finalreport

Project code: P.PSH.0547

Prepared by: Nigel Perkins

AusVet Animal Health Services Pty Ltd

Date published: Feb 2013

ISBN:

PUBLISHED BY

Meat & Livestock Australia Limited
Locked Bag 991
NORTH SYDNEY NSW 2059

Animal health survey of the Australian feedlot industry (2010)

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

This publication is published by Meat & Livestock Australia Limited ABN 39 081 678 364 (MLA). Care is taken to ensure the accuracy of the information contained in this publication. However MLA cannot accept responsibility for the accuracy or completeness of the information or opinions contained in the publication. You should make your own enquiries before making decisions concerning your interests. Reproduction in whole or in part of this publication is prohibited without prior written consent of MLA.

Abstract

This report presents findings from a survey involving collection of data and information from 47 feedlots that were randomly selected from all accredited feedlots in Australia. The target number of responses was 57 and the survey team received response from 47 feedlots (82.5% of the target number and 39% of the 121 feedlots that were contacted to ask if they would participate).

All 47 participating feedlots provided responses to the questionnaire component of the survey and 13 feedlots provided some form of electronic data as well. Of these 10 feedlots were found to have provided electronic data that could be used to produce summary statistics for weight gain (ADG) and six feedlots provided detailed data at the individual animal level that could be used to summarise morbidity (pulls) and mortality rates.

Responses from the questionnaire were aggregated and analysed to produce summary statistics that can be used to describe patterns and performance in Australian feedlots and management practices. Detailed electronic files were also provided by feedlots in the larger two size categories, allowing production of summary information on weight gain and patterns of pulls and mortalities based both on calendar month and weeks on feed.

The annual cost of all losses due to pulls and deaths across the Australian feedlot industry is estimated to be more than $50 million per year and is equivalent to a cost of about $22,000 per 1000 head turned off.

It is recommended that consideration be given to a study that assesses the potential usefulness and availability, accessibility and statistical quality of retrospective records from the feedlot industry for the purpose of risk factor analyses for bovine respiratory disease in feedlot cattle.

Executive Summary

This report presents findings from a survey conducted in 2011 of a randomly selected set of Australian feedlots. A total of 121 feedlots were selected from each of four size strata with selection probability weighted more heavily for the larger feedlot size categories. The target number of responses was 57 and the survey team received response from 47 feedlots (82.5% of the target number and 39% of the 121 feedlots that were contacted to ask if they would participate).

All 47 participating feedlots provided responses to the questionnaire component of the survey and 13 feedlots provided some form of electronic data as well. Of these 10 feedlots were found to have provided electronic data that could be used to produce summary statistics for weight gain (ADG) and six feedlots provided detailed data at the individual animal level that could be used to summarise morbidity (pulls) and mortality rates.

Responses from the questionnaire were aggregated and analysed to produce summary statistics that can be used to describe patterns and performance in Australian feedlots and management practices. The results provide a useful summary of management practices across all feedlots in Australia with summaries presented by size category and with separate results for the two states with most feedlots (NSW and QLD). These results are considered able to be extrapolated to the overall population of all feedlots in Australia because of the random selection process applied in choosing feedlots for inclusion in the study and the fact that all size classes and multiple states were represented in the survey.

Detailed electronic files were provided by feedlots in the larger two size categories and provide very useful summary information on performance and in particular patterns of pulls and mortalities based both on calendar month and weeks on feed. Since these records were only obtained from larger feedlots (no electronic files were obtained from feedlots in the smallest size category and most records were from feedlots in the largest category), the findings from these analyses may not represent performance in all feedlots. Since most of the cattle on feed in Australia are likely to be held in the larger feedlots, the findings from these analyses are still of direct use for the industry.

There is a clear pattern in induction of cattle with a peak in March that is comprised of <85 day cattle and cattle in the 85 to <120 day class. There is then a second peak in inductions in August that is comprised of cattle in the 85 to <120 day and 120 to <250 day classes.

Pull rates and mortality rates are presented by month of the year and by week on feed. There is a clear association between pull rates and mortality rates with pull rates rising and falling about a week ahead of mortality rates.

The highest mortality rates are seen in animals in the shortest feed duration (<85 days) and the lowest mortality rates in the animals in the longest market feed class (>250 days on feed).

Respiratory disease is the major cause of morbidity and mortality by a very clear margin.

There is also an association between mortality rates and weeks on feed, particularly for animals in the shorter three market classes (<85d, 85 to <120d and 120 to <250d). There is a progressive rise in mortality rate from the first week on feed to a peak between 4 and 6 weeks on feed. There is then a progressive decline to levels that are not different to the first week rate by about week 12 to 15. Given that the shortest feed category (<85d) are generally finished by about week 12, the mortality rate at the end of the feed period is still significantly higher than the rate in the first week on feed. In other feed categories the mortality rate continues to decline over time to a rate not different to the first week. This pattern appears to be very consistent across the three market feed classes and independent of the time of year when animals enter the feedlot. This information has potential ramifications for management of feedlots and animals to minimise disease risk.

Results of the current survey have been compared to findings in the previous two surveys of performance in Australian feedlots. Using the findings of the current survey it is estimated that the annual cost of all losses due to pulls and deaths across the Australian feedlot industry is more than $50 million per year and is equivalent to a cost of about $22,000 per 1000 head turned off. Using an achievable target based on the threshold separating the best performing 25% of feedlots in the current survey (for mortality rates) it is postulated that industry can achieve a 20% reduction in disease costs, representing a saving of about $10.6 million per year.

This study has provided very useful descriptions of common management practices across feedlots in Australia. It has relied on collection of survey information through a questionnaire, and through limited provision of retrospective electronic records. Questionnaire data do not allow detailed analysis to identify risk factors that may be influencing morbidity or mortality risk. Similarly the electronic records obtained during this study did not contain information on risk factors. As a result this study has been limited to largely descriptive analyses.

It is recommended that consideration be given to a study that assesses the potential usefulness and availability, accessibility and statistical quality of retrospective records from the feedlot industry for the purpose of risk factor analyses for bovine respiratory disease in feedlot cattle.

Contents

1 Background

Previous studies have examined and described diseases in Australian feedlot cattle including a survey conducted in 1990 (Dunn et al 1991), followed by a detailed prospective study involving six feedlots from eastern Australia (Dunn et al 2000) and a follow-up survey of feedlot diseases reported in 2001 (Sergeant 2001). An updated literature review on feedlot diseases was completed in conjunction with this report. These reports provide valuable records of morbidity and mortality in Australian feedlots. The current study was developed to collect data and information from a representative sample of Australian feedlots in order to describe management practices and performance (growth, morbidity and mortality) in Australian feedlot cattle.

2 Project objectives

1. Conduct an animal health survey of Australian feedlots to collect baseline data on current feedlot animal health practices and the incidence, significance, causes and costs of disease and deaths in feedlot cattle.

2. Exploration of the patterns of occurrence of BRD in particular, to determine the driving factors.

3. Undertake a comparative analysis of current survey results with those from previous surveys to identify trends and parameters that have improved/worsened since previous survey information was collected.

4. Provide two written reports on the project outcomes:
   a. a comprehensive report for internal use only; and
   b. a public report that will be made available through the MLA website.

3 Methods

3.1 Development of methods

Project team meetings were held in Brisbane on 21 December 2010 and Wednesday 9 March 2011 to finalise design & data collection strategies. Participants at the first project meeting included Mr Des Rinehart (MLA), Nigel Perkins (Chairperson), Robyn Tynan, Jane Campbell, Des Rinehart, Jim Cudmore (ALFA), Tristan Jubb, Lee Taylor, Kev Sullivan, David Frith, Paul Cusack, Tamsin Barnes. The second meeting was restricted to the core project team and included Jane Campbell, Nigel Perkins, Tristan Jubb, Evan Sergeant and John House.

