



# Broiler welfare index based on slaughter-house parameters

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# Introduction

- The Council of the European Union has laid down the welfare directive for broiler chickens (2007/43/EC)
- Welfare demands and objectives for growing broilers
  - Stocking density
  - Air quality
  - Mortality
- How to measure welfare?
- Welfare index
  - Combines different welfare variables to one figure
  - Attempts to estimate the animal's welfare on the farm
  - Find differences between farms and flocks

# Materials and methods

- The slaughter-house mortality and post-mortem data from Evira
  - Three slaughter-houses
  - Three periods
    - 6.-17.10.2008
    - 17.-28.11.2008
    - 16.-27.2.2009
  - 30 flocks/slaughter-house
  - Total of 90 flocks
- The data was analysed and based on this analysis and literature, five welfare variables and their subclasses were chosen for the index.



# Welfare variables

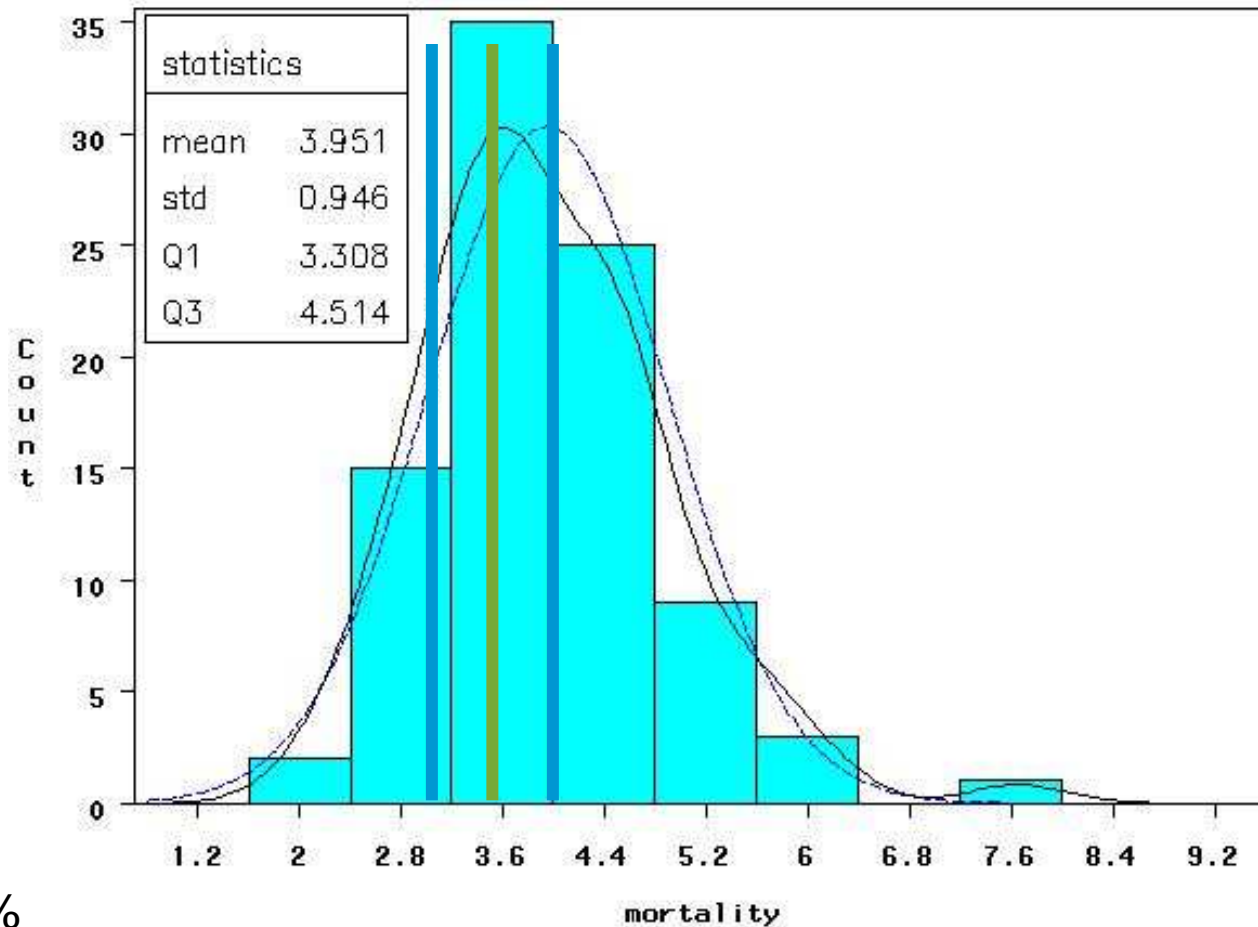
- Mortality
  - All dead and culled birds
- Ascites (pulmonary hypertension syndrome, "waterbelly")
  - Ascites is the most common reason for carcass rejections in Finland.
  - Rapid growth (could) creates ascites, but it can be reduced with good housing (air quality) and by preventing stress.
  - Lot of variation between the flocks
- Foot-pad dermatitis
  - The wet litter can cause lesions to the foot-pad.
  - Scoring: 0 p (no lesions), 1 p (some lesions), 2 p (severe lesions); Sum of 100 foot-pads, 0 p=0, 1 p=0.5 and 2 p=2; (Ekstrand et al. 1997)

