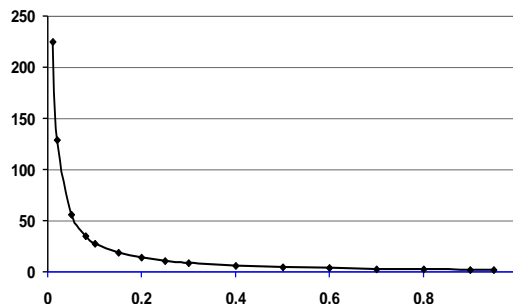


# Use of register data to assess animal welfare

**Hans Houe**  
**Søren Saxmose Nielsen**  
**Matthew Denwood**  
**Bjørn Forkman**  
**Tine Rousing**  
**Jan Tind Sørensen**

**Department of Large Animal Sciences,  
 University of Copenhagen**  
**Department of Animal Science, Aarhus University**



# Outline

- **Why are register data attractive - Primary versus secondary data**
- **Quality criteria when assessing register data – definitions of terminology**
- **Register data in Denmark**
- **Sources of major interest for assing animal welfare in pig porudction**
  - **Meat inspection**
  - **Mortality**
  - **Medicine consumption**



# Primary vs. secondary data

## Primary data

- ❖ Collected for a specific purpose
- ❖ Data collection controlled/adapted for the purpose
- ❖ Often expensive

## Secondary data – register data

- ❖ Not collected for the purpose in question (but originally for other purposes)
- ❖ Readily 'available'
- ❖ Often available from large populations
- ❖ Data collection is beyond the control of the investigator
- ❖ Evaluation of data quality not always possible



# Steps from event to database



Event

Circumst.

Observation

Diagnostic tests  
Interpretation

Recording

Transfer DB

Correction

Recording in database



?



# Quality criteria when assessing register data

- 1. Relevance**
- 2. Sensitivity and specificity**
- 3. Robustness**
- 4. Feasibility**
- 5. Occurrence (significant prevalence)**
- 6. Completeness**
- 7. Validation of aggregated measures**

