On-farm cow mortality in Swedish dairy herds

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On-farm mortality

= euthanasia and unassisted death

- Increasing mortality indicates sub-optimal health and welfare
- Causes financial losses

Picture: hornimports.com

Observed mortality in other countries

US mortality rates[1]

1996 3.8%

2002 4.8%

2007 5.7%

Danish mortality rates[2]

1990 2.0%

1999 3.5%

2008 5.8%

[1]USDA, 2007 [2]Thomsen *et al.,* 2005

Photo: Peter T. Thomsen

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Swedish dairy production

- Big structural changes in the dairy sector
- More efficient technology, increased average milk yield and herd size, high quality feeds

  - man hours per cow decreases
- No of herds with >300 cows has doubled during the last 4 years
- Over 500 herds in AMS (>10%)

Swedish Dairy Association, 2010

Hypothesis

There are systematic differences in mortality between herds under Swedish conditions

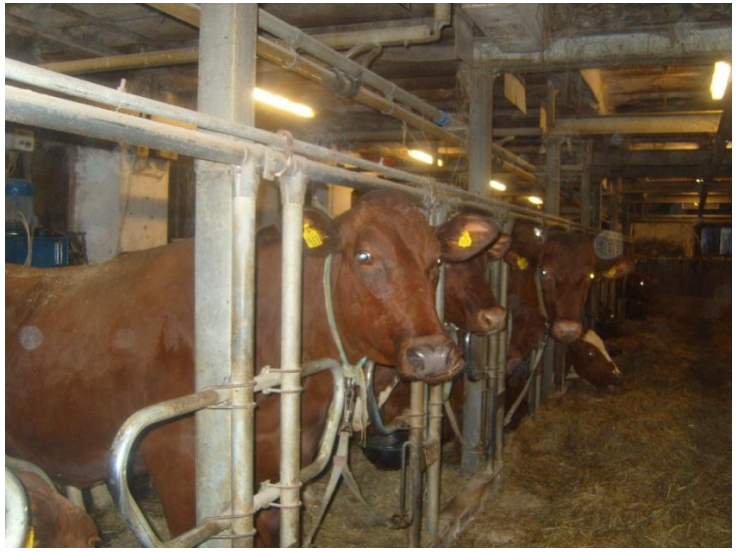


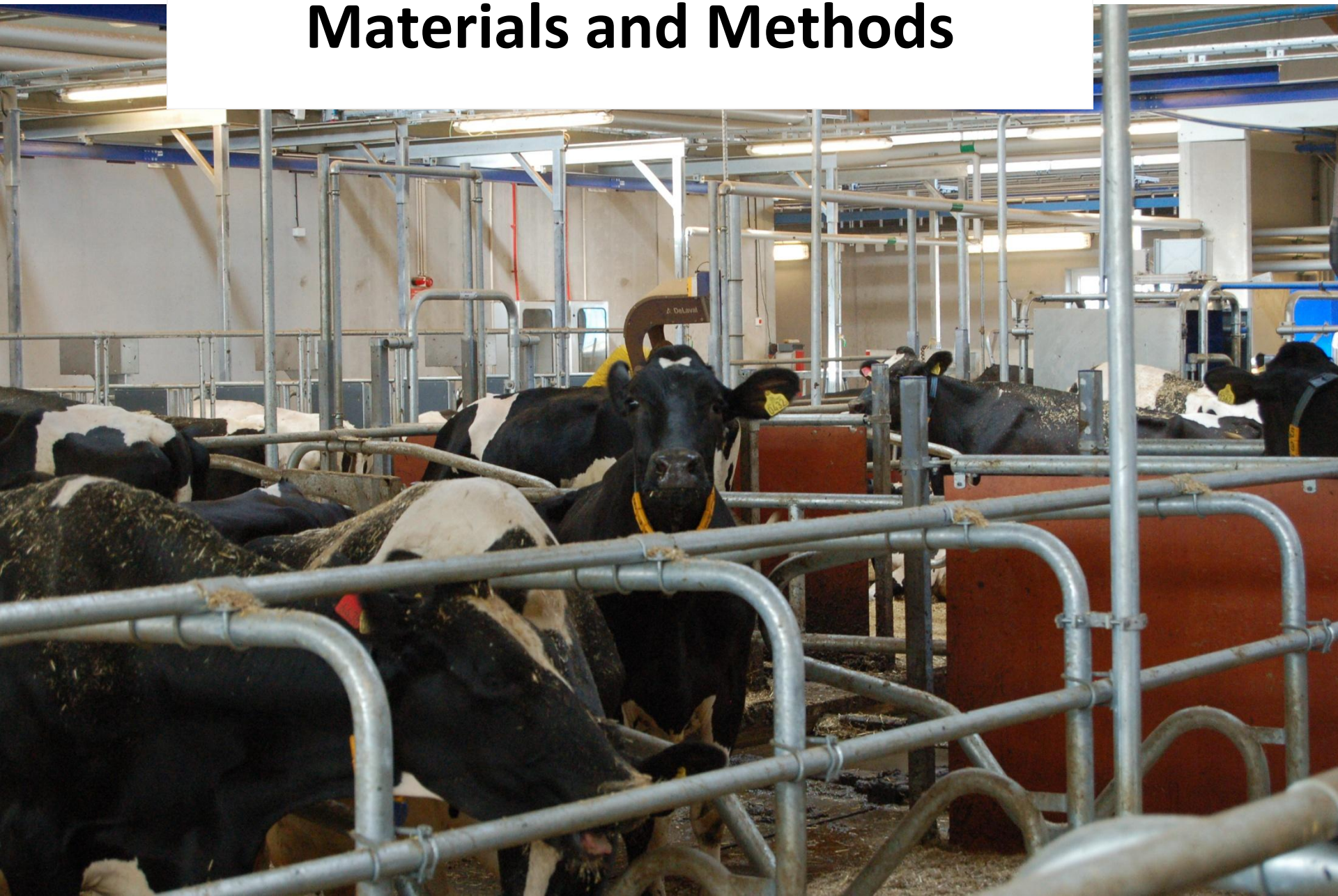
Photo: M. Högberg

Quantify the development of cow mortality in Swedish herds during 2002-2010

Identify risk factors for mortality in dairy cows on herd level

Evaluate geographical and seasonal trends

Materials and Methods



Data from the Swedish milk recording scheme

- Breed
- Calving interval
- Milk yield
- Herd size
- Location

Herd averages

svenskmjölk
SWEDISH DAIRY ASSOCIATION

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Data from the Board of Agriculture

- Central register of Bovine animals managed by the Swedish Board of Agriculture

- Farmers have to report movements for cows leaving the farm

  2 = Sales/Export

  3 = Slaughter

  4 = Temporary out

  6 = Home slaughter

  7 = Euthanasia/died unassisted (to destruction plant)

  8 = Euthanasia/died unassisted (not to destruction plant)

svenskmjölk
SWEDISH DAIRY ASSOCIATION

+

Swedish Board
of Agriculture

- Data from all herds enrolled in the Swedish milk recording scheme (incl. 84% of all Swedish dairy cows)