A draft questionnaire and approach for collection of electronic data were developed and tested on five feedlots (two from Queensland, two from Victoria and one from New South Wales). The pilot feedlots provided feedback on the questionnaire design and process that resulted in changes to the questionnaire for the main data collection process.

The final questionnaire was then developed and used for the main part of the study. A copy of the questionnaire is provided in the appendix to this report. The questionnaire was purposefully developed to cover similar broad issues to those raised in previous surveys while also including some modifications based on issues of current relevance for the Australian feedlot industry.

3.2 Selection of feedlots

Feedlots were selected from a list of feedlots accredited with AusMeat Ltd[1] through the National Feedlot Accreditation Scheme (NFAS).

In order to prepare sample size estimates preliminary information on estimated numbers of feedlots by size category and state were obtained from the Australian Lot Feeders' Association (ALFA)[2].

Table 1: Count of number of feedlots by capacity and state. Obtained from ALFA on 16 Dec 2010.

State	<1000	1000-5000	5001-10000	>10000	total
NSW	47	16	6	11	80
QLD	171	41	14	13	239
Vict	11	4	0	2	17
Tas				1	1
SA	19	7			26
WA	31	14	1		46
TOTAL	279	82	21	27	409

An attempt was then made to produce targets for sample sizes in each combination of size category and state so that the survey may be able to produce valid estimators for performance and health conditions for each of these combinations.

Table 2: Draft table of proposed sample sizes for each combination of state and capacity

SAMPLE	<1000	1000-5000	5001-10000	>10000	total
NSW	5	4	4	5	18
QLD	6	4	6	5	21
Vict	3	2	0	1	6
SA	3	2			5
WA	3	3	1	?	7
TOTAL	20	15	11	11	**57**

Note that the sample of 20 feedlots from the smallest size strata is about 7% of the total number of feedlots in this strata. In contrast, even though a smaller sample size is being proposed for the strata of larger capacities (10 to 12 feedlots from each of the biggest two strata) these samples represent 40-52% of the total number of feedlots. The key issue is that the samples from each strata were large enough to make inferences about findings in that strata and also to allow comparisons

[1] www.ausmeat.com.au
[2] http://www.feedlots.com.au

between strata. In addition there were sufficient samples proposed from each state to allow comparisons between states.

It was also noted that a separate project currently being funded by Meat and Livestock Australia was operating and aiming to collect detailed samples and information on Bovine Respiratory Disease (BRD) in Australian feedlots. This project, called The National BRD Initiative, involved about 10-12 feedlots mainly from the upper two size strata, at the time that the current project was being implemented. A decision was made to purposefully enrol any project cooperating with The National BRD Initiative into the current project. This meant that the proposed total sample from each strata would include the combination of purposeful selection of feedlots already in the National BRD Initiative and additional randomly selected feedlots as needed to make up the total sample size based on the targets identified in Table 2.

A sampling frame of accredited feedlots was categorised by state and size category and then a random sampling routine was performed in a spreadsheet to produce a list of selected feedlots. The initial list of selected feedlots numbered 121 feedlots (more than double the target). Selected feedlots were then contacted in order of selection until target numbers of cooperating feedlots were achieved. By the time the enrolment phase had been completed, all of the feedlots on this initial list had been contacted.

Feedlots were contacted by phone and letter to provide explanation about the project and to ask for cooperation. Follow up contacts were then made mainly by telephone and email. Feedlots that responded with a clear negative message were not contacted again. A number of feedlots were then personally visited by a project team member to facilitate collection of information, including feedlots in Western Australia, Victoria, New South Wales and Queensland.

3.3 Data collection and analysis

Feedlots that agreed to cooperate in the study were then sent a copy of the questionnaire either by mail or as a file attachment (PDF file format) to an email. A specific project team member was then tasked with particular regions to follow-up with cooperating feedlots, answer queries and ensure timely provision of information. Stamped, return-addressed envelopes were sent to feedlots on request to facilitate return of completed questionnaires.

In general cooperating feedlots required variable and often repeated communication and occasionally visits. A specific visit by a project team member to Western Australia was adopted following a poor initial response to telephone contacts of selected feedlots in that state seeking cooperation. In-person visits definitely improved the likelihood of feedlots agreeing to cooperate and of receiving a completed questionnaire from participating feedlots.

The questionnaire was divided into two parts. Part A was designed to be completed in paper form by all participating feedlots.

Part B included questions on feedlot performance and mortality estimates and participating feedlots were provided with two options for completing this part of the questionnaire. One option was for the feedlot to provide electronic data files (in spreadsheet or some form of delimited file format), and the other option was for feedlots to complete a limited set of paper forms providing summary estimates of defined outcomes. The questionnaire clearly indicated that electronic records were preferred and that if feedlots were prepared to provide electronic records then there was no need for the paper-based part B of the questionnaire to be completed. If the feedlot was unable or did not wish to provide electronic records, then the feedlot was asked to complete the paper-based version of part B of the questionnaire.

Returned questionnaires and electronic data files were returned to the project team member and then securely archived at a central location. Paper-based questionnaires were then provided to one team member for data entry into a spreadsheet and electronic data files were reviewed and cleaned in preparation for analyses.

Responses from all feedlots were then summarised using standard statistical approaches for count data (proportions and confidence intervals) and continuous outcome data (mean and standard deviation / standard error). Summary statistics were compiled for each state and size category combination and then for size categories overall. Poisson regression was used to estimate incidence rates for mortalities and pulls.

In many cases because there were very few responses from feedlots in SA, Vict and WA, these three states were combined to form a category called other. This allowed many summary statistics to be estimated for NSW, QLD, Other and all states combined.

Statistical analyses were conducted using commercial statistical software (Stata version 11, www.stata.com).

4 Results and discussion

4.1 Australian feedlot capacity and numbers on feed

Summary statistics were sourced from quarterly newsletters produced by the Australian Lot Feeders' Association (ALFA: www.feedlots.com.au) describing feedlot capacity and numbers of cattle on feed for the period of time most directly relevant to this survey (July 2009 to June 2010).

Table 3: Summary statistics for capacity of Australian cattle feedlots, arranged by quarter for the year ending June 2010, state and size class (using four size classes as defined by ALFA). Data sourced from newsletters released periodically on the ALFA web site (www.feedlots.com.au).

Size category ALFA classification	Year & Quarter	State NSW	QLD	SA	Vict	WA	Total by quarter & size
> 10,000 Capacity	Jul-Sept 2009	285,573	314,139	0	52,000	20,000	671,712
	Oct-Dec 2009	285,573	307,406	0	54,505	0	647,484
	Jan-Mar 2010	285,573	307,406	0	54,050	0	647,029
	Apr-June 2010	285,573	322,406	0	60,243	0	668,222
1,000 to 10,000 Capacity	Jul-Sept 2009	111,700	219,520	17,925	26,999	60,900	437,044
	Oct-Dec 2009	111,700	224,366	17,925	24,494	79,900	458,385
	Jan-Mar 2010	109,700	226,642	19,570	24,494	77,700	458,106
	Apr-June 2010	109,700	230,642	20,570	18,756	77,700	457,368
500 to 1,000 Capacity	Jul-Sept 2009	20,603	47,126	7,385	3,973	11,660	90,747
	Oct-Dec 2009	21,602	47,126	7,385	1,000	4,300	81,413
	Jan-Mar 2010	22,202	48,274	7,975	1,000	6,100	85,551
	Apr-June 2010	22,202	48,264	7,975	1,000	5,800	85,241
< 500 Capacity	Jul-Sept 2009	7,499	46,419	3,978	1,225	11,705	70,826
	Oct-Dec 2009	7,499	46,419	3,978	420	19,065	77,381
	Jan-Mar 2010	7,309	44,984	3,290	1,894	15,665	73,142
	Apr-June 2010	7,459	44,558	3,290	420	16,265	71,992
Total by quarter and state	Jul-Sept 2009	425,375	627,204	29,288	84,197	104,265	1,270,329
	Oct-Dec 2009	426,374	625,317	29,288	80,419	103,265	1,264,663
	Jan-Mar 2010	424,784	627,306	30,835	81,438	99,465	1,263,828
	Apr-June 2010	424,934	645,870	31,835	80,419	99,765	1,282,823

Table 4: Summary statistics for numbers of cattle on feed at Australian cattle feedlots, arranged by quarter for the year ending June 2010, state and size class (using four size classes as defined by ALFA). Data sourced from newsletters released periodically on the ALFA web site (www.feedlots.com.au).