**Correction**

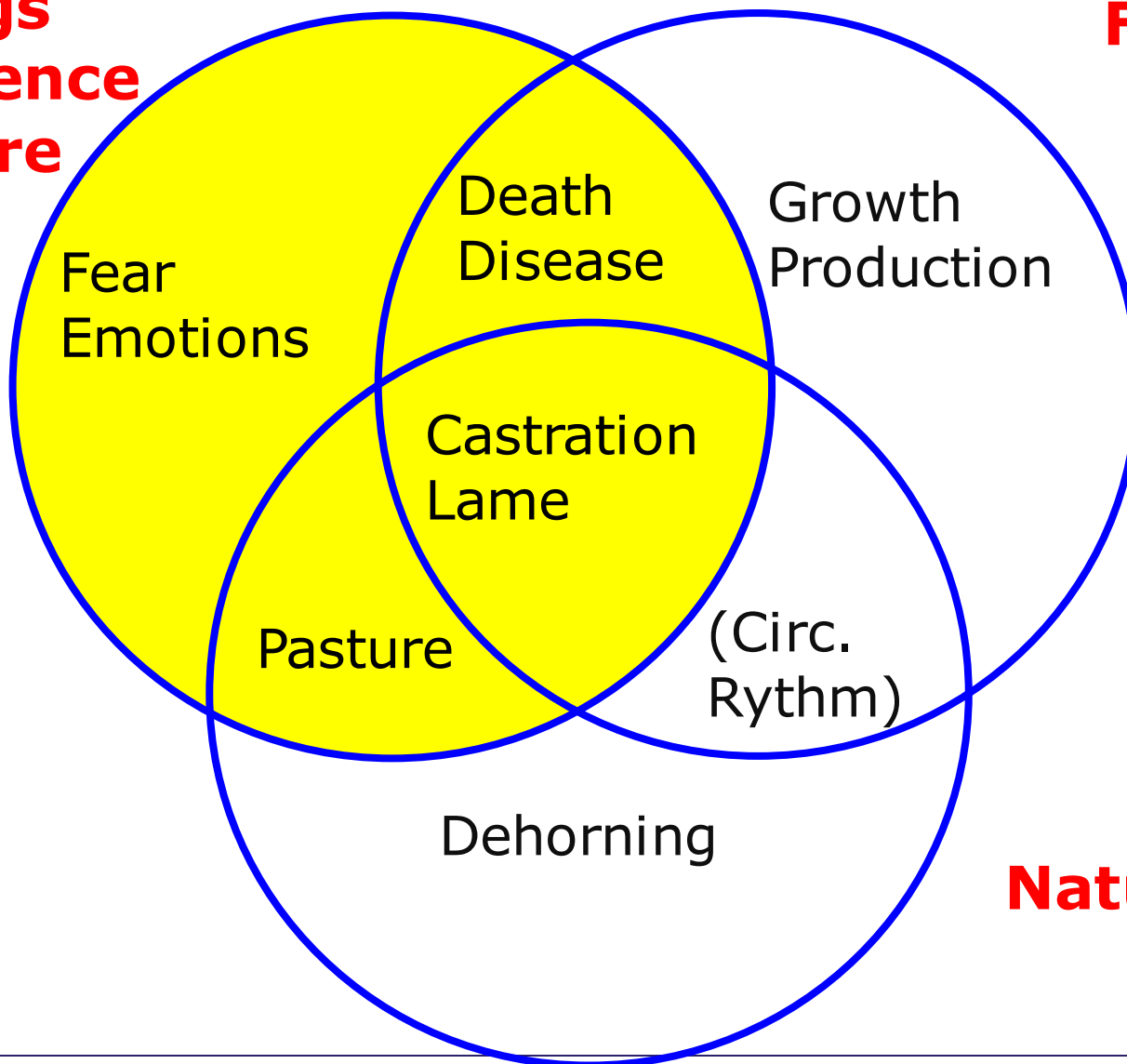


# Relevance

## Welfare definitions → Indicators

**Feelings**  
**Experience**  
**Pleasure**

**Function**



**Naturalness**



# Assessment of indicators

Criteria	Medicine usage	Meat inspection
1. Relevance	+++	++
2. Sens. and Spec.	+	+++
3. Robustness	++	+++
4. Feasibility	+	+++
5. Occurrence	+++	+++
6. Recording	++	++
7. Aggregation	-	-

**Selection is a balanced consideration of all criteria**



# Databases in Denmark

- 1. The Central Husbandry Register (CHR)**
- 2. Movement Database (incl. mortality)**
- 3. Meat inspection data**
- 4. VetStat**
- 5. Welfare Control data**





# Databases in Denmark

Database	Purpose	variables
CHRs	Demographic information on herd level; population composition.	Owner; geographic location; species; herd size; notifiable diseases
Move-ment database	Veterinary preparedness	Animal type, no of movements, mortality, date; Source and destination herds Trucks incl. nationality
Meat inspection recordings	Food safety; price deduction for farmer	Abattoir ID; animal category; clinical findings at live inspection; pathological lesions
VetStat	Recording of prescription medication at herd level	Medication name and active substance; species; age group; ordination group; Vet authorisation and practice no; Drug store ID; date; ADD/100 animals
Welfare control data	Recording of DVFA control data	Reason for control; visit date No of infringements of animal welfare legislation: Warning, enforcement notice or police report

# Selected list of variables – relevance, se and sp and occurrence

- **Mortality**
- **Movements (distance)**
- **Meat inspection codes:**
  - **exhausted, lame, skinny, paralysed, muscle atrophy, fractures, inflammations, abscess, stomach ulcer, hernia, rectal prolaps, emphysema, trauma, wounds a.o.**
- **Welfare control: Warning, enforcement notice, police recording**
- **Medication**