- Study period:
  September 1st 2002 to August 31st 2010

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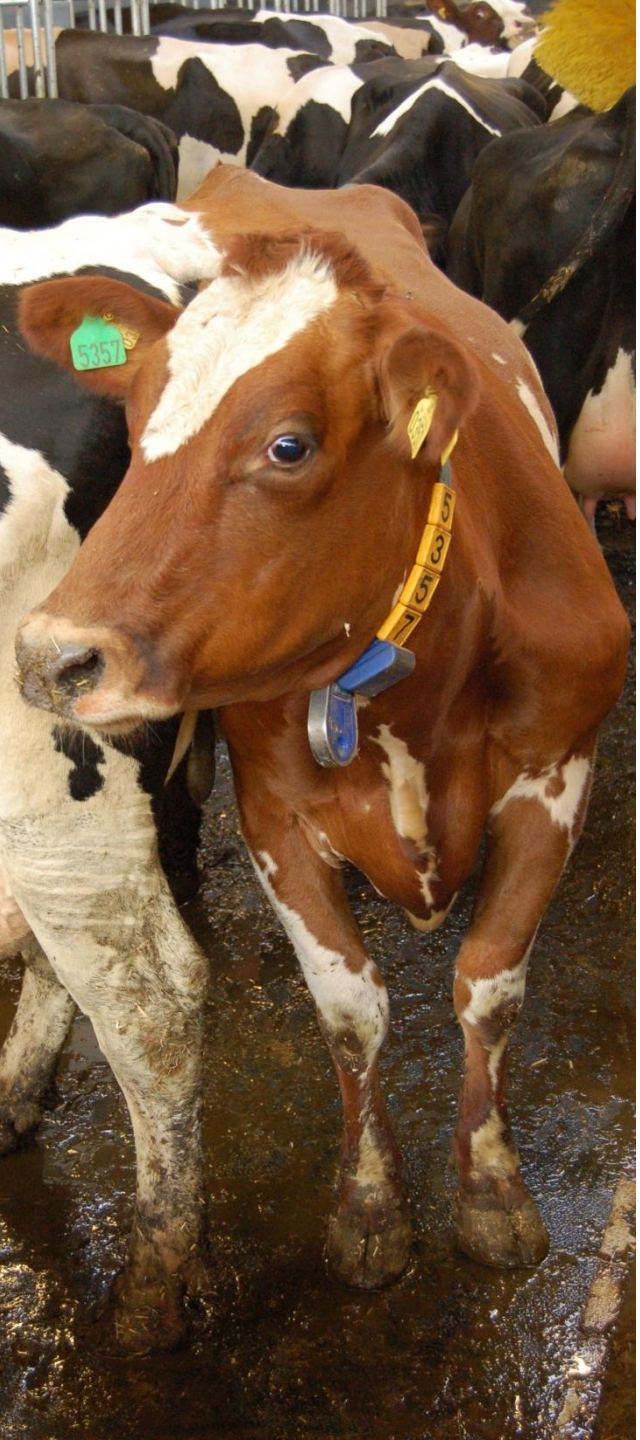

Data editing

Data for analysis included:

- Herds with ≥ 20 cows
- Yearly mortality rate < 40 events per 100 cow-years

6898 herds

Variables of interest

- Year — 8 classes, one for each year
- Breed — 3 classes, >80% of the herd pure-bred
- Calving interval — 4 classes, after quartiles
- Region — 6 classes
- Pasture period — 3 classes
- Herd size — 4 classes
- Season — 3 classes
- Milk yield — 4 classes, after quartiles

Collinearity
spearman's rank-order correlation coefficients

Statistical analysis

- Negative binomial regression
  over-dispersed count data
- Outcome = number of euthanised and dead cows per season and year
  (123659 herd-year-seasons)
- Exposure variable = Herd size
- Adjusted for clustering within herd