Size category ALFA classification	Year & Quarter	State NSW	QLD	SA	Vict	WA	Total by quarter & size
> 10,000							
Numbers on feed	Jul-Sept 2009	175,072	236,673	0	30,097	3,637	445,479
	Oct-Dec 2009	177,448	229,226	0	35,874	0	442,548
	Jan-Mar 2010	148,935	220,264	0	40,848	0	410,047
	Apr-June 2010	164,458	258,052	0	43,588	0	466,098
1,000 to 10,000							
Numbers on feed	Jul-Sept 2009	40,440	161,680	13,613	22,927	6,027	244,687
	Oct-Dec 2009	51,136	175,068	12,604	19,426	24,939	283,173
	Jan-Mar 2010	50,411	146,542	14,007	21,631	23,766	256,357
	Apr-June 2010	49,394	172,199	19,433	13,967	25,771	280,764
500 to 1,000							
Numbers on feed	Jul-Sept 2009	3,054	22,588	3,315	593	0	29,550
	Oct-Dec 2009	7,956	16,758	3,616	0	0	28,330
	Jan-Mar 2010	7,672	12,753	5,911	0	0	26,336
	Apr-June 2010	5,558	18,314	5,665	0	0	29,537
< 500							
Numbers on feed	Jul-Sept 2009	3,317	18,680	934	405	0	23,336
	Oct-Dec 2009	2,039	10,643	1,997	0	1,493	16,172
	Jan-Mar 2010	1,951	8,313	2,245	1,084	4,865	18,458
	Apr-June 2010	3,787	6,742	1,176	0	2,668	14,373
Total by quarter and state	Jul-Sept 2009	221,883	439,621	17,862	54,022	9,664	743,052
	Oct-Dec 2009	238,579	431,695	18,217	55,300	26,432	770,223
	Jan-Mar 2010	208,969	387,872	22,163	63,563	28,631	711,198
	Apr-June 2010	223,197	455,307	26,274	57,555	28,439	790,772

Table 3 and Table 4 provide descriptive summaries of the Australian feedlot industry for the period of most relevance to this survey (the year ending June 2010).

During that period, there was a total capacity across all accredited Australian feedlots of about 1.2 million head of cattle and at any given time there were more than 770,000 cattle on feed.

Queensland has the largest feedlot industry in the country based on capacity and numbers of feed, accounting for about 50% of national capacity and about 55-59% of total cattle on feed. Queensland and New South Wales combined, account for about 83% of national feedlot capacity and 83-89% of total cattle on feed.

4.2 Response rate

Table 5: Number of feedlots that participated in the study by state and size category, based on completion of paper-based portions of the questionnaire

State	Size category				Total	% of target
	1 <1000	2 1001-5000	3 5001-10000	4 >10000		
NSW	5	6	3	7	21	116.7
QLD	5	2	4	4	15	71.4
Vict	3			2	5	83.3
SA	1				1	20.0
WA	1	4			5	71.4
Total	15	12	7	13	47	82.5
% of target	75.0	80.0	63.6	118.2	82.5	

An overall measure of response rate can be based on the number of selected feedlots (N=121) that were contacted to ask if they would participate, with a final response rate of 47 feedlots (39%).

When the participating feedlots were compared to the target numbers, the study achieved results from 47 feedlots against a target of 57 (82.5% of the target).

A number of feedlots that were selected for inclusion in the study were identified as not having any cattle on feed during the period of interest, reflecting the variable nature of market forces that can influence a decision to operate a beef cattle feedlot in Australian conditions.

Electronic data files were obtained from a total of 13 feedlots, including 9 from category 4, two from category 3 and two from category 2 feedlots. In general smaller feedlots (categories 1 and 2) were less likely to have electronic record keeping systems that were used routinely to store and monitor animal health and performance. Larger feedlots were more likely to use some form of electronic record keeping system on a routine basis.

4.3 Feedlot capacity and turnoff

Table 6: Summary statistics for capacity of participating feedlots arranged by state and size category. se=standard error, min=minimum, max=maximum.

	State					
	NSW	QLD	SA	Vict	WA	Total
Category = 4 (> 10,000)						
Count	7	4	0	2	0	13
Total capacity	120,963	85,290		40,000		246,253
Mean	17,280	21,323		20,000		18,943
se	2,548	3,370		47,766		1,701
min	10,000	10,000		20,000		10,000
max	30,000	50,000		20,000		50,000
Category=3 (5-10,000)						
Count	3	4	0	0	0	7
Total capacity	13,860	27,322				41,182
Mean	4,620	6,831				5,883
se	3,892	3,370				2,318
min	2,860	1,242				1,242
max	6,000	10,000				10,000
Category=2 (1-5,000)						
Count	6	2	0	0	4	12
Total capacity	10,460	10,617			12,400	33,477
Mean	1,743	5,309			3,100	2,790
se	2,752	4,766			3,370	1,771
min	1,000	2,517			2,000	1,000
max	3,000	8,100			5,000	8,100
Category=1 (< 1,000)						
Count	5	5	1	3	1.00	15
Total capacity	3,658	1,909	100	2,099	200	7,966
Mean	732	382	100	700	200	531
se	3,015	3,015		3,892		1,584
min	300	49		400		49
max	999	960		999		999
Total capacity	148,941	125,138	100	42,099	12,600	328,878

When the reported capacity for participating feedlots was compared to the national statistics for the Australian feedlot population, the feedlots participating in the survey accounted for 26% of the estimated total population capacity of all feedlots in Australia.

If this comparison was restricted to just the largest size capacity (>10,000 animals), the feedlots participating in the survey accounted for 37% of the total Australian feedlot capacity.

There was state by state variation in representation. For Queensland and New South Wales, those feedlots participating in the survey represented 20% and 35%, respectively of the total capacity in the two states.

These findings support the conclusion that the survey was able to enrol feedlots from all size categories and that the findings from this survey provide a representative sample of the total Australian feedlot population.

Table 7: Summary statistics for annual turnoff, arranged by feedlot size class (1 to 4) and state. Data for the year ending 30 June 2010 and limited to animals on feed for less than 100 days (short-fed). se=standard error, min=minimum, max=maximum.

