

# Determining property-level rates of breeder cow mortality in northern Australia



# This presentation

- Background
- Approach
- Results
- Recommendations



# Who did the work

- Alastair Henderson
- Nigel Perkins
- Steve Banney



# Why this research

- Little reliability of on-property levels of breeder cow mortality
- Producer surveys: 3-4%
- Published papers: 6% to 40% (av.11-13%)
- Inadequate property herd records and the extensive production system
- Important profit driver

# Project objectives

1. Develop and test an indirect method for estimating breeder mortality and possible contributing causes, retrospectively over a period of 3-5 years using readily available property herd and turn-off data combined with simple herd modelling.

# Project objectives

2. Collect and analyse data from at least 5 properties in each of the following 6 regions:  
Pilbara, Kimberley, Katherine, Barkly  
Tablelands, Alice Springs and the Gulf region of  
Queensland.

# Project objectives

3. Collect property-level data on management practices and meteorological data over the same period which may explain some of the variation detected.

# Project objectives

4. Report on breeder cow mortality in each of the six regions, speculate on causal influences, provide recommendations for future research, development or extension activities to cost-efficiently reduce mortality rates and make recommendations for improvements to data collection and monitoring systems.



## Scale and time frame

- 45 properties
- 36 sets of usable data - females
- 9 regions
- Period of 3 to 9 years (2002-2011)
- ~ 540,000 females

# Regions

1. Queensland southern Gulf
2. Queensland northern Gulf
3. Northern Territory Barkly Tableland
4. Northern Territory Gulf/Katherine/Sturt Plateau
5. Northern Territory Alice Springs
6. NT Victoria River district
7. Kimberley East
8. Kimberley West
9. Pilbara.

# Data collection

- Mostly during property visits
- Template of questions
- Interrogation of management on the validity of the data, seasonal conditions, land types and property management practices.

# Quality of data

- Random selection of properties
- Selection criteria:
  - ✓ Minimum 1,000 breeders
  - ✓ Self replacing herd
  - ✓ Willingness to cooperate
  - ✓ Adequate herd records
  - ✓ Confidentiality - consolidated and regional in nature.

## Average annual opening female count for each region.

**n=number of stations**

		Count of opening females		
Region	n	Average	Minimum	Maximum
QLD SG	6	13,649	1,339	30,233
QLD NG	2	14,598	2,605	26,592
NT Barkly	6	27,598	7,749	53,148
NT GKS	3	8,304	4,214	16,212
NT ASpr	4	3,555	1,976	4,557
NT VRD	4	19,927	9,299	27,304
WA EKimb	3	21,742	5,240	30,222
WA WKimb	5	11,425	6,269	14,998
WA Pilb	3	4,954	2,232	7,225
<b>Total</b>	<b>36</b>	<b>14,798</b>	<b>1,339</b>	<b>53,148</b>

~530,000 total females

# Mortality calculations

- BCOWPLUS herd model
- Principles of a static, self-replacing herd
- Significant numbers of both female and male cattle move in and out
  
- Alternative developed
- Livestock inventory schedule

# Mortality defined

- **Death rate** = No. deaths / No. animals at risk  
(in a 12 month period)
- 1 animal present for the year contributes 1 animal year to denominator
- **Adjusted females at risk is:**  
Opening + 0.5\*branded heifers + 0.5\*purchased females

# Livestock inventory schedule

- Populate a livestock inventory schedule
- Over a number of consecutive years
- Herd records are simple
- Validation - herd data from two large pastoral companies
- A livestock mortality calculator was born.

