A remote assessment tool for farm animal welfare through dairy herd improvement data

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Introduction

Regular assessment is important to monitor herd welfare status on farm

Monitoring a large number of herds on regular basis is challenging

- A remote assessment tool is required
- Should make use of routinely collected herd data from central databases – approach validated in Europe (Sandgren et al 2009, de Vries et al 2014)
- Routine herd data are typically milk yield, milk composition, reproduction, health data…
- Should be preferably a tool that allows comparing herds (benchmarking)

Objectives

Develop a dairy management tool that allows assessing and monitoring the welfare status on dairy farms based on DHI data

Welfare index approach

Multi-criteria approach to generate a composite welfare index for herds

- Approach proposed for welfare monitoring in Sweden, Italy and Norway (Sandgren et al 2009, Nyman et al 2011, Tondo 2014, Østerås 2018)

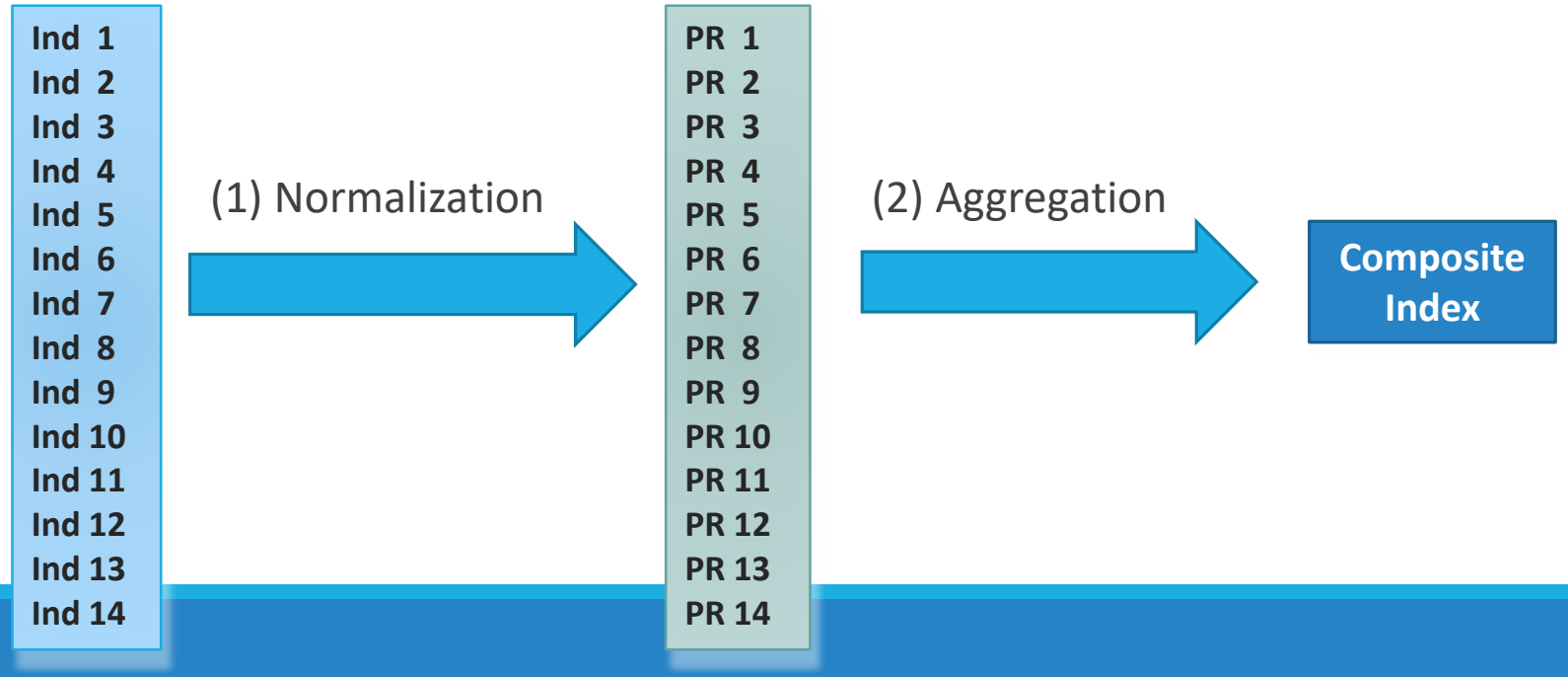
Based on 14 herd welfare indicators

- Initial data set included 81 indicators – selection based on 10 experts (welfare, health, nutrition, dairy management, and economics), completeness of data, and statistical procedures (multicollinearity)
- 4 focus areas
  - Longevity
  - Nutrition and production
  - Calves and youngstock
  - Health and reproduction