Short-fed turnoff	State					
	NSW	**QLD**	**SA**	**Vict**	**WA**	**Total**
Category = 4 (>10,000)						
Count	7	4	0	2	0	13
Total turnoff (sum)	20,827	22,327		32,637		75,791
Mean	2,975	5,582		16,319		5,830
se	2,840	3,088		7,842		2,339
min	0	0		8,476		0
max	20,000	11,471		24,161		24,161
Category=3 (5-10,000)						
Count	3	4	0	0	0	7
Total turnoff (sum)	10,800	21,760				32,560
Mean	3,600	5,440				4,651
se	2,170	2,369				1,554
min	0	0				0
max	7,500	10,000				10,000
Category=2 (1-5,000)						
Count	6	2	0	0	4	12
Total turnoff (sum)	40,738	13,166			23,990	77,894
Mean	6,790	6,583			5,998	6,491
se	769	2,283			2,011	770
min	4,500	4,300			3,490	3,490
max	10,088	8,866			4,023	12,000
Category=1 (<1,000)						
Count	5	5	1	3	1	15
Total turnoff (sum)	6,657	6,300	44	5,864	250	19,115
Mean	1,331	1,260	44	1,955	250	1,274
se	881	598		481		365
min	0	0		1,000		0
max	4,737	2,880		2,541		4,737

Table 8: Summary statistics for annual turnoff, arranged by feedlot size class (1 to 4) and state. Data for the year ending 30 June 2010 and limited to animals on feed for between 100 and 250 days (mid-fed). se=standard error, min=minimum, max=maximum.

Mid-fed	State					
	NSW	**QLD**	**SA**	**Vict**	**WA**	**Total**
Category = 4 (>10,000)						
Count	7	4	0	2	0	13
Total turnoff (sum)	209,730	155,074		41,812		406,616
Mean	29,961	38,769		20,906		31,278
se	5,080	18,888		20,906		6,549
min	14,300	6,000		0		0
max	48,588	92,574		41,812		92,574
Category=3 (5-10,000)						
Count	3	4	0	0	0	7
Total turnoff (sum)	4,350	28,610				32,960
Mean	1,450	7,153				4,709
se	1,303	4,990				2,947
min	0	400				0
max	4,050	22,000				22,000
Category=2 (1-5,000)						
Count	6	2	0	0	4	12
Total turnoff (sum)	600	6,472				7,072
Mean	100	3,236				589
se	100	2,492				473
min	0	744				0
max	600	5,728				5,728
Category=1 (<1,000)						
Count	5	5	1	3	1	15
Total turnoff (sum)	1,030	4	86	200		1,320
Mean	206	1	86	67		88
se	206	1		67		69
min	0	0		0		0
max	1,030	4		200		1,030

The summary statistics in the previous two tables indicate that for the largest size category of feedlot (size category=4), the mid-fed group (100 to 250 days on feed) represents the largest number of cattle turned off.

In contrast for the second largest size feedlots (size category=3), the short fed animals (<100 days on feed) make up about an equal number of cattle turned off compared to the cattle in the mid-fed group.

In the smallest two size categories of feedlots (size categories 1 and 2), the overwhelming majority of cattle turned off appear in the short-fed group (<100 days on feed).

Table 9: Summary statistics for annual turnoff, arranged by feedlot size class (1 to 4) and state. Data for the year ending 30 June 2010 and limited to animals on feed for greater than 250 days (long-fed). se=standard error, min=minimum, max=maximum.

long fed	**State**					
	NSW	**QLD**	**SA**	**Vict**	**WA**	**Total**
Category = 4 (>10,000)						
Count	7	4	0	2	0	13
Total turnoff (sum)	24,000	13,840		6,683		44,523
Mean	3,429	3,460		3,342		3,425
se	3,429	2,360		3,339		1,933
min	0	0		3		0
max	24,000	10,000		6,680		24,000
Category=3 (5-10,000)						
Count	3	4	0	0	0	7
Total turnoff (sum)	0	6,690				6,690
Mean		1,673				956
se		976				621
min		0				0
max		3,690				3,690
Category=2 (1-5,000)						
Count	6	2	0	0	4	12
Total turnoff (sum)	0	2,550			1,160	3,710
Mean		1,275			290	309
se		1,275			290	225
min		0			0	0
max		2,550			1,160	2,550
Category=1 (<1,000)						
Count	5	5	1	3	1	15
Total turnoff (sum)	1,800	0	0	0	0	1,800
Mean	360					120
se	360					120
min	0					0
max	1,800					1,800

Very long fed animals (>250 days on feed) may be managed on any sized feedlot but do appear to be most likely in the largest size category of feedlots.

Table 10: Summary statistics on number of feeder pens, pen density and stocking capacity for smallest and largest pens, arranged by size category of feedlots. se=standard error, min=minimum, max=maximum.

	Number of pens	Pen density m^2/SCU	Stock capacity (head) largest pen	Stock capacity (head) smallest pen
Category = 4 (>10,000)				
feedlots (n)	13	13	13	13
Mean	99	13	282	74
se	13	0	24	10
95% CI lower	74	13	236	53
95% CI upper	125	14	329	94
min	52	11	170	20
max	225	16	431	140
Category=3 (5-10,000)				
feedlots (n)	7	6	7	7
Mean	39	19	260	76
se	12	3	68	21
95% CI lower	16	13	128	35
95% CI upper	63	25	393	117
min	8	10	20	12
max	100	29	600	150
Category=2 (1-5,000)				
feedlots (n)	12	12	12	12
Mean	23	17	156	60
se	5	1	27	10
95% CI lower	13	15	102	40
95% CI upper	32	19	209	79
min	10	10	31	16
max	64	25	280	140
Category=1 (<1,000)				
feedlots (n)	15	11	12	12
Mean	5	17	128	102
se	1	2	15	18
95% CI lower	4	14	99	66
95% CI upper	7	21	157	138
min	1	7	60	35
max	10	27	250	250

4.4 Descriptions of incoming cattle

Table 11: Summary statistics for percentage of incoming cattle by source (vendor direct, other property and saleyard). Data arranged by NSW and QLD and overall totals. se=standard error, min=minimum, max=maximum.

	NSW			QLD			Total		
	Vendor direct %	Other property %	Sale yard %	Vendor direct %	Other property %	Sale yard %	Vendor direct %	Other property %	Sale yard %
Category = 4 (>10,000)									
feedlots (n)	7	7	7	4	4	4	13	13	13
Mean	43	35	23	43	14	18	45	27	21
se	15	13	12	19	12	16	10	8	8
min	0	0	0	0	0	0	0	0	0
max	100	82	75	90	50	67	100	82	75
Category=3 (5-10,000)									
feedlots (n)	3	3	3	4	4	4	7	7	7
Mean	12	21	68	68	28	5	44	25	32
se	4	11	13	14	13	5	14	8	14
min	5	2	50	40	0	0	5	0	0
max	20	40	93	100	60	20	100	60	93
Category=2 (1-5,000)									
feedlots (n)	6	6	6	2	2	2	12	12	12
Mean	33	17	50	23	78	0	43	24	33
se	11	7	13	18	18	0	8	8	9
min	0	0	10	5	60	0	0	0	0
max	85	44	100	40	95	0	85	95	100
Category=1 (<1,000)									
feedlots (n)	5	5	5	5	5	5	15	15	15
Mean	18	34	48	55	12	14	39	16	39
se	13	20	18	17	12	10	9	8	9
min	0	0	0	4	0	0	0	0	0
max	70	100	100	100	60	50	100	100	100

There appears to be considerable variability in sources of cattle arriving at Australian feedlots.