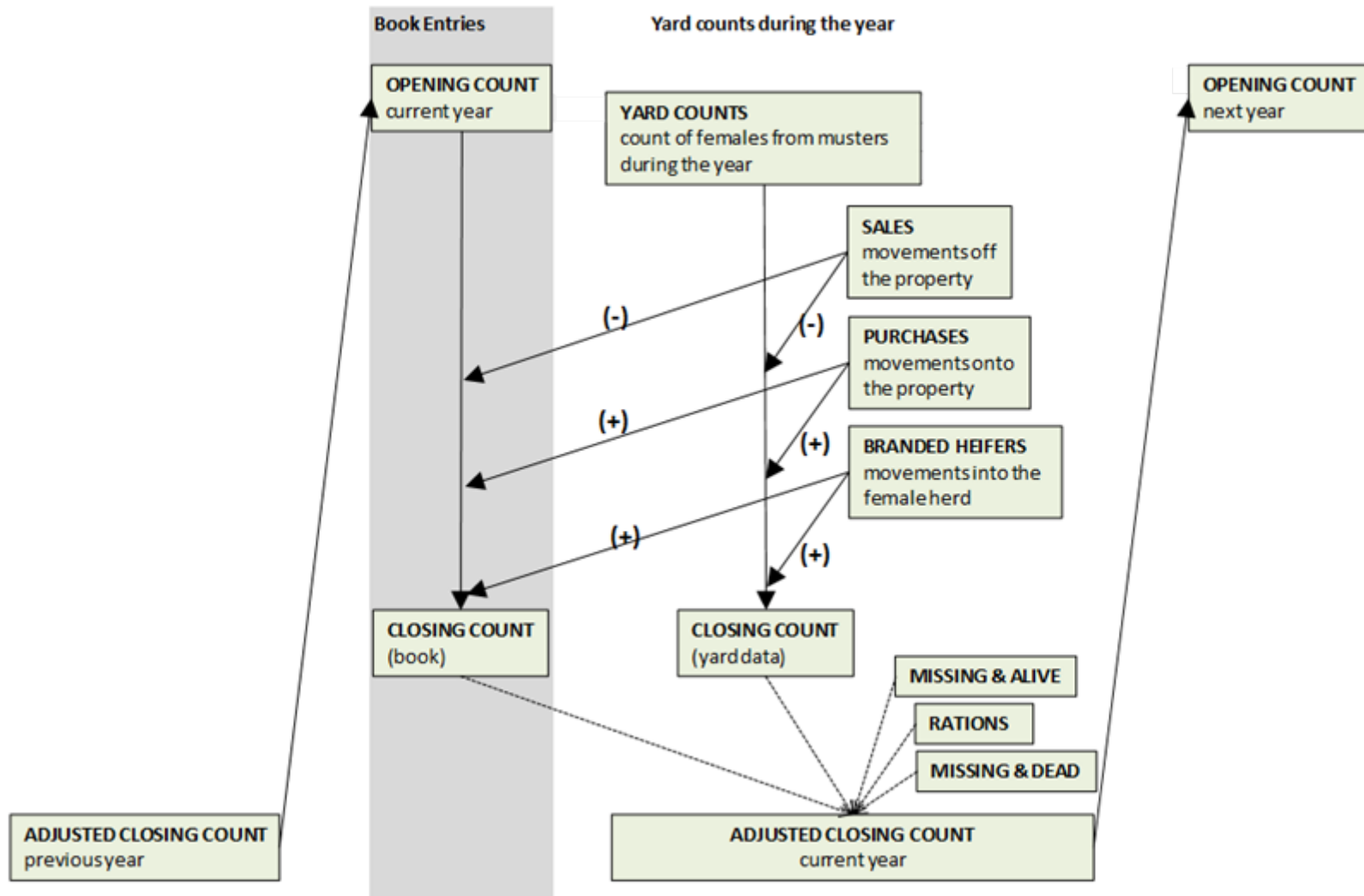


# Livestock inventory schedule

Minimum inputs:

- Opening total female number
- Opening breeder number
- Branded number
- Female sales
- Female purchases
- Closing book female number.