Results & Discussion

```
                    current                                   memory usage
    settable         value      description                   (1M = 1024k)
-------------------------------------------------------------------------
    set maxvar        5000      max. variables allowed              1.947M
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.                 xi: nbreg sum_season_sa i.mko_seas i.kontar i.k_ecm i.ras i.region i.k_ki, ///
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i.mko_seas        _Imko_seas_11-43    (naturally coded; _Imko_seas_11 omitted)
i.kontar          _Ikontar_203-910    (naturally coded; _Ikontar_203 omitted)
i.k_ecm           _Ik_ecm_1-4         (naturally coded; _Ik_ecm_1 omitted)
i.ras
i.region
i.k_ki
> d)

Negative binomial
Dispersion
Log pseudolikeliho
```
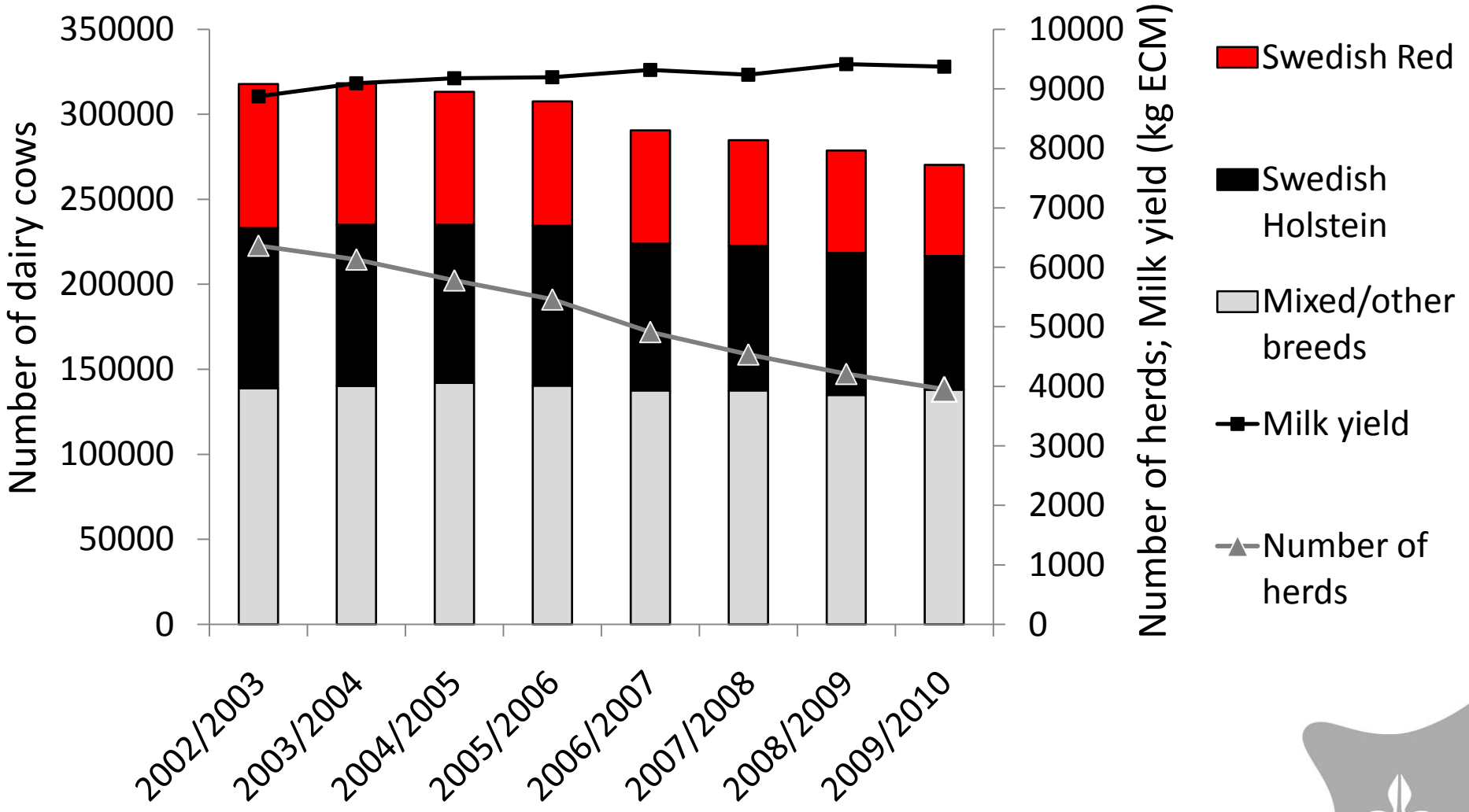
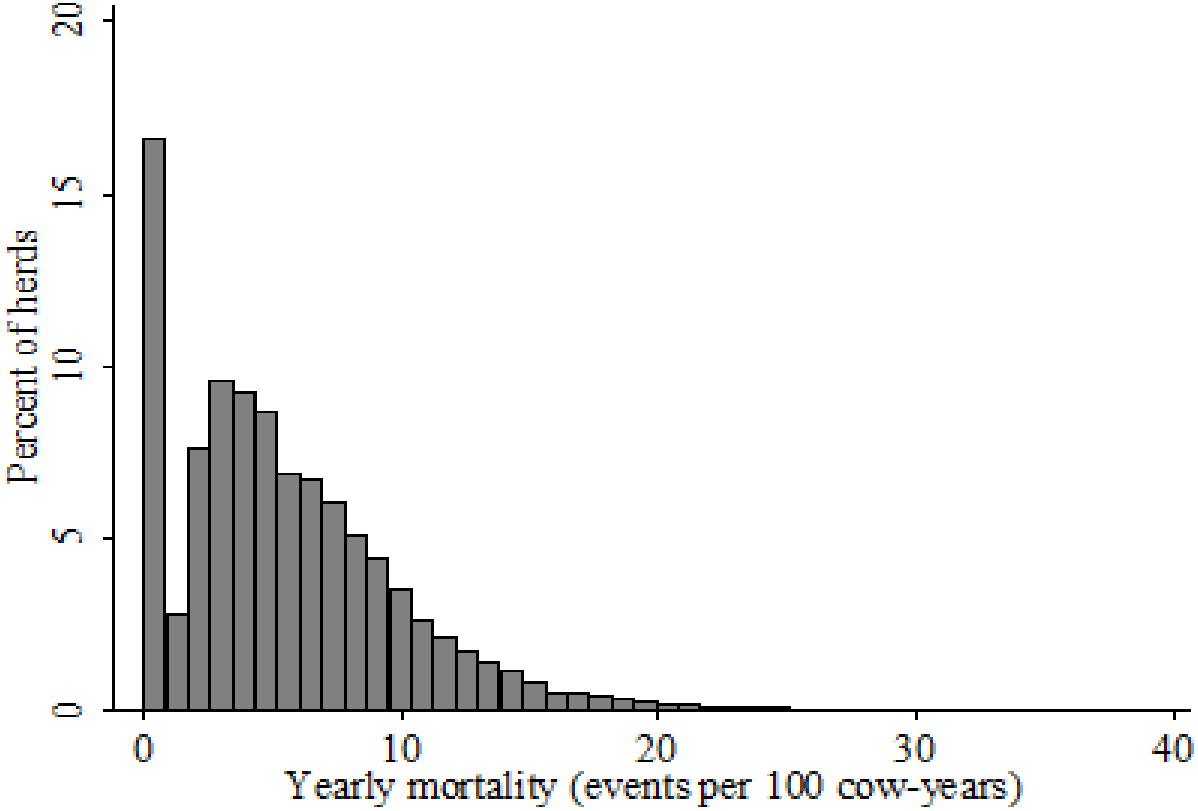