In the largest size category, most feedlots sourced cattle directly from vendors (43 to 58% of incoming cattle) and the remainder of sourced cattle appeared to be similarly distributed between other property and saleyard sources. Note that vendor direct cattle were defined as cattle coming directly to the feedlot from the property where they were bred. Other property cattle included cattle coming from any property other than the place where they were bred.
In size category =3, there were contrasting results between NSW and QLD feedlots. In NSW, most cattle were sourced from saleyards and relatively few from vendor direct and other properties. In QLD the trend was reversed with most cattle coming from vendor direct and very few animals coming from saleyards. This may reflect the presence within QLD of feedlots that draw cattle directly from northern breeding properties whereas feedlots in NSW may be more likely to source cattle from saleyards. This finding may also reflect the feedlots that were involved in the study though the

random selection process employed in selecting the feedlots for inclusion in the study should mean that the study sample is likely to be reflective of the situation in each state.

Table 12: Summary statistics for maximal travel distance and time for incoming cattle arriving at Australian feedlots during the year ending 30 June 2010. All responses represent percentage of arriving cattle. se=standard error, min=minimum, max=maximum.

	NSW		QLD		Total	
	Max travel distance/time		Max travel distance/time		Max travel distance/time	
	>1000km	>12hrs	>1000km	>12hrs	>1000km	>12hrs
Category = 4 (>10,000)						
Feedlot (n)	7	7	4	4	13	13
Mean	12	14	32	34	16	19
se	10	10	20	23	8	9
min	0	0	0	0	0	0
max	70	70	90	100	90	100
Category=3 (5-10,000)						
Feedlot (n)	3	3	4	4	7	7
Mean	0	0	6	6	3	3
se			3	3	2	2
min			0	0	0	0
max			12	12	12	12
Category=2 (1-5,000)						
Feedlot (n)	6	6	2	2	12	12
Mean	3	3	20	35	5	8
se	2	2	20	35	3	6
min	0	0	0	0	0	0
max	10	10	40	70	40	70
Category=1 (<1,000)						
Feedlot (n)	5	5	5	5	15	15
Mean	8	8	0	0	3	3
se	8	8			3	3
min	0	0			0	0
max	40	40			40	40

There appears to be both a state effect and a feedlot size category effect with respect to distance travelled by incoming cattle. In the largest feedlot size category, a higher proportion of incoming cattle are travelling longer distances/times and this probably reflects the need for these feedlots to source cattle from a wider area to maintain capacity. It is also likely to reflect the fact that large feedlots are likely to be able to handle the larger and more consistent supply of incoming cattle from larger breeder properties, and these larger supply properties may tend to be further away. In QLD and other states (SA, Vict, WA) large supply properties are considered likely to be far from the areas where feedlots are likely to be located, meaning that most cattle from these source properties will need to travel longer distances. Smaller feedlots may be more likely to source cattle from supplies closer to their location though there are still feedlots in all categories that are sourcing cattle from more than 1000 km (or longer than 12 hrs) distant.

Table 13: Summary statistics for percentage of arriving cattle that are horned. se=standard error, min=minimum, max=maximum.

% horned	State		
	NSW	QLD	Total
Category = 4 (>10,000)			
Feedlot (n)	7	4	13
Mean	8	30	15
se	4	12	5
min	0	1	0
max	30	50	50
Category=3 (5-10,000)			
Feedlot (n)	3	4	7
Mean	15	10	12
se	8	7	5
min	5	0.08	0.08
max	30	30	30
Category=2 (1-5,000)			
Feedlot (n)	6	2	12
Mean	6	8	6
se	2	2	1
min	0.2	6	0
max	15	10	15
Category=1 (<1,000)			
Feedlot (n)	5	5	15
Mean	12	2	7
se	5	1	2
min	2	0	0
max	33	5	33

Table 14: Summary statistics for percentage of incoming cattle that were male (either entire or castrated). se=standard error, min=minimum, max=maximum.

% male	State		
	NSW	QLD	Total
Category = 4 (>10,000)			
Feedlot (n)	7	4	13
Mean	96	69	83
se	1	10	5
min	90	50	50
max	100	95	100
Category=3 (5-10,000)			
Feedlot (n)	3	4	7
Mean	53	69	62
se	23	9	11
min	30	44	30
max	100	90	100
Category=2 (1-5,000)			
Feedlot (n)	6	2	12
Mean	80	54	62
se	11	27	9
min	40	27	6
max	100	80	100
Category=1 (<1,000)			
Feedlot (n)	5	5	15
Mean	65	82	66
se	18	5	7
min	2	70	2
max	100	100	100

Table 15: Summary statistics for percentage of arriving males that were entire or castrated (testes removed or retained). se=standard error, min=minimum, max=maximum.

		NSW			QLD			Total		
		Entire	Castrated & testes		Entire	Castrated & testes		Entire	Castrated & testes	
Category			removed	retained		removed	retained		removed	retained
4 (>10,000)	Feedlot (n)	7	7	7	4	4	4	13	13	13
	Mean (%)	0.1	100	0	3	97	0	1	99	0
	se	0.1	0.1		2	2		1	1	
	min (%)	0	99		0	90		0	90	
	max (%)	1	100		10	100		10	100	
3 (5-10,000)	Feedlot (n)	3	3	3	4	4	4	7	7	7
	Mean (%)	0.3	96	4	0	99	1	0.3	98	2
	se	0.3	4	3	0	0	1	0.2	2	1
	min (%)	0	89	0	0	98	0	0	89	0
	max (%)	1	100	10	1	100	2	1	100	10
2 (1-5,000)	Feedlot (n)	6	6	6	2	2	2	12	12	12
	Mean (%)	0	100	0	10	90	0	4	94	2
	se				8	8		3	3	2
	min (%)		100		2	82		0	70	0
	max (%)		100		18	98		30	100	20
1 (<1,000)	Feedlot (n)	5	5	5	5	5	5	15	15	15
	Mean (%)	0.1	76	24	0	100	0	6	86	8
	se	0.1	14	14				6	8	5
	min (%)	0	25	0		100		0	5	0
	max (%)	0.5	100	75		100		95	100	75

Virtually all male cattle are castrated and have their testes removed. Castration using methods that retain the testes in the scrotum appears to be uncommon and similarly, few feedlots are feeding intact male animals.

Table 16: Summary statistics describing the percentage of arriving female animals that were either entire females or spayed females at the time they arrived at the feedlot. Data presented as percentage that were intact females. se=standard error, min=minimum, max=maximum.

	NSW	**QLD**	**Total**
	Entire	Entire	Entire
Category = 4 (>10,000)			
Feedlot (n)	7	4	13
Mean	43	74	61
se	20	23	14
min	0	5	0
max	100	100	100
Category=3 (5-10,000)			
Feedlot (n)	3	4	7
Mean	67	75	71
se	33	25	18
min	0	0	0
max	100	100	100
Category=2 (1-5,000)			
Feedlot (n)	6	2	12
Mean	50	100	69
se	22		13
min	0	100	0
max	100	100	100
Category=1 (<1,000)			
Feedlot (n)	5	5	15
Mean	80	80	87
se	20	20	9
min	0	0	0
max	100	100	100

The proportion of the spayed female animals can be estimated from the above table as the remainder ie 100% minus the percentage of intact females.

There are a significant number of spayed female animals entering Australian feedlots, more so in the larger feedlot size categories.

4.5 Feedlot identification and recording systems

Table 17: Count of feedlots using different types of animal identification system. NLIS=National Livestock Identification System, Vtag=Visual ear tag.

Category	ID system	Count
Category=1 (<1,000)	NLIS	3
	NLIS+Vtag	12
	NLIS +Vtag + Lot tag	0
Category=2 (1-5,000)	NLIS	0
	NLIS+Vtag	11
	NLIS +Vtag + Lot tag	1
Category=3 (5-10,000)	NLIS	2
	NLIS+Vtag	5
	NLIS +Vtag + Lot tag	0
Category = 4 (>10,000)	NLIS	0
	NLIS+Vtag	11
	NLIS +Vtag + Lot tag	2
All	NLIS	5
	NLIS+Vtag	38
	NLIS +Vtag + Lot tag	3

All feedlots used some form of animal identification with 38 of 47 (81%) using a combination of NLIS tags and a visual tag (Vtag)..