# Use of slaughter recordings for animal welfare index

**All carcasses subject to meat inspection**

**Objective:**

**Descriptive analysis prevalence**

**Identify variation between slaughterhouses**

**Estimate correction factor**

**Revise data**

**Methods:**

**Exclusion: Relevance, prevalence,**

**Establishment of code combinations**

**Abattoir effect: Random effects logistic regression**

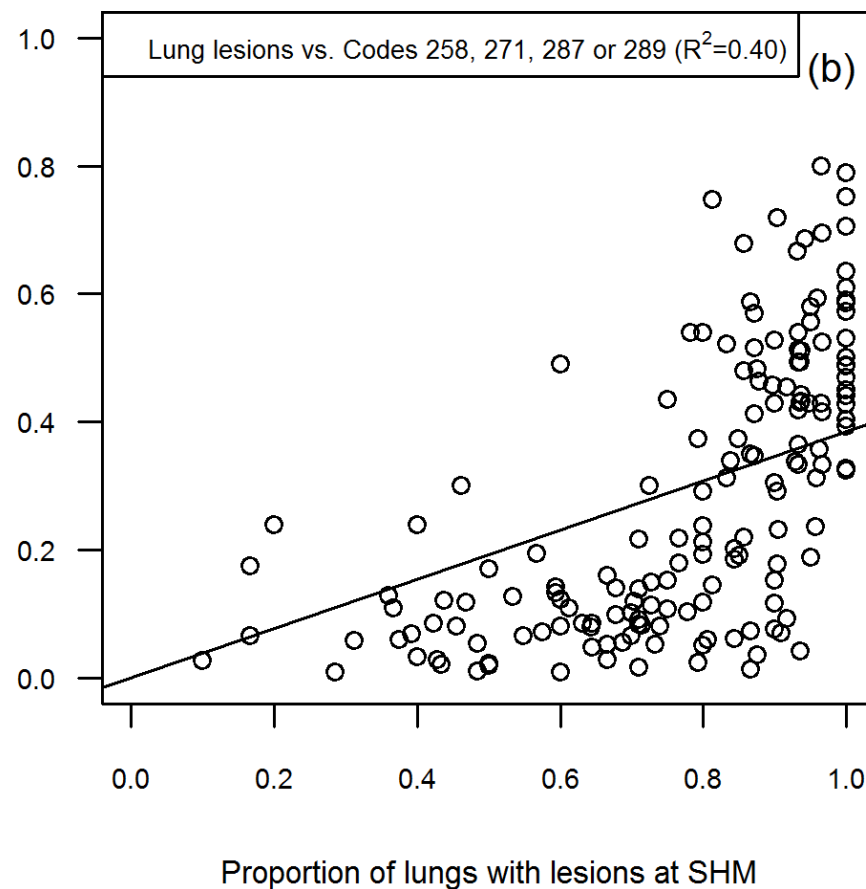
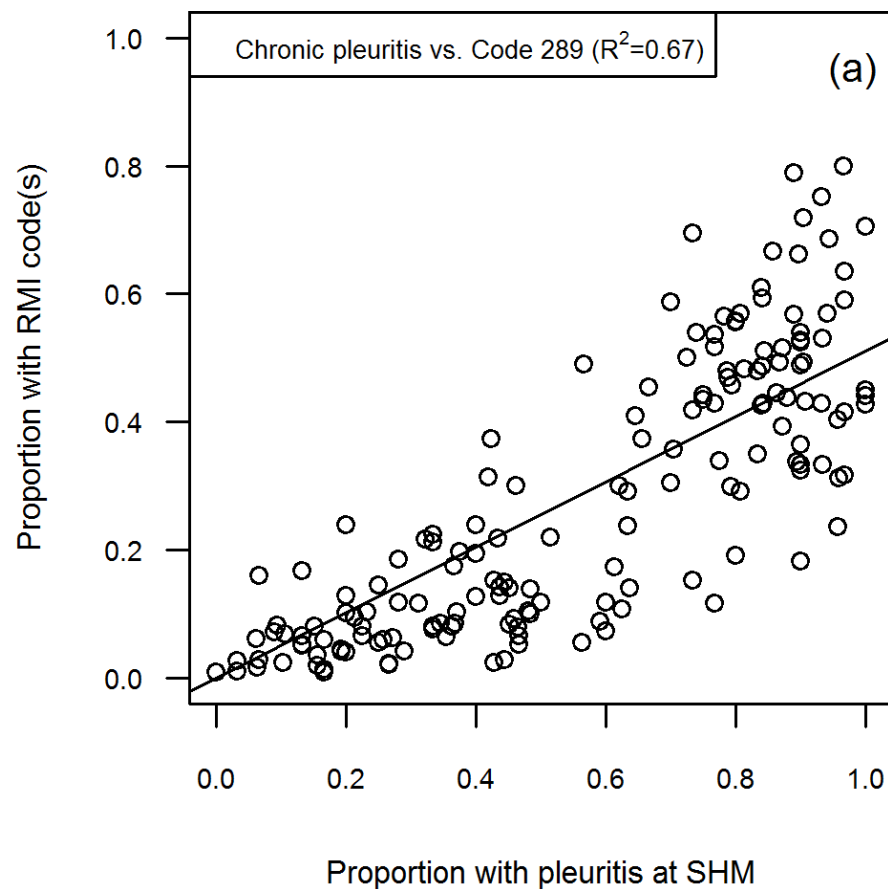