Descriptive statistics

Analysis

sum_season~a						
_Imko_sea~12	1					
_Imko_sea~13	1					
_Imko_sea~21	1					
_Imko_sea~22	1					
_Imko_sea~23	1					
_Imko_sea~31	1					
_Imko_sea~32						
_Imko_sea~33						
_Imko_sea~41	1.690793	.0504844	17.59	0.000	1.594686	1.792694
_Imko_sea~42	1.720045	.0499771	18.67	0.000	1.624828	1.820841
_Imko_sea~43	1.891036	.0552273	21.82	0.000	1.785832	2.002438
_Ikontar_304	1.035426	.0127392	2.83	0.005	1.010757	1.060698
_Ikontar_405	1.148003	.0146467	10.82	0.000	1.119652	1.177072
_Ikontar_506	1.168574	.0148576	12.25	0.000	1.139814	1.198061
_Ikontar_607	1.17351	.0157473	11.92	0.000	1.143048	1.204784
_Ikontar_708	1.097819	.0152297	6.73	0.000	1.068372	1.128079
_Ikontar_809	1.200144	.0169256	12.94	0.000	1.167425	1.233781
_Ikontar_910	1.217481	.0176223	13.60	0.000	1.183427	1.252515
_Ik_ecm_2	.9652272	.0146672	-2.33	0.020	.9369039	.9944068
_Ik_ecm_3	.9035707	.0150321	-6.10	0.000	.8745835	.9335187
_Ik_ecm_4	.8800205	.0155392	-7.24	0.000	.8500852	.91101
_Iras_2	1.275623	.024217	12.82	0.000	1.229031	1.323982
_Iras_9	1.154261	.0178741	9.26	0.000	1.119755	1.189831
_Iregion_2	1.099625	.0270736	3.86	0.000	1.047822	1.153989
_Iregion_3	.9902547	.0240303	-0.40	0.687	.9442587	1.038491
_Iregion_4	1.045766	.0360005	1.30	0.194	.9775337	1.11876
_Iregion_5	1.035055	.0356055	1.00	0.317	.9675696	1.107246
_Iregion_6	1.126725	.03246	4.14	0.000	1.064867	1.192176
_Ik_ki_2	1.054636	.0137255	4.09	0.000	1.028075	1.081884
_Ik_ki_3	1.141967	.0169801	8.93	0.000	1.109167	1.175737
_Ik_ki_4	1.262448	.0210891	13.95	0.000	1.221783	1.304466
hrdsize	(exposure)					
/lnalpha	-1.484613	.0334651			-1.550203	-1.419023
alpha	.22659	.0075829			.2122048	.2419504