Table 18: Count of feedlots that use various approaches to managing animal and feedlot records

Record system	Category 1 <1,000	Category 2 1-5,000	Category 3 5-10,000	Category 4 >10,000
Paper or spreadsheet	11	3	1	
Other software				
Custom software	3	1	1	3
Belvoir IT		1		
Possum Gully	1	2	1	1
StockaID	2	4	3	8
Stockbook	1		1	
FY 3000		5	3	9
Feedbunk				2
Total responding feedlots	15	12	7	13

There is considerable variation between feedlots over the types of recording systems being used. In general there is also a feedlot size effect with smaller feedlots appearing to be more likely to use some combination of paper records or simple spreadsheet records. Larger feedlots appear to be more likely to use custom or commercial software for managing animal, feed and other records.

4.6 Feedlot entry procedures

Table 19: Summary statistics for percentage of cattle that complete induction and entry into the feedlot less than 7 days after arrival at the feedlot premises. se=standard error, min=minimum, max=maximum.

Entry within 7d	**State**		
	NSW	**QLD**	**Total**
Category = 4 (>10,000)			
Feedlot (n)	7	4	13
Mean	99	80	93
se	1	20	6
min	91	20	20
max	100	100	100
Category=3 (5-10,000)			
Feedlot (n)	3	4	7
Mean	97	91	94
se	2	7	4
min	95	70	70
max	100	100	100
Category=2 (1-5,000)			
Feedlot (n)	6	2	12
Mean	64	95	71
se	19	5	12
min	5	90	0
max	100	100	100
Category=1 (<1,000)			
Feedlot (n)	5	5	15
Mean	99	80	86
se	1	20	9
min	95	0	0
max	100	100	100

Almost all arriving cattle complete their induction and entry procedures within a week of arrival at the feedlot.

Table 20: Summary statistics for days from arrival at feedlot to induction, reported as target, shortest, average and longest achieved performance. Based on those cattle that complete induction and entry less than 7 days after arrival at the feedlot premises. min=minimum, max=maximum.

	State NSW	performance			QLD	performance			Total	performance		
	target	short	ave	long	target	short	ave	long	target	short	ave	long
Category = 4 (>10,000)												
Feedlot (n)	7	7	7	7	4	4	4	4	13	13	13	13
Mean	0.9	0	0.9	3.7	2.6	0	1.1	5.8	1.6	0	1.1	4.8
min	0	0	0	1	0	0	0	2	0	0	0	1
max	2	1	2	7	6	2	3.5	7	6	2	3.5	7
Category=3 (5-10,000)												
Feedlot (n)	3	3	3	3	4	4	4	4	7	7	7	7
Mean	5.0	2	5.3	8	2.0	1	2.6	6	3.3	1	3.8	6.9
min	3	1	4	7	1	0	1.5	4	1	0	1.5	4
max	7	3	7	10	3	1	4	10	7	3	7	10
Category=2 (1-5,000)												
Feedlot (n)	5	5	5	5	2	2	2	2	10	10	10	10
Mean	1.2	1	1.2	3.4	1.5	1	1.5	3.5	0.9	0	0.9	2.8
min	0	0	0	0	0	0	0	0	0	0	0	0
max	2	1	2	5	3	1	3	7	3	1	3	7
Category=1 (<1,000)												
Feedlot (n)	5	5	5	5	4	4	4	4	13	13	13	13
Mean	1.8	0	2.0	5	0.8	0	0.8	2	1.4	0	1.6	3.5
min	0	0	1	2	0	0	0	0	0	0	0	0
max	3	1	3	7	3	1	3	5	4	1	5	7

Table 21: Summary statistics for days from induction to entry, reported as target, shortest, average and longest achieved performance. Based on those cattle that complete induction and entry less than 7 days after arrival at the feedlot premises. Min=minimum, max=maximum.

	State NSW	performance			QLD	performance			Total	performance		
	target	short	ave	long	target	short	ave	long	target	short	ave	long
Category = 4 (>10,000)												
Feedlot (n)	7	7	7	7	0	0	0	0	9	9	9	9
Mean	0.4	0	0.4	1.4					0.7	0	0.6	1.9
min	0	0	0	0					0	0	0	0
max	1	1	1	7					3	1	2	7
Category=3 (5-10,000)												
Feedlot (n)	3	3	3	3	2	2	2	2	5	5	5	5
Mean	0	0	0	0	0	0	0	0	0	0	0	0
min	0	0	0	0	0	0	0	0	0	0	0	0
max	0	0	0	0	0	0	0	0	0	0	0	0
Category=2 (1-5,000)												
Feedlot (n)	5	5	5	5	2	2	2	2	10	10	10	10
Mean	0.2	0	0.2	1.4	0.0	0	0.0	0	1.5	1	2.1	18.7
min	0	0	0	0	0	0	0	0	0	0	0	0
max	1	0	1	7	0	0	0	0	14	14	20	180
Category=1 (<1,000)												
Feedlot (n)	5	5	5	5	3	3	3	3	12	12	12	12
Mean	0.2	0	0.2	0.2	0.0	0	0.0	0	1.3	1	1.3	1.1
min	0	0	0	0	0	0	0	0	0	0	0	0
max	1	1	1	1	0	0	0	0	7	7	7	7

Table 22: Summary statistics for days from arrival at feedlot to induction, reported as target, shortest, average and longest achieved performance. Based on those cattle that complete induction and entry more than 7 days after arrival at the feedlot premises. Limited to overall summaries since there were few respondents within any one state. Min=minimum, max=maximum.

	Total	**performance**		
	target	short	ave	long
Category = 4 (>10,000)				
Feedlot (n)	2	2	2	2
Mean	3.0	0	4.0	11.5
min	0	0	0	3
max	6	0	8	20
Category=3 (5-10,000)				
Feedlot (n)	2	2	2	2
Mean	6.5	9	8.5	10.0
min	3	7	7	10
max	10	10	10	10
Category=2 (1-5,000)				
Feedlot (n)	7	7	6	7
Mean	15.7	8	15.2	72.0
min	0	0	0	0
max	35	14	42	180
Category=1 (<1,000)				
Feedlot (n)	3	3	3	3
Mean	35.3	24	35.7	67.0
min	4	1	5	7
max	90	60	90	180

It seems possible that the prolonged interval in the smaller feedlots may be associated with a management decision to put incoming animals on pasture for a period before induction. Smaller feedlots may be managed in conjunction with other enterprises on a property.

The responses for larger category feedlots in this table appear to be inconsistent with the question and may reflect some confusion over the wording of the questionnaire. The question specifically asked for time intervals for those cattle that completed entry and induction greater than 7 days after arrival. However, the estimates for the larger feedlots appear to be more consistent with targets that are less than 7 days.

Table 23: Summary statistics for days from induction to entry, reported as target, shortest, average and longest achieved performance. Based on those cattle that complete induction and entry more than 7 days after arrival at the feedlot premises. Limited to overall summaries since there were few respondents within any one state. Min=minimum, max=maximum.

