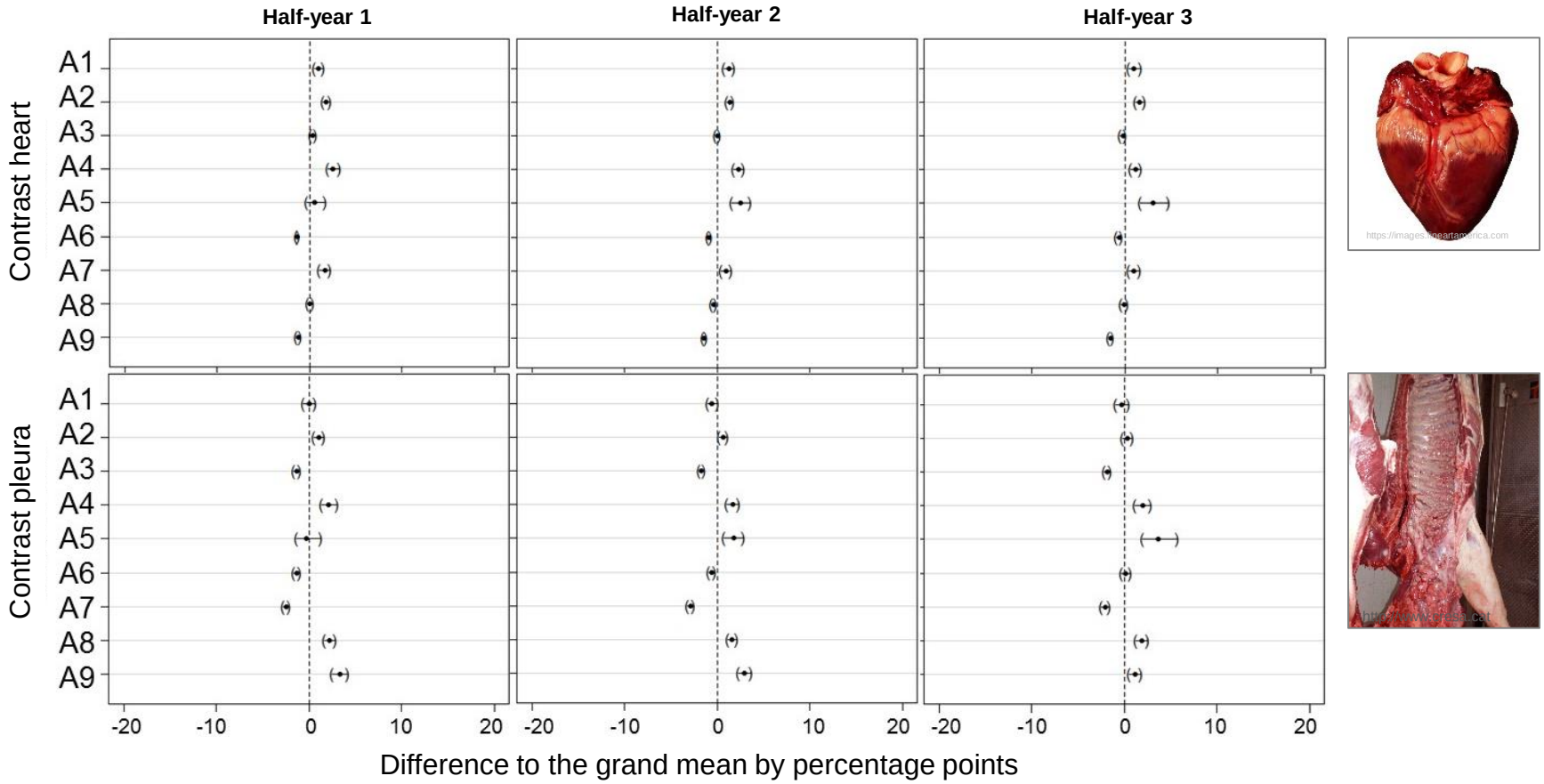
Appendix I

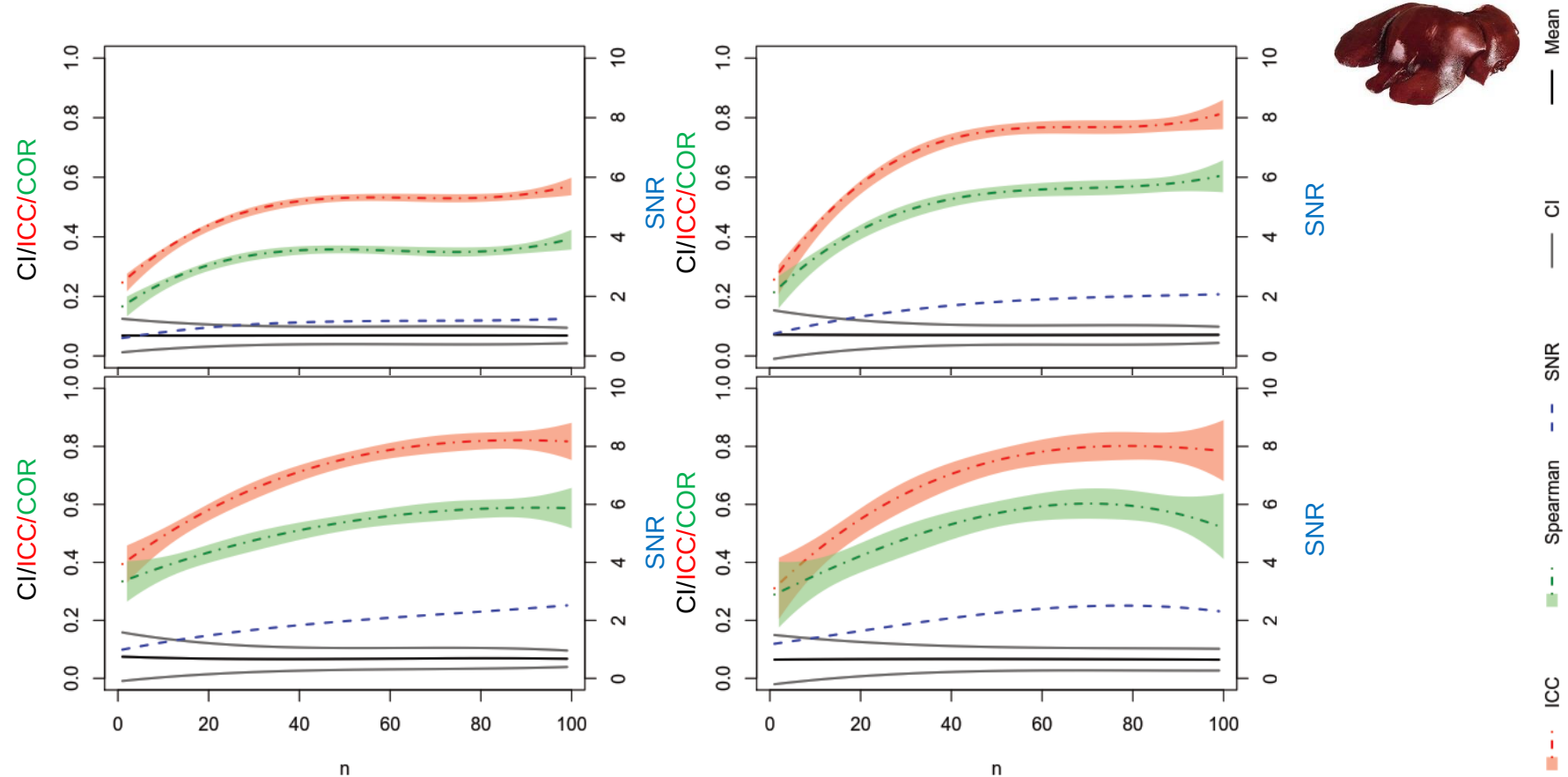
Grand mean test of significance of heart and pleura prevalences