# Meat inspection codes deemed potential useful

Code	Description	Useful in
120	Circulatory system disturbances (poor bleeding); anaemia; dropsy; oedema	pigs; sows
132	Skinny	Sows
141	Pyemia; septicemia; pyemic lung abscesses; splenitis - septicemia; nephritis - septicemia;	Sows
230	Endocarditis (acute or healed)	Sows
271 & 289	Chronic pneumonia or pleuritis; aeric abscesses; serositis	Sows
331 & 337	Rectal prolapse; rectal stricture	Pigs
352	Chronic peritonitis; peritoneal abscess; discoloured peritoneum (from splenic torsion)	Sows
361	Hernia (umbilical; inguinal)	Pigs
379 & 381	Chronic hepatitis; hepatic necrosis; jaundice	Sows
432	Chronic metritis; retained placenta; incomplete partuition; uterine prolapse	Sows
472	Chronic mastitis	Sows
502 & 503	Old fracture; infected fracture; open fracture > 6 hours old	pigs; sows
511	Acute, chronic, local, healed osteomyelitis; abscesses following wound	pigs; sows
532	Chronic arthritis; arthrosis	pigs; sows
570 & 577 & 580 & 584 & 585	Abscesses in front, mid or rear part; in the leg or toe; in the head; blood ear	pigs; sows
600 & 601	Tail-bite, local; tail-bite incl. Infection	pigs; sows
615	Shoulder wounds	Sows