# Livestock inventory flow chart



# Livestock inventory schedule

Mortality Calculator	Year 1	Year 2	Year 3	Year 4	Year 5	ALL
Opening female	25505	29311	32799	22836	22425	132959
Opening breeder	18293	16331	17896	18860	18920	90300
Branded	11527	10183	9194	9238	12375	52517
Est'd branded heifers	5764	5092	4597	4619	6188	26259
At-risk non-breeding females	10094	15526	17202	6286	6599	55788
At-risk_females (open_fem+0.5*brd_heif+0.5*purchase)	28387	31857	35098	25146	25519	146088
Proportion branded=male	0.5	0.5	0.5	0.5	0.5	0.5
Female sales	1698	1248	8173	5020	3526	19665
Female purchases	0	0	0	0	0	0
Closing females (adjusted count)	29311	32799	22836	22425	23624	130995
Closing females (book count)	29571	33155	29223	22435	25087	139553
Estimated deaths in all females (difference)	260	356	6387	10	1463	8558
<b>Female deaths as % of At-risk females</b>	<b>0.91%</b>	<b>1.12%</b>	<b>18.20%</b>	<b>0.04%</b>	<b>5.73%</b>	<b>5.86%</b>
Assumed death rate in non-breeding females						<b>0.03</b>
Estimated deaths in non-breeding females						1674
Estimated deaths in breeding females						6884
<b>Estimated % deaths in breeders</b>						<b>7.6%</b>

# Data analysis

- Mortality estimates for total females, breeders and males
- Variables including season and management practices
- Univariable (a single explanatory factor)
- Multivariable (many explanatory factors)
- Relative risk

Questions/comments?

# Data interpretation

- Most suitable indicator of breeder cow mortality was the total female death rate.
- Breeder mortality requires more assumptions and is more difficult to estimate accurately
- Includes non-breeding and breeding females and is a rational proxy for the breeder death rate.
- Most cases, the breeder death rate will be slightly higher than the total female death rate