Appendix II
Amount of animals, farmer and slaughter day per abattoir

Abattoir	S1			S2			S3		
	Animals (n)	Slaughter day (n)	Farmer (n)	Animals (n)	Slaughter day (n)	Farmer (n)	Animals (n)	Slaughter day (n)	Farmer (n)
A1	66,464	125	154	75,366	127	140	51,696	121	113
A2	593,025	146	946	671,171	152	1,060	387,284	150	716
A3	602,857	149	933	711,436	151	1,073	461,460	149	767
A4	111,666	111	210	156,681	119	334	122,183	124	305
A5	9,869	52	22	27,355	102	45	12,917	74	23
A6	663,302	150	741	646,737	153	887	461,114	149	595
A7	55,766	140	142	43,849	139	152	46,445	141	148
A8	517,002	152	835	626,974	158	922	359,384	152	655
A9	169,907	149	267	205,399	152	319	147,459	149	251
∑	**2,789,858**	**1,174**	**4,250**	**3,164,968**	**1,253**	**4,932**	**2,049,942**	**1,209**	**2,978**
Ø	**309,985**	**130**	**472**	**351,663**	**139**	**548**	**227,771**	**134**	**330**

Appendix III
Measures of agreement of liver prevalence



Appendix IV

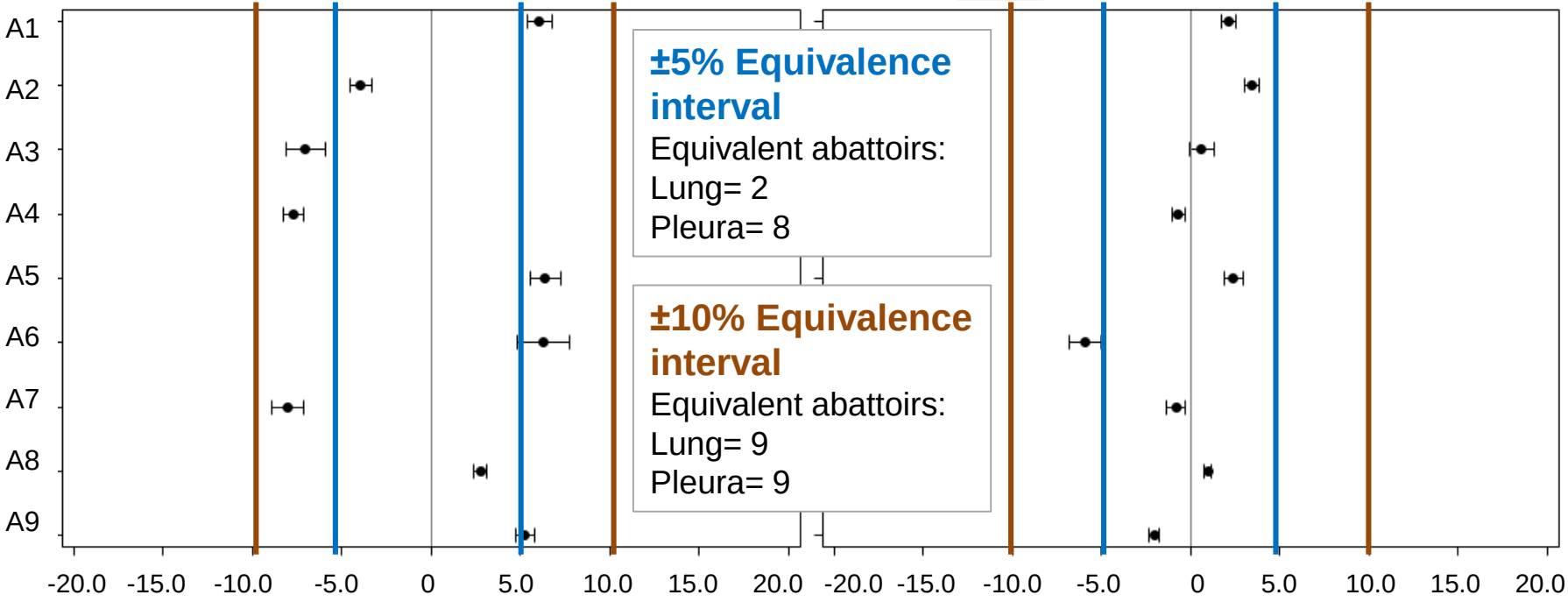
Equivalence test (TOST) based on lung and liver prevalences

Equivalence interval lung

Mean= 14.3%

Equivalence interval pleura

Mean= 6.80%



±5% Equivalence interval

Equivalent abattoirs:
Lung= 2
Pleura= 8

±10% Equivalence interval

Equivalent abattoirs:
Lung= 9
Pleura= 9