Welfare index approach

Calculation of a composite index for 4,355 herds in Quebec, Canada

- Data from September 2016 to September 2017
- Step 1: Individual welfare indicators scaled to percentile ranks (normalization)
- Step 2: Percentile ranks aggregated to composite index

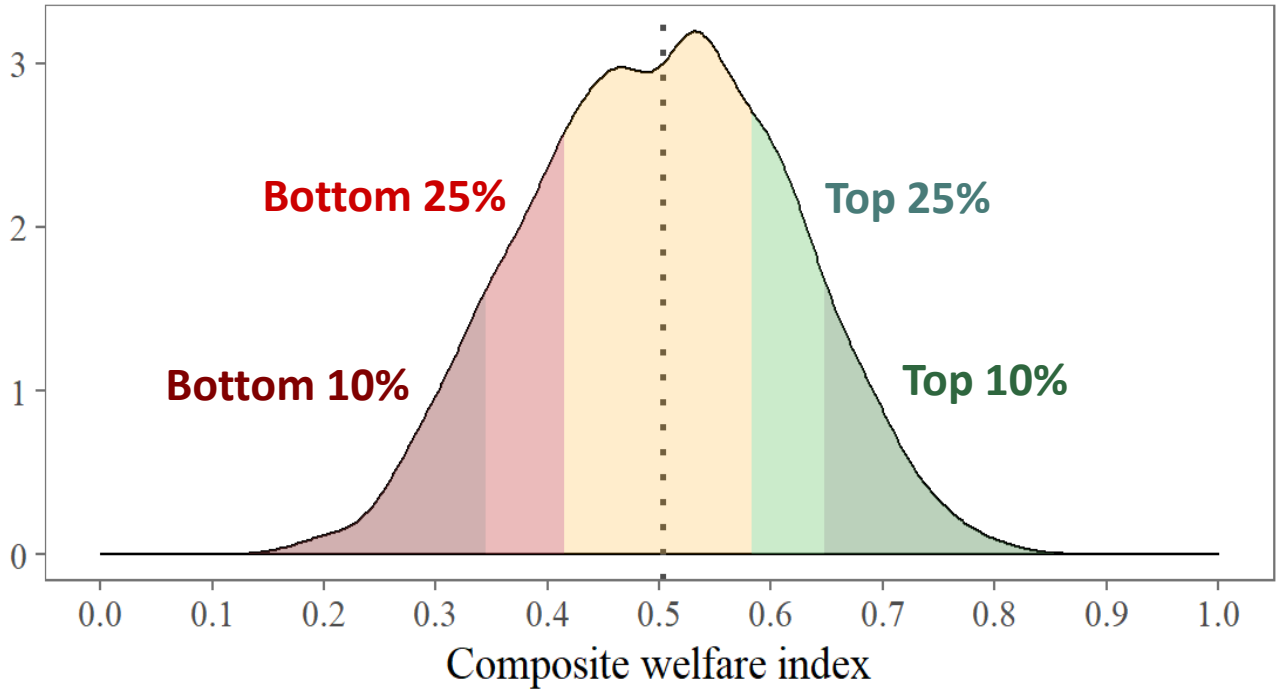


Welfare index approach

Standardized welfare index

Possible to compare herds

Possible to differentiate among best and worst performing herds



Welfare index approach

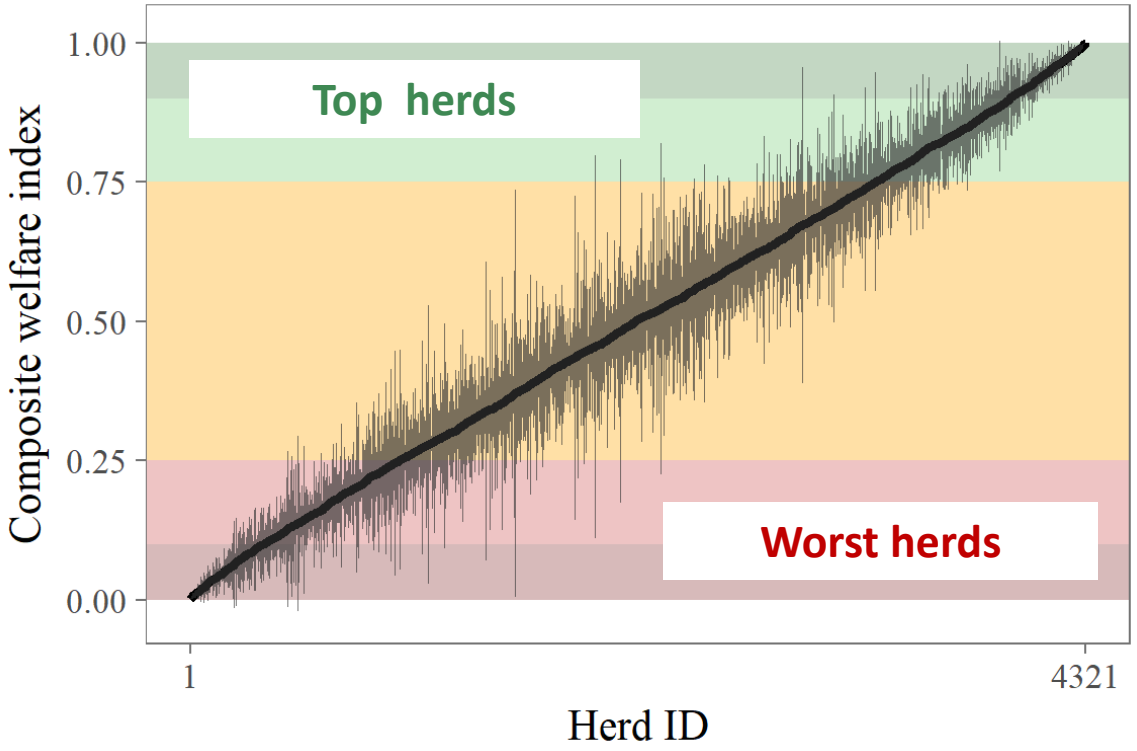
Herd **XXXX**
Housing Tie stall
Composite welfare index **87%**

Herd welfare indicators	2016	2017			
	My herd	My herd	Median	Top 25%	Rank
Longevity					
% longevity (% cows lactation 3+)	xxx	**38.0**	41.9	47.3	33%
% culled cows	xxx	**26.5**	27.6	21.9	56%
% dead cows	xxx	**5.0**	3.5	1.4	36%
Nutrition and production					
% cows with low milk urea (< 5 mg/dl of milk)	xxx	**2.4**	1.8	0.5	39%
Management index	xxx	**1 168**	(325)	386	91%
Transition Cow Index	xxx	**805**	240	508	93%
Daily life value rank	xxx	**95.0**	51.0	76.0	95%
Calves and youngstock					
% dead calves (0-24 h)	xxx	**3.3**	7.6	4.2	80%
Age at first calving	xxx	**24.1**	25.5	24.7	88%
Health and reproduction					
% abortions	xxx	**0.0**	0.0	0.0	66%
% cows with high BHB (> 0.20 mmo/L of milk)	xxx	**2.2**	1.5	0.8	34%
% cows with high SCC (> 400,000/ml of milk)	xxx	**12.6**	12.2	9.0	45%
% cows with high milk protein-fat ratio (> 1.1)	xxx	**3.8**	2.5	1.2	34%
Lameness and injury index	xxx	**12.3**	29.8	20.9	94%

Validation

Do herds tend to keep their position if methodology is updated in the future?