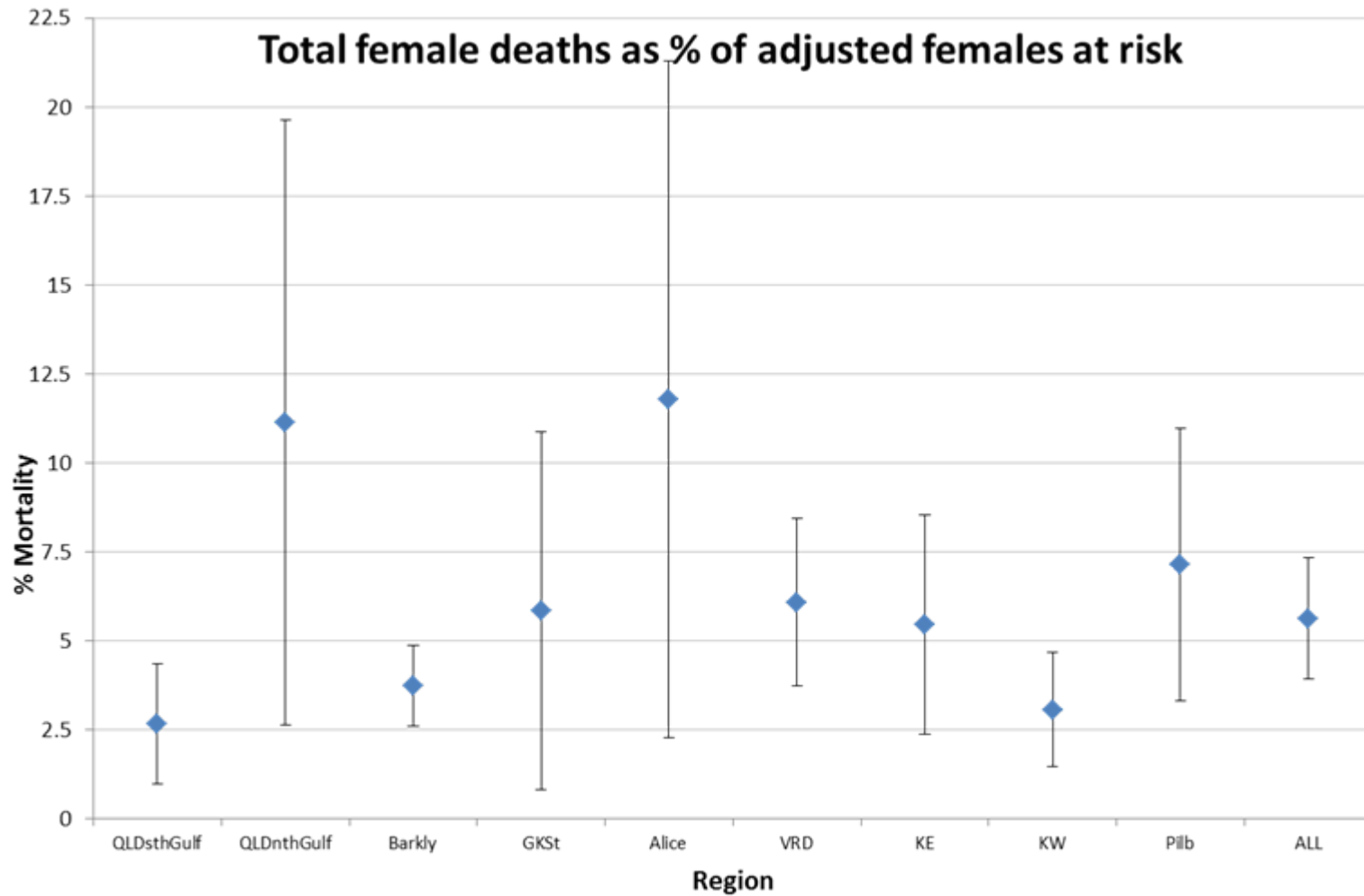
## Female mortality rate by region

	No of properties	Mortality rate	95% Confidence interval	
Region		%	Lower	Upper
QLD SGulf	6	2.68	0.99	4.37
QLD NGulf	2	11.14	2.65	19.64
NT Barkly	6	3.74	2.59	4.88
NT GKS	3	5.86	0.83	10.89
NT ASpr	4	11.80	2.30	21.31
NT VRD	4	6.09	3.73	8.46
WA EKimb	3	5.46	2.37	8.55
WA WKimb	5	3.08	1.48	4.68
WA Pilb	3	7.14	3.32	10.97
Total	36	5.64	3.93	7.35