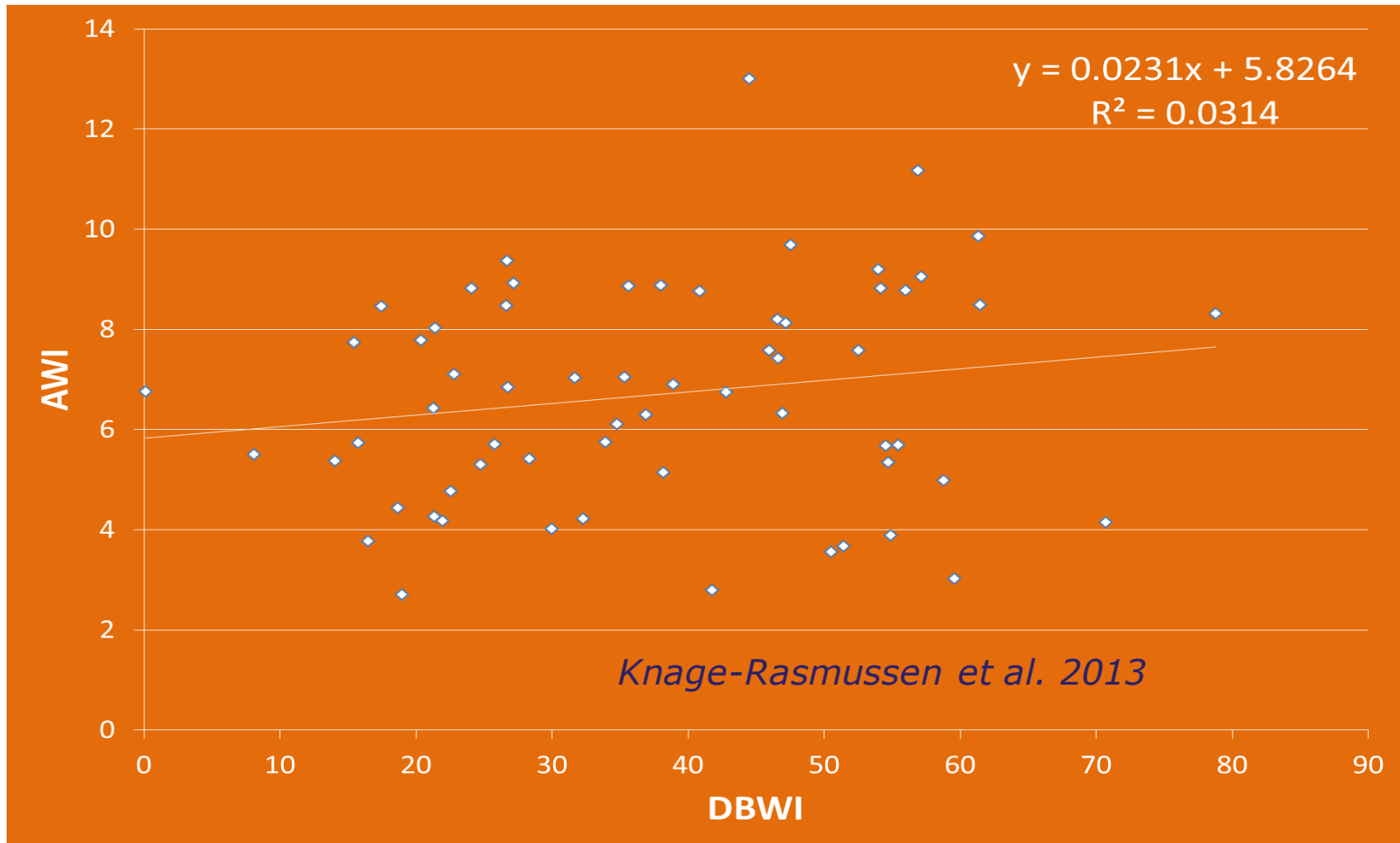


# Comparison of routine and ext. meat inspection

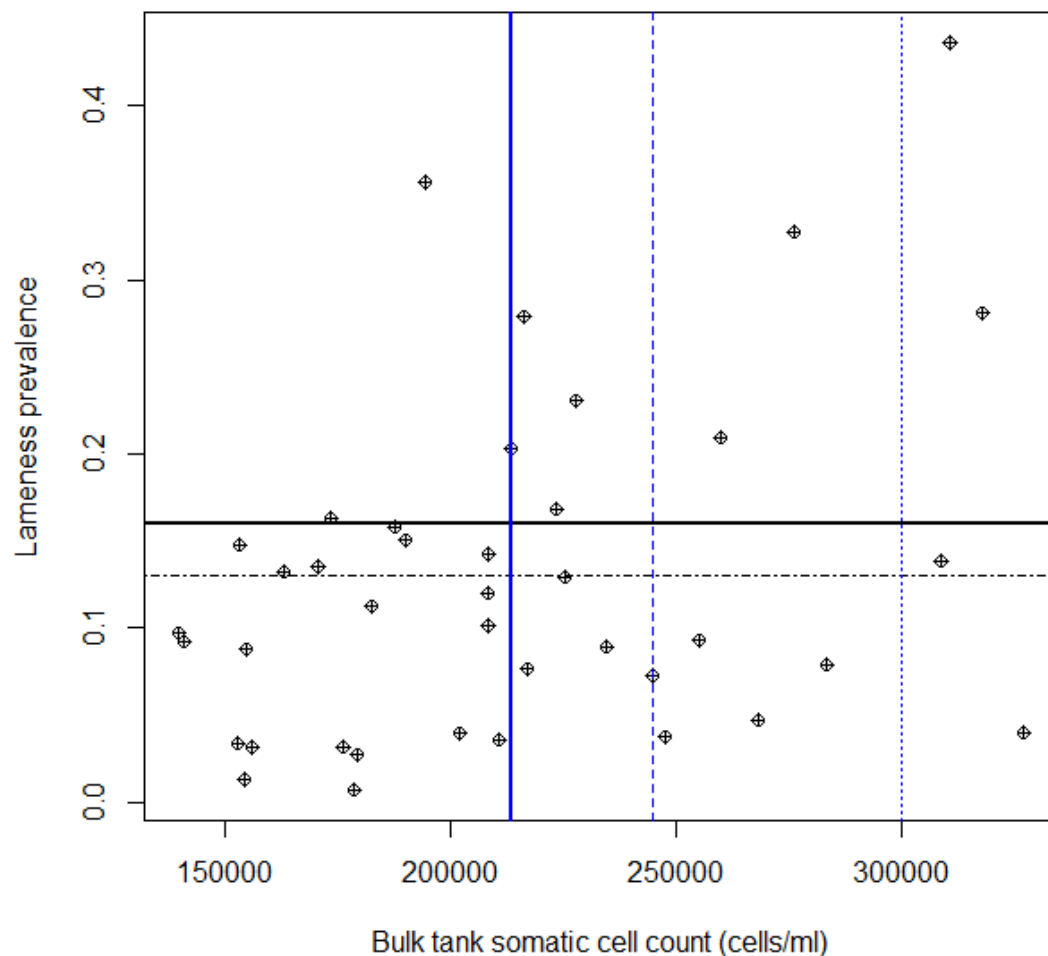




## Animal welfare index based on mortality, meat inspection and medication (DBWI) compared with index based on clinical and behavioural observations (AWI) - Results from 63 sow herds.



# Register data may be fairly good at identifying specific welfare problems, e.g herds with high lameness prevalence:



**Final model**  
**Mortality**  
**Cell count**  
**Skinny cows at sl.**  
**Spread in calv. age**

**Correct classification**  
**in 79 % of the herds**

*Otten et al., 2013*





# Steps from event to database



Event

Circumst.

Observation

Diagnostic tests  
Interpretation

Recording

Transfer DB

Correction

Recording in database



## Ranking of herds based on register data can give false results: Ranking of 20 dairy herds based on different types of information

Ranking	Welfare index (number = herd number)		
	Register data	System information	Observation of clinical signs and behaviour
1	1	4	1
2	14	6	4
3	5	13	13
4	10	2	16
5	12	14	6
6	7	1	3
7	13	10	8
8	19	18	5
9	11	11	19
10	2	5	11
11	20	9	14
12	17	8	7
13	16	17	18
14	15	15	20
15	6	16	2
16	18	3	10
17	4	7	12
18	8	19	17
19	9	12	15
20	3	20	9



## Ranking of herds based on register data can give false results: Ranking of 20 dairy herds based on different types of information

Ranking	Welfare index (number = herd number)		
	Register data	System information	Observation of clinical signs and behaviour
1	①	4	①
2	14	6	4
3	5	13	13
4	10	2	16
5	12	14	6
6	7	①	3
7	13	10	8
8	19	18	5
9	⑪	⑪	19
10	2	5	⑪
11	20	9	14
12	17	8	7
13	16	17	18
14	15	15	20
15	6	16	2
16	18	3	10
17	4	7	12
18	8	19	17
19	9	12	15