	Total	**performance**		
	target	short	ave	long
Category = 4 (>10,000)				
Feedlot (n)	1	1	1	1
Mean	100	30	100	300
min	100	30	100	300
max	100	30	100	300
Category=3 (5-10,000)				
Feedlot (n)	3	2	3	2
Mean	2.3	0	2.3	0.0
min	0	0	0	0
max	7	0	7	0
Category=2 (1-5,000)				
Feedlot (n)	5	5	4	5
Mean	7.0	3	10.5	18.0
min	0	0	0	0
max	35	14	42	90
Category=1 (<1,000)				
Feedlot (n)	3	3	3	3
Mean	4.7	0	2.3	7.0
min	0	0	0	0
max	14	0	7	21

Participants were asked to indicate the percentage of incoming cattle for the year ending 30 June 2010 that were enrolled in an accredited feedlot preparation program such as Landmark Maxistart or Elders Feeder Guard. Only 6 of 47 respondents indicated that any cattle were enrolled in such programs and these 6 respondents indicated that between 1 and 10% of incoming cattle were enrolled in such programs. Programs that were indicated included Feeder Guard (n=5), Feedlot Ready (n=2), Maxistart (n=3) and Red Start (n=1). Two additional feedlots indicated that cattle were managed in accordance with an internal or custom program.

Feedlots were asked a series of questions concerning policy or aims regarding specific vaccines. The questions identified three specific vaccines (Bovilis MH[3], Pestigard[4], and Rhinogard (IBR) [4]) and asked if the feedlot policy was to have all cattle vaccinated before or shortly after arrival at the feedlot, if they vaccinated some lines of cattle or at some time points, or if they did not vaccinate. These questions were specifically intended to relate to cattle that were not enrolled in a feedlot preparation program since most feedlot preparation programs have vaccination as part of their schedule of activities.

Table 24: Count of participating feedlots by category concerning policy regarding vaccination status of incoming cattle with Bovilis-MH. Feedlots were asked to indicate if they aimed to have all cattle vaccinated with before or shortly after arrival at the feedlot, if they vaccinated some lines of cattle or at some time points, or if they did not vaccinate.

Policy concerning vaccination with Bovilis-MH							
Size category	Responses	No vacc		Some only		All	
	n	n	%	n	%	n	%
<1,000	15	12	80.0	1	6.7	2	13.3
1-5,000	12	3	25.0	3	25.0	7	58.3
5-10,000	7	3	42.9	1	14.3	3	42.9
>10,000	13	5	38.5	3	23.1	6	46.2
All	47	23	48.9	8	17.0	18	38.3

Table 25: Count of participating feedlots by category concerning policy regarding vaccination status of incoming cattle with Pestigard. Feedlots were asked to indicate if they aimed to have all cattle vaccinated with before or shortly after arrival at the feedlot, if they vaccinated some lines of cattle or at some time points, or if they did not vaccinate.

Policy concerning vaccination with Pestigard							
Size category	Responses	No vacc		Some only		All	
	n	n	%	n	%	n	%
<1,000	15	14	93.3	1	6.7	0	0.0
1-5,000	12	10	83.3	1	8.3	1	8.3
5-10,000	7	6	85.7	0	0.0	1	14.3
>10,000	13	12	92.3	1	7.7	0	0.0
All	47	42	89.4	3	6.4	2	4.3

[3] Coopers Animal Health
[4] Pfizer Animal Health

Table 26: Count of participating feedlots by category concerning policy regarding vaccination status of incoming cattle with Rhinogard. Feedlots were asked to indicate if they aimed to have all cattle vaccinated with before or shortly after arrival at the feedlot, if they vaccinated some lines of cattle or at some time points, or if they did not vaccinate.

Policy concerning vaccination with Rhinogard							
Size category	Responses n	No vacc n	No vacc %	Some only n	Some only %	All n	All %
<1,000	15	14	93.3	1	6.7	0	0.0
1-5,000	12	8	66.7	1	8.3	3	25.0
5-10,000	7	5	71.4	0	0.0	2	28.6
>10,000	13	4	30.8	2	15.4	7	53.8
All	47	31	66.0	4	8.5	12	25.5

It was recognised that there may be important distinctions between a policy or aim (that might include aiming to have all or most animals vaccinated against a particular disease agent) and an achieved performance measure such as the percentage of incoming animals that were vaccinated either before or after arrival at the feedlot. Additional questions therefore asked for estimates of the percentage of incoming animals that were vaccinated using the same three vaccines (Bovilis MH, Pestigard, and RHinogard).

Table 27: Estimates of percentage of cattle vaccinated at varying times with Bovilis-MH relative to arrival and entry. Limited to those cattle that were not enrolled in a feedlot preparation program.

Size category	Responses n	vacc before arrival mean %	vacc before arrival min %	vacc before arrival max %	after arrival & before entry mean %	after arrival & before entry min %	after arrival & before entry max %	at entry mean %	at entry min %	at entry max %
<1,000	15	0.0	0	0	6.7	0	100	10.7	0	100
1-5,000	12	15.4	0	75	10.4	0	100	47.5	0	100
5-10,000	7	1.4	0	10	32.9	0	100	8.6	0	60
>10,000	13	11.4	0	80	23.1	0	100	24.6	0	100
All	47	7.3	0	80	16.1	0	100	23.9	0	100

Table 28: Estimates of percentage of cattle vaccinated at varying times with Pestigard relative to arrival and entry. Limited to those cattle that were not enrolled in a feedlot preparation program.

Size category	Responses n	vacc before arrival mean %	vacc before arrival min %	vacc before arrival max %	after arrival & before entry mean %	after arrival & before entry min %	after arrival & before entry max %	at entry mean %	at entry min %	at entry max %
<1,000	15	0.0	0	0	0.0	0	0	0.0	0	0
1-5,000	12	6.3	0	75	2.1	0	25	0.0	0	0
5-10,000	7	1.4	0	10	4.3	0	30	0.0	0	0
>10,000	13	0.8	0	9	0.0	0	0	0.0	0	0
All	47	2.0	0	75	1.2	0	30	0.0	0	0

Table 29: Estimates of percentage of cattle vaccinated at varying times with Rhinogard relative to arrival and entry. Limited to those cattle that were not enrolled in a feedlot preparation program.

Size category	Responses n	vacc before arrival			after arrival & before entry			at entry		
		mean %	min %	max %	mean %	min %	max %	mean %	min %	max %
<1,000	15	0.0	0	0	3.3	0	50	0.0	0	0
1-5,000	12	0.0	0	0	8.3	0	100	20.8	0	100
5-10,000	7	0.0	0	0	14.3	0	100	14.3	0	100
>10,000	13	0.7	0	9	30.8	0	100	30.4	0	100
All	47	0.2	0	9	13.8	0	100	15.9	0	100

Table 30: Estimates of the percentage of arriving cattle that had been implanted with hormonal growth promotant (HGP) prior to arrival at the feedlot. se= standard error, min=minimum, max=maximum.

	NSW	QLD	Total
Category=4 (>10,000)			
Feedlot (n)	7	4	13
Mean	50	80	59
se	16	15	11
min	0	35	0
max	100	98	100
Category=3 (5-10,000)			
Feedlot (n)	3	4	7
Mean	34	49	43
se	33	24	18
min	1	6	1
max	100	100	100
Category=2 (1-5,000)			
Feedlot (n)	6	2	12
Mean	68	43	53
se	16	38	12
min	5	5	0
max	100	80	100
Category=1 (<1,000)			
Feedlot (n)	5	5	15
Mean	24	40	23
se	19	24	10
min	0	0	0
max	98	100	100

A total of 15 feedlots (32% of 47) indicated that between 90-100% of arriving cattle were implanted prior to arrival. A higher percentage of feedlots in the largest category (cat=4) had 90%+ animals implanted prior to arrival (6 of 13 or 46%) compared to other categories: cat=1 (3 of 15 or 20%), cat=2 (4 of 12 or 33%) and cat=3 (2 of 7 or 29%).