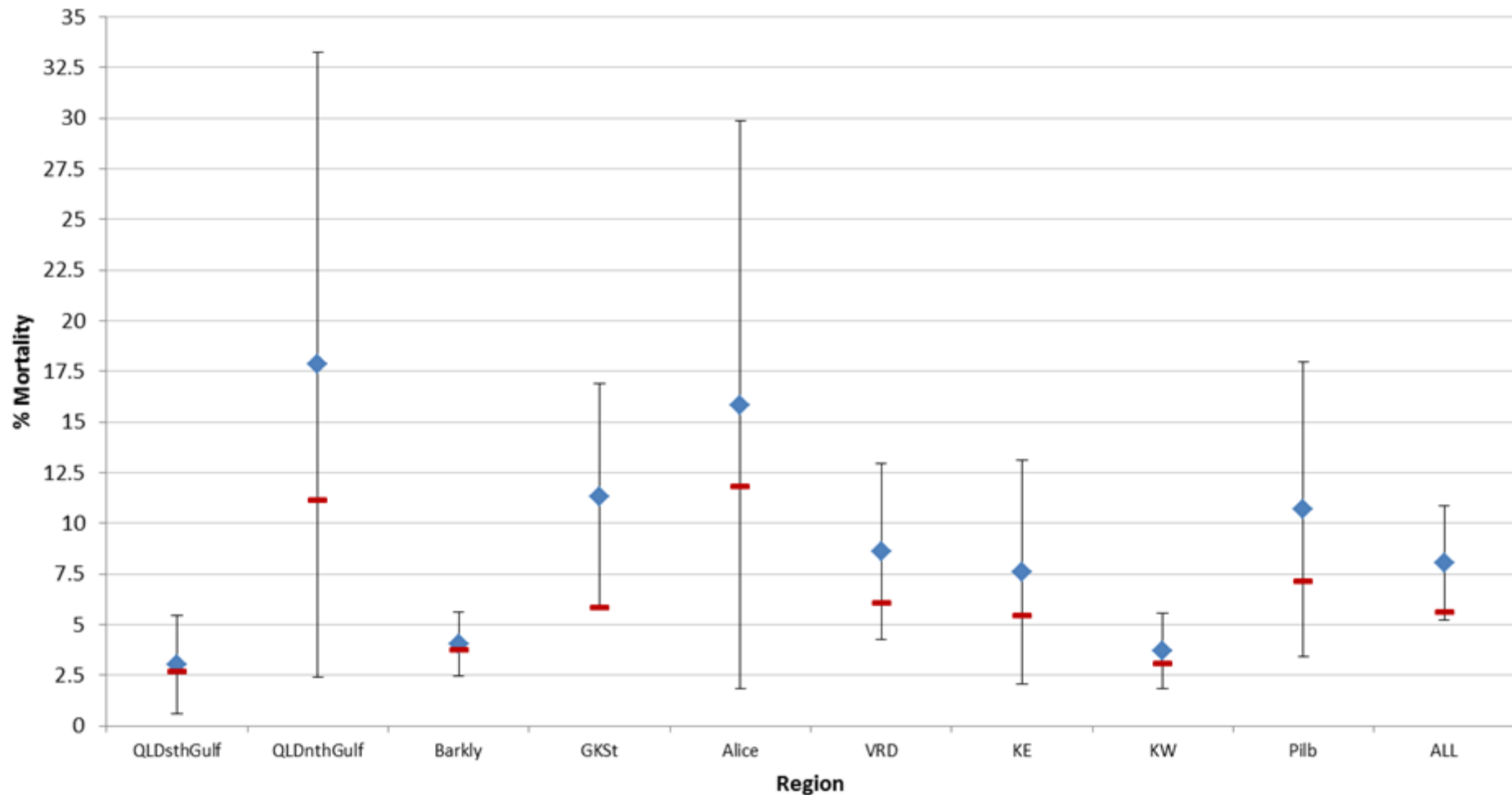
## Mortality rates by region for all females and breeders

	Mortality rates (%)	
Region	Total female	Breeders
QLD SG	2.68	3.01
QLD NG	11.14	17.84
NT Barkly	3.74	4.04
NT GKS	5.86	11.30
NT ASpr	11.80	15.85
NT VRD	6.09	8.58
WA EKimb	5.46	7.58
WA WKimb	3.08	3.70
WA Pilb	7.14	10.68
ALL	5.64	8.03