- Dermatitis etc. skin infections
  - Wet litter, stocking density, restless birds and bacterial stress can cause wounds, bruises, infections and cellulitis to birds.
- Cachexia
  - Underweight birds and cachexia are also common reason for carcass condemnation.
  - Underweight birds are small and their growth is slow.
  - Indication of inadequate culling.



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# Subclasses were chosen to each variable. For example: mortality, %



- $\leq 3,2$  %
- 3,2–3,8 %
- 3,8–4,2 %
- $> 4,2$  %

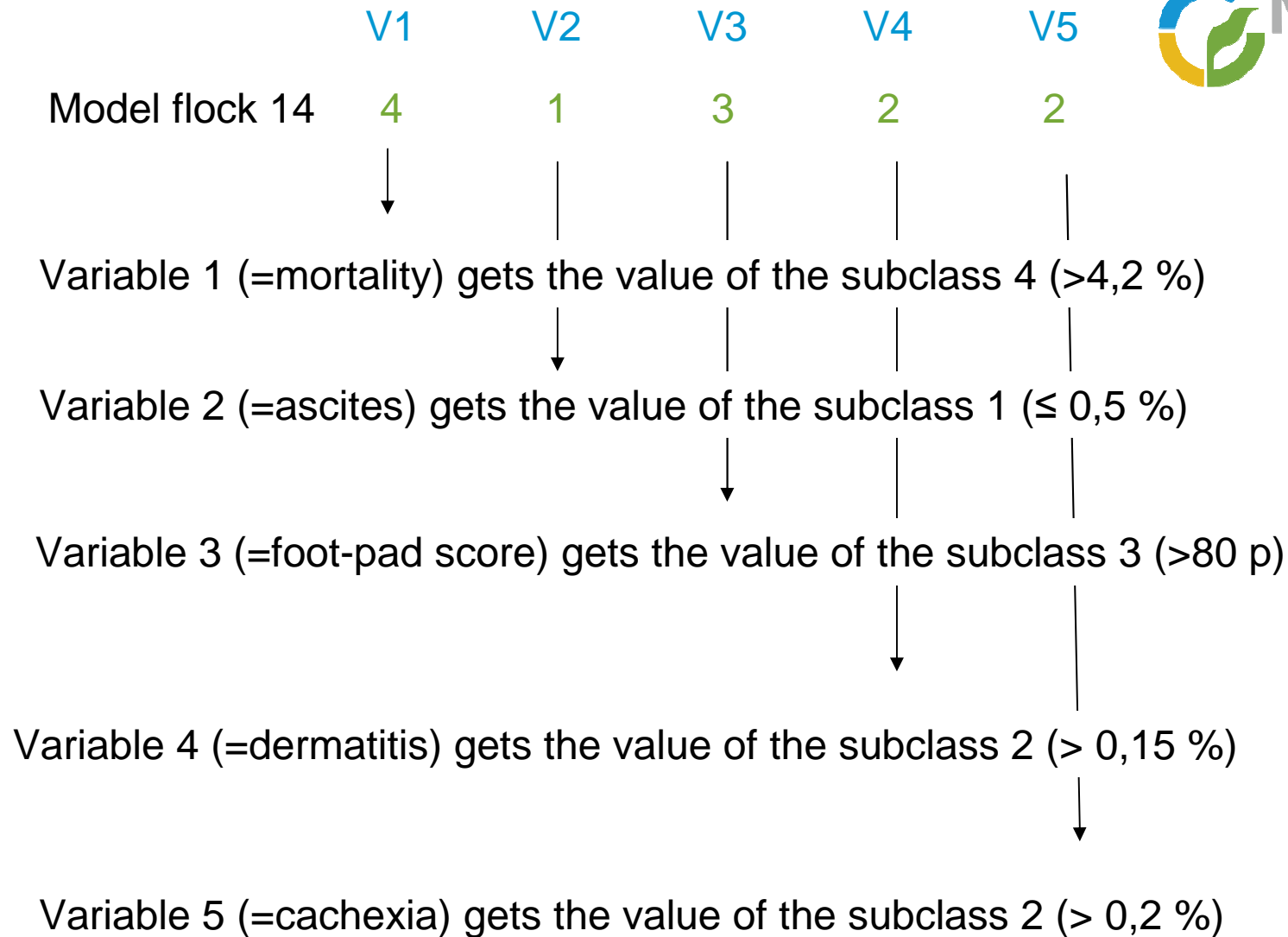
- Ascites
  - < 0,5 %
  - 0,5–1,5 %
  - > 1,5 %
- Foot-pad score
  - < 40 p
  - 40–80 p
  - > 80 p
- Dermatitis
  - < 0,15 %
  - > 0,15 %
- Cachexia
  - < 0,2 %
  - > 0,2 %