20	3	20	9

## Ranking of herds based on register data can give false results: Ranking of 20 dairy herds based on different types of information

Ranking	Welfare index (number = herd number)		
	Register data	System information	Observation of clinical signs and behaviour
1	1	4	1
2	14	6	4
3	5	13	13
4	10	2	16
5	12	14	6
6	7	1	3
7	13	10	8
8	19	18	5
9	11	11	19
10	2	5	11
11	20	9	14
12	17	8	7
13	16	17	18
14	15	15	20
15	6	16	2
16	18	3	10
17	4	7	12
18	8	19	17
19	9	12	15
20	3	20	9



## Ranking of herds based on register data can give false results: Ranking of 20 dairy herds based on different types of information

Ranking	Welfare index (number = herd number)		
	Register data	System information	Observation of clinical signs and behaviour
1	1	4	1
2	14	6	4
3	5	13	13
4	10	2	16
5	12	14	6
6	7	1	3
7	13	10	8
8	19	18	5
9	11	11	19
10	2	5	11
11	20	9	14
12	17	8	7
13	16	17	18
14	15	15	20
15	6	16	2
16	18	3	10
17	4	7	12
18	8	19	17
19	9	12	15
20	3	20	9

# Challenges with register data

- 1. Some measures are ambiguously related to animal welfare (e.g. treatments) or related to something else (meat inspection and food safety)**
- 2. Different thresholds for observers**
- 3. Reporting bias to database (low completeness)**
- 4. Corrections possible but complicated**



# Use of register data

## Conclusions

- **Some register data potentially useful for further use**
- **Can be used to identify certain welfare problems**
- **Cannot stand alone in an index, but be an add on to observations on farm**



# **Use of register data**

## **What are the ways forward**

- **Establish elaborate data base protocols**
- **Include comprehensive quality check**
- **Transparency when using register data**





# Thank you