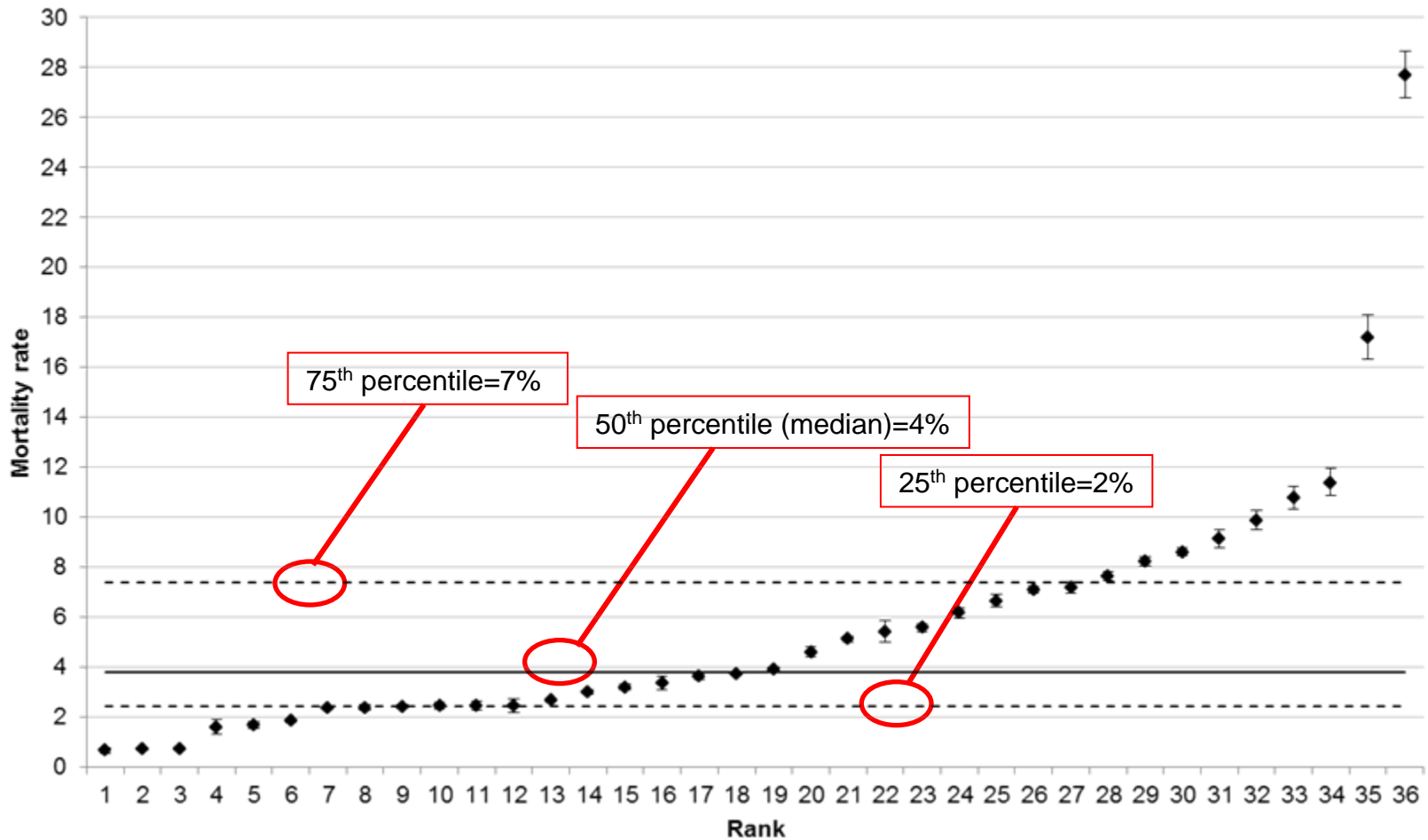




## Breeder deaths as % of adjusted breeders at risk



## Total female mortality rate (%)



## Significant variables

Significant variables	
Age females last joined	Region
Age females weaned (p=0.08)	Controlled mating
Age females culled	Dry season segregation

## Other variables screened:

Rainfall, Phosphorous, Botulism, Age at 1<sup>st</sup> weaning, Month of peak calving, Natural disasters, Age steers sold, Mustering efficiency, Frequency of bangtail musters, Weaning rounds, Joining heifers separately, nitrogen

Questions/comments?