# Simulated model flocks

- It's possible to make
  - $4 \times 3 \times 3 \times 2 \times 2 = 144$  different welfare profiles from 5 welfare variables and their subclasses.
  - Hard to handle!
- Orthogonal series reduced the number of profiles to 24 (model flocks)

Flocks	V1	V2	V3	V4	V5
1	4	3	2	2	2
2	4	3	1	1	1
3	3	2	3	2	2
4	3	1	2	1	1
5	2	1	3	1	1
6	1	2	1	2	2
7	4	2	2	1	1
8	3	3	1	1	1
9	3	1	3	2	1
10	2	1	1	2	2
11	1	3	2	2	1
12	1	2	3	1	2
13	4	2	3	1	1
14	4	1	3	2	2
15	3	3	2	2	2
16	2	3	2	1	2
17	2	2	1	2	1
18	1	1	1	1	1
19	4	1	1	2	2
20	3	2	1	1	2
21	2	3	3	1	2
22	2	2	2	2	1
23	1	3	3	2	1
24	1	1	2	1	2



- Data of 24 simulated flocks were sent to poultry experts of slaughter-houses, feed industry, administration and research. The experts were asked to sort flocks from worse to best according to welfare.
- We received 21 answers from different experts, 20 of them were used in the analysis.



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- The statistical analysis was made with the conjoint regression analysis
  - Finds the best possible combination from given variables, so the other variables are weighed more than others according to experts' opinions.
  - Usually used in marketing research.
  - Some examples in animal welfare research (Haslan & Kestin 2003)



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TABLE 3 Conjoint analysis results: the relative importance values for selected welfare variables based on 20 expert's opinions.



Expert	Mortality <sup>†</sup>	Foot-pad score <sup>††</sup>	Ascites <sup>*</sup>	Dermatitis <sup>*</sup>	Cachexia <sup>*</sup>
1	82.01	9.68	4.53	1.27	2.51
2	0.01	99.99	0.00	0.00	0.00
3	40.94	25.02	22.17	4.66	7.75
4	34.77	22.76	32.31	5.58	4.58
5	44.08	12.83	35.15	5.59	2.37
6	0.18	99.33	0.34	0.15	0.01
7	27.43	33.73	27.68	9.92	1.20
8	22.15	65.19	6.40	4.79	1.47
9	44.68	18.07	29.77	3.85	3.64
10	17.21	21.98	40.04	14.74	6.03
11	3.67	48.62	29.24	5.64	12.83
12	20.58	8.88	55.88	11.74	2.93
13	3.07	68.51	23.02	4.23	1.18
14	2.42	39.92	19.87	35.96	1.83
15	69.98	10.66	15.62	3.07	0.68
16	3.60	34.48	9.59	51.60	0.73
17	32.41	20.63	26.11	19.96	0.89
18	17.81	35.39	12.75	27.68	6.37
19	25.51	2.83	2.88	42.95	25.84
20	0.00	40.00	0.00	60.00	0.00

†Dead and culled birds per flock

††Foot-pad scores 100 birds/flock: no lesions= 0 p. some lesions= 0.5 p and severe lesions= 2 p