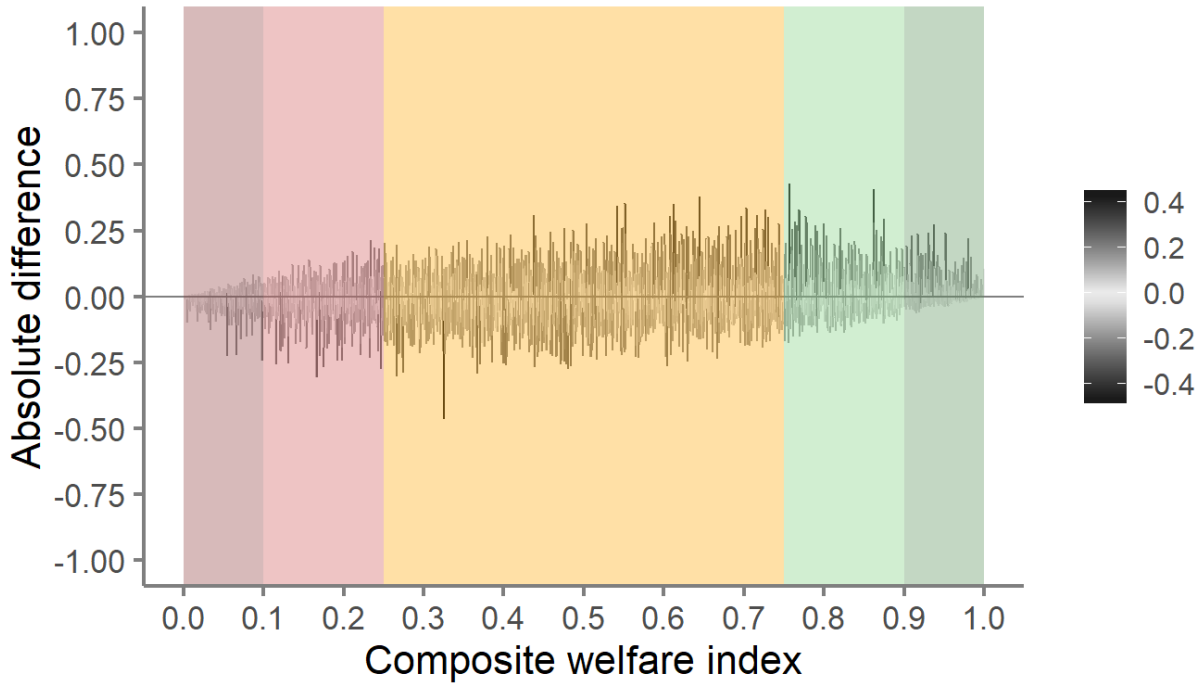
- Effect of indicator selection, data normalization and aggregation method on composite index (OECD 2018)
- Composite index rather robust for worst herds (SD of 0.061) and top herds (SD of 0.062)
- Some uncertainty around average herds (SD of 0.157)
- Possible to identify herds with large variation (preliminary results: herds with some extreme values for some indicators)



Validation

Robustness over time (difference between 2016/17 and 2017/18) → which herds change position?

- Overall: 51% of the herds fluctuated by ≥10 percentile ranks (MAD of ≥0.10)
  - Top herds: MAD of 0.05
  - Worst herds: MAD of 0.04
  - Average herds: MAD of 0.14
- Fluctuations likely reflect changes in management practices over the 2 yr
- Possible to identify herds with large fluctuation



Conclusions

Aggregation approach

- Allows benchmarking herds
- Allows illustrating complex issues such as the multidimensionality in welfare
- Relatively easy to interpret
- Can stimulate participation of dairy producers
- Allocate advisory services to herds at risk of poor welfare, identify top herds

However, a composite index is only as good as the indicators it is composed of…

Risk of over-interpreting a composite index (allows comparing herds but naturally does not allow focused improvements on welfare issues that are not included)

Conclusions

Need of transparency: validation steps presented here may help to be more transparent with regard to how the composite index is computed and with regard to its robustness

Tool can be updated as new data are routinely collected (e.g. lying time, body condition score)

DHI data can be used to

- Remotely assess and monitor the welfare status of herds
- Screen a large amount of herds (useful for routine and automatized applications)

Thank you

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