# POLL- AGE

# Age of females at last joining

(p=0.003)



Age at last joining	Mort rate
Up to 10 yrs.	4.29
>10 yrs.	8.03
	RR
>10 vs. up to 10	1.87

**Mort rate:** animal deaths per 100 animals per year, or % deaths per year

**Relative Risk:** Properties where the age of females at last joining was >10 yrs, had a 1.87 times higher risk of death compared to properties where the age at last joining was <10 yrs.

Reducing age at last joining associated with 47% reduction in female mortality rate.

# Age of females at last weaning

(p=0.08)



Age at last weaning	Mort rate
Up to 11 yrs.	4.67
>11 yrs.	7.36
	RR
>11 vs. up to 11	1.57

**Relative Risk:** Properties where the age of females at last weaning was >11 yrs, had a 1.57 times higher risk of death compared to properties where the age at last weaning was up to 11 yrs.

**If age at last weaning was <11 yrs., associated with a 37% reduction in female mortality.**



# Age of females at culling

(p=0.01)



Age culls sold	Mort rate
Up to 11 yrs.	3.98
11 to 12 yrs.	6.07
>12 yrs.	7.82
	RR
11-12 vs. up to 11	1.53
>12 vs. up to 11	1.97
>12 vs. 11-12	1.29

Relative Risk: Properties where the age of females at culling was >12 yrs had a:

1.29 times higher risk of death compared to properties where the age of females at culling was 11-12 yrs;

1.97 times higher risk of death compared to properties where the age of females at culling was up to 11 yrs.

If age of females at culling is up to 11 yrs, this may reduce overall female mortality by 49%.

# Wet season phosphorous

(p=0.5)



P supp. during wet	Mort rate
No	7.05
Whole herd	5.26
Part of herd	4.69
	RR
No vs. whole herd	1.34
No vs. part herd	1.50
Whole herd vs. part herd	1.12

Relative Risk: Properties where there was no wet season P supp had a:

1.50 times higher risk of death compared to properties where wet season P was provided to part of the herd.

The maximal benefits of P supp. in females may be up to 50% reduction in overall female mortality.

This effect appears to be enhanced in older cows.

# Dry season segregation of breeders

( $p = .009$ )



<b>Dry season segregation</b>	<b>Mort rate</b>
<b>No</b>	<b>8.77</b>
<b>Yes</b>	<b>2.56</b>
	<b>RR</b>
<b>No vs. Yes</b>	<b>3.42</b>

**RR: Properties which did not practise dry season segregation of breeders had a:**

**3.42 times higher risk of death compared to properties did practise dry season segregation of breeders.**

**Properties which segregate breeders during the dry season can have up to a 71% reduction in overall female mortality.**

**Attributed to other management decisions such as better access to feed or targeted group supplementation.**

# Male cattle

Region	Mortality rates (deaths per 100 animals per year)		
	Total female	Breeders	Steers
QLD SG	2.68	3.01	6.71
QLD NG	11.14	17.84	24.89
NT Barkly	3.74	4.04	6.25
NT GKS	5.86	11.30	13.93
NT ASpr	11.80	15.85	5.48
NT VRD	6.09	8.58	7.75
WA EKimb	5.46	7.58	7.52
WA WKimb	3.08	3.70	4.17
WA Pilb	7.14	10.68	17.97
ALL	5.64	8.03	8.80

# Mortality calculator

- Version 1 – less records
- Version 2 – more detailed records
- See Excel tools

## Future R&D?

1. Re-examine economics of changing practices to reduce mortalities
2. Challenge high mortality properties to demonstrate a reduction in mortality over a number of years
3. Monitor and report using mortality calculator tool with these demonstration properties

## Extension?

- Keep records
- Mortality calculator
- Cull for age
- Wet season P
- BCOWPLUS

# Questions/comments?





# Questions?

How many females in northern Australia?

Cows & heifers joined 30 June 2010: 6,540,000 (ABARES)

What does a 1% drop in mortality represent?

65,400 additional females

How would this affect the northern beef industry?

# POLL - RESEARCH