\*Rejected carcasses per flock in meat inspection

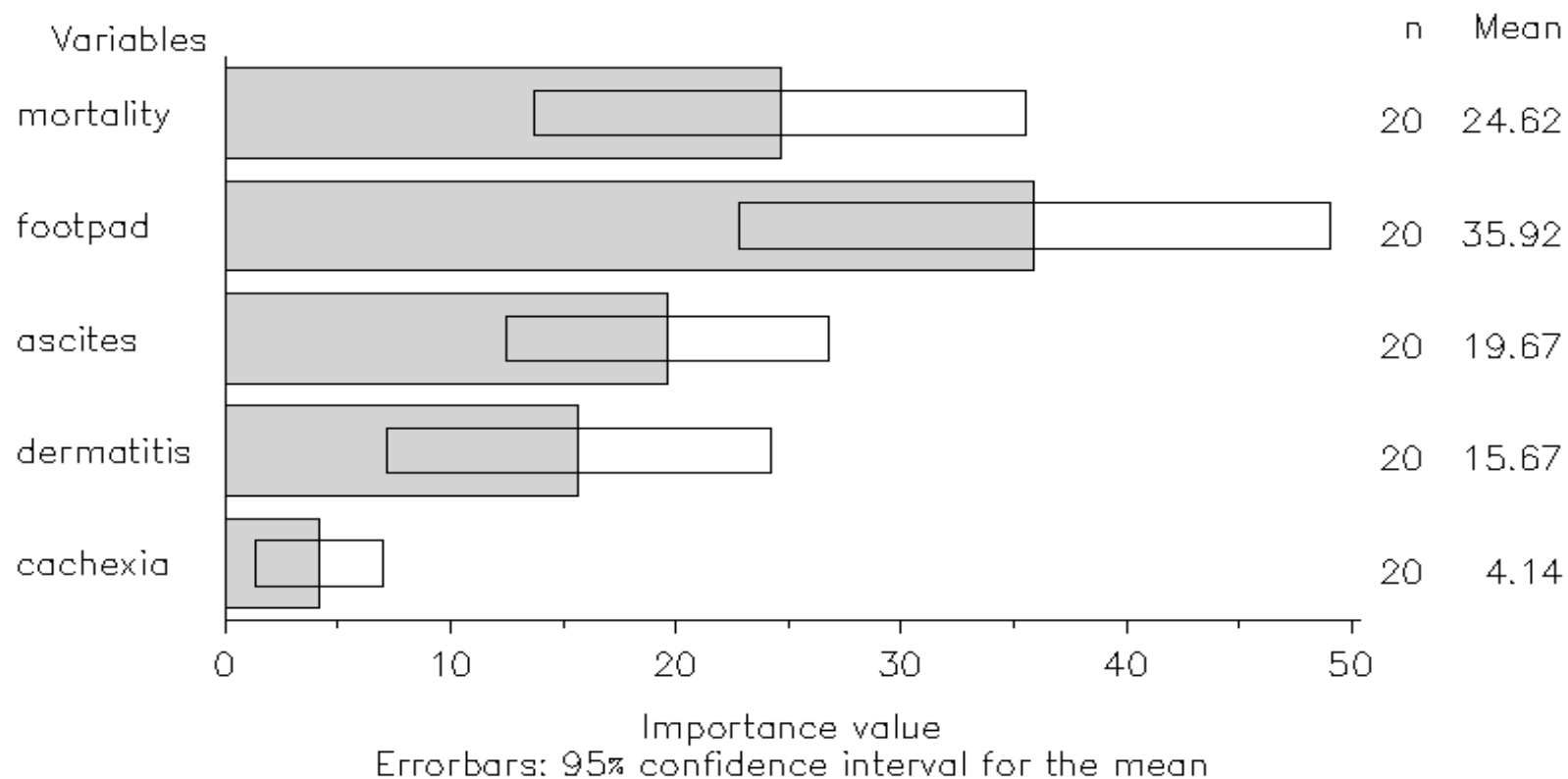


FIGURE 1 Summary of importance weighting of welfare variables. Each bar represents the relative importance for broiler welfare and each error bar represents 95 % confidence intervals for the mean.

# Results

- We received responses from 21 poultry experts, but one of the experts did not rate all of the model flocks. Therefore we decided to exclude the observation and use only 20 observations in the analysis.
- The mean relative importance for broiler welfare were: 24.6% for mortality, 35.9% for foot-pad score, 19.7% for the incidence of ascites, 15.7% for the incidence of dermatitis and 4.1% for the incidence of cachexia.
- The coefficient of concordance (Kendall's W) or the agreement among the experts was 0.517, which was moderately good ( $p < 0.0001$ ). Kendall's W ranges from 0 (no agreement) to 1 (complete agreement).

# Conclusions

- Simple method to use
- Utilises slaughter-house data
- Problems?
  - Variables
  - Subclasses
  - Model flocks
  - Experts
- This index can be used as an indicator of flocks' welfare and to compare flocks' and farmers' results.
- No plans have been made to implement it so far.



**Thank you for your  
attention.**