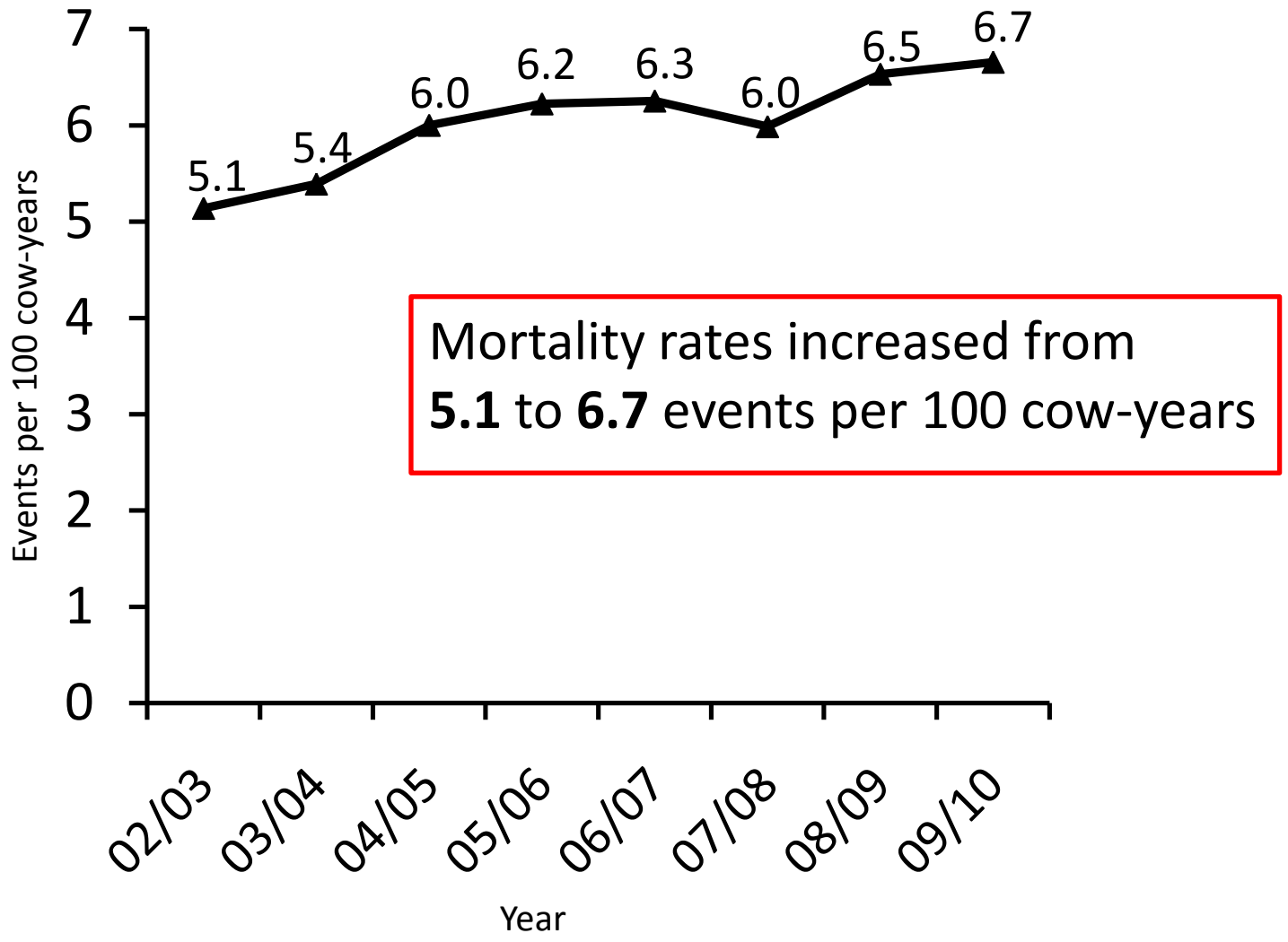
Number of cows in different breeds, herd average milk yield per cow and total number of herds

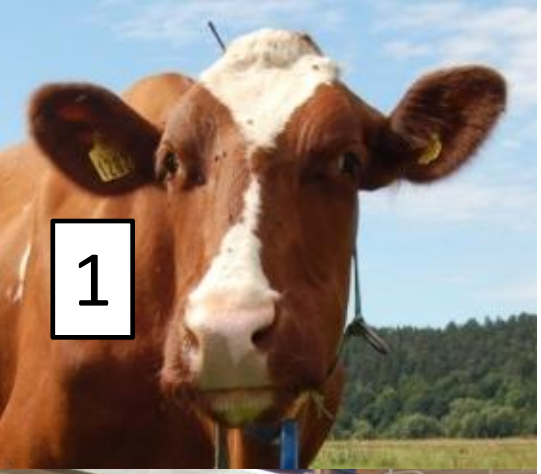




Distribution of mortality events per 100 cow-years in 6,898 Swedish dairy herds in the period September 2002 to August 2010

Incidence rate of euthanized and dead cows in 6,898 dairy herds during September 1st 2002 to August 31st 2010





Mortality rates in different breeds

- Differences in size and conformation
- SH have high mortality in previous studies[1]
- SH higher incidence of common production diseases[2]
- SH higher risk of culling compared to SR[3]

[1] Hare *et al.* (2006); Thomsen *et al.* (2006); Raboisson *et al.* (2011)

[2] Nyman *et al.* (2007)

[3] del P. Schnider *et al.* (2007)

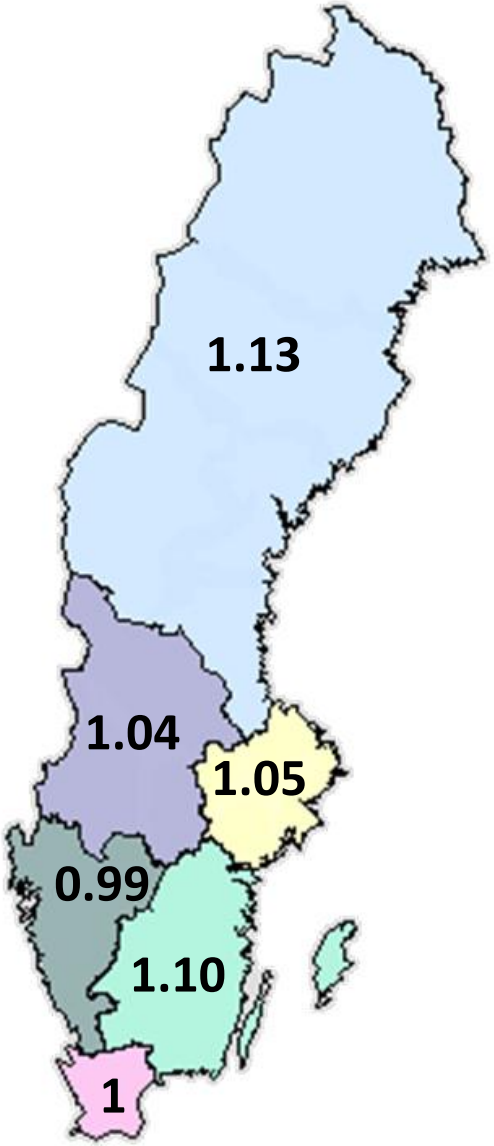
Mortality rates in different calving intervals

CI (days)	MR
< 389	1
389 – 403	1.05
404 – 421	1.14
≥ 422	1.26

- Calving = Critical period
- 30-65% of all mortality occur during the first month of lactation[1]
- Highest rates first few days after calving

[1]Thomsen *et al.* (2004); Milian-Suazo *et al.* (1988); Menzies *et al.* (1995)

Mortality rates in different regions



Pasture	MR
2 months	1
3 months	0.94
4 months	0.90

Herd size x Season

Larger herd size = higher mortality

Smaller effects of season when herd size increases

Mortality rates in different seasons:

Summer ↑ higher risk

Autumn-Winter ↓ reduced risk

Autumn-Winter (Sept. 1 - Dec. 31), Winter-Spring (Jan. 1 - Apr. 31), Summer (May 1 - Aug. 31)

Herd size x Season

- Generally less time to spend on individual cows
- Separate treatment becomes more complicated
- Difficulties with pasture management

- A negative effect of the previous indoor-period?
- Increased stress on pasture?
- Less frequent observation at pasture?

Pasture is associated with reduced mortality in Danish herds[1]

[1]Burow *et al.* (2011); Thomsen *et al.* (2006)

Photo: T. Manske

Mortality rates in different milk yields

kg ECM	MR
< 8525	1
8525 – 9290	0.97
9291 – 9980	0.90
≥ 9981	0.88

A matter of management!

Conclusions

- On-farm cow mortality has increased over the last decade in Sweden
- Higher mortality associated with:
  long calving intervals and low milk yields
  Holstein breed
  large herd size and during Summer season
- There were regional differences

THANK YOU ALL FOR YOUR ATTENTION!

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