Feedlots were asked to provide information concerning administration of various treatments or procedures at feedlot entry or induction.

Of 47 respondents, 41 indicated that 100% of animals were treated with an anthelmintic against worms. A total of 6 feedlots indicated that they did not administer anthelmintic to arriving cattle and these 6 feedlots were distributed across categories 1 (n=2), 3 (n=2) and 4 (n=2).

In contrast, only 8 feedlots indicated that all incoming cattle were treated with a flukicidal therapy and 5 of these were in the largest size category (category=4). A further five feedlots indicated that some cattle (10 to 40%) were treated with flukicidal products on arrival, based on criteria such as origin of cattle and season or if flukes were considered likely to be a problem. All other respondents did not use flukicides.

Table 31: Count of feedlots providing responses to a question about whether animals were treated for lice at entry or induction. The first three rows provide a count of the total number of responding feedlots overall and in NSW and QLD, arranged by size category of feedlot. The next rows provide a count of feedlots in each of four categories of lice treatment based on the percentage of animals treated.

Lice treatment		Size category <1,000	1-5,000	5-10,000	>10,000	Totals	% of totals
	Respondents - all	15	12	7	13	47	
	NSW	5	6	3	7	21	
	QLD	5	2	4	4	15	
	% of ans treated						
All states	0	3	1	1	1	6	
	up to 50%	1	0	0	3	4	
	>50 to 90%	0	0	1	0	1	
	>90 to 100%	11	11	5	9	36	76.6
NSW	0	0	0	0	1	1	
	up to 50%	0	0	0	2	2	
	>50 to 90%	0	0	0	0	0	
	>90 to 100%	5	6	3	4	18	85.7
QLD	0	1	1	1	1	4	
	up to 50%	1	0	0	0	1	
	>50 to 90%	0	0	1	0	1	
	>90 to 100%	3	1	2	3	9	60.0

Table 31 indicates that 47 feedlots provided responses to questions about lice treatment and that of these there were a total of 36 (76.6%) that treated >90% of animals at entry or induction. There appeared to be some differences between states with a higher % of feedlots indicating they treated all animals at arrival or induction in NSW (85.7%) compared to QLD where only 60% of responding feedlots indicated they treated almost all animals in this way.

Table 32: Count of feedlots providing responses to a question about whether animals were treated for fly at entry or induction. The first three rows provide a count of the total number of responding feedlots overall and in NSW and QLD. The next rows provide a count of feedlots in each of four categories based on the percentage of animals treated.

Fly treatment		Size category <1,000	1-5,000	5-10,000	>10,000	Totals	% of totals
	Respondents - all	15	12	7	13	47	
	NSW	5	6	3	7	21	
	QLD	5	2	4	4	15	
	% of ans treated						
All states	0	11	7	6	7	31	
	up to 50%	1	0	0	1	2	
	>50 to 90%	0	0	0	0	0	
	>90 to 100%	3	5	1	5	14	29.8
NSW	0	5	3	3	4	15	
	up to 50%	0	0	0	1	1	
	>50 to 90%	0	0	0	0	0	
	>90 to 100%	0	3	0	2	5	23.8
QLD	0	1	1	3	1	6	
	up to 50%	1	0	0	0	1	
	>50 to 90%	0	0	0	0	0	
	>90 to 100%	3	1	1	3	8	53.3

Table 33: Count of feedlots providing responses to a question about whether animals were treated for ticks at entry or induction. The first three rows provide a count of the total number of responding feedlots overall and in NSW and QLD. The next rows provide a count of feedlots in each of two categories based on the percentage of animals treated.

Tick treatment		Size category <1,000	1-5,000	5-10,000	>10,000	Totals	% of totals
	Respondents - all	15	12	7	13	47	
	NSW	5	6	3	7	21	
	QLD	5	2	4	4	15	
	% of ans treated						
All states	0	13	8	6	9	36	
	100%	2	4	1	4	11	23.4
NSW	0	5	3	3	6	17	
	100%	0	3	0	1	4	19.0
QLD	0	3	1	3	1	8	
	100%	2	1	1	3	7	46.7

Table 34: Count of feedlots providing responses to a question about whether animals received an HGP implant at entry or induction. The first three rows provide a count of the total number of responding feedlots overall and in NSW and QLD. The next rows provide a count of feedlots in each of four categories based on the percentage of animals treated.

HGP treatment		Size category <1,000	1-5,000	5-10,000	>10,000	Totals	% of totals
	Respondents - all	15	12	7	13	47	
	NSW	5	6	3	7	21	
	QLD	5	2	4	4	15	
	% of ans treated						
All states	0	4	2	0	2	8	
	up to 50%	1	1	2	1	5	
	>50 to 90%	1	2	1	1	5	
	>90 to 100%	9	7	4	9	29	61.7
NSW	0	1	1	0	1	3	
	up to 50%	1	0	0	0	1	
	>50 to 90%	1	0	0	0	1	
	>90 to 100%	2	5	3	6	16	76.2
QLD	0	1	0	0	0	1	
	up to 50%	0	1	2	1	4	
	>50 to 90%	0	1	1	1	3	
	>90 to 100%	4	0	1	2	7	46.7

Feedlots were asked if any animals received antibiotic at feedlot entry or induction. A total of 46 of 47 respondents indicated that they did not routinely administer antibiotics to animals at this time. One feedlot indicated that about 10% of animals received antibiotic at entry or induction (NSW, size category=1), and that such treatments were only administered as deemed necessary.

Table 35: Count of feedlots providing responses to a question about whether animals received clostridial vaccination at entry or induction. The first three rows provide a count of the total number of responding feedlots overall and in NSW and QLD. The next rows provide a count of feedlots in each of two categories based on the percentage of animals treated.

Vacc clostridia treatment		**Size category** <1,000	**1-5,000**	**5-10,000**	**>10,000**	**Totals**	**% of totals**
	Respondents - all	15	12	7	13	47	
	NSW	5	6	3	7	21	
	QLD	5	2	4	4	15	
	% of ans treated						
All states	0	9	2	3	6	20	
	100%	6	10	4	7	27	57.4
NSW	0	3	0	2	4	9	
	100%	2	6	1	3	12	57.1
QLD	0	3	1	1	1	6	
	100%	2	1	3	3	9	60.0

None of the respondents indicated that the vaccinated against leptospirosis. One feedlot only indicated that they vaccinated all incoming animals against botulism (QLD, size category=1). A total of 2 feedlots (QLD, size category=3) indicated that they vaccinated animals against pestivirus at arrival or induction.

39 of the 47 feedlots indicated that they did not vaccinate against pink eye. One feedlot (WA, size category=2) indicated that about 70% of incoming animals were vaccinated against pink eye. A further 7 feedlots indicated that they vaccinated some animals (1 to 10%) against pink eye.

46 of the 47 feedlots indicated that they did not vaccinate animals at entry or induction against anthrax. A single feedlot (NSW, size category =4) indicated that 100% of animals were vaccinated against anthrax.

46 of the 47 feedlots indicated that they did not vaccinate animals at entry or induction against bovine ephemeral fever (BEF or 3-day fever). A single feedlot (QLD, size category =1) indicated that 100% of animals were vaccinated against BEF.

46 of the 47 feedlots indicated that they did not vaccinate animals at entry or induction against tick fever. A single feedlot (QLD, size category =1) indicated that 100% of animals were vaccinated against tick fever.

None of the 47 feedlots vaccinated animals at entry or induction against *E.coli* or *Salmonella* spp.

Table 36: Summary statistics for percentage of incoming cattle that had their horns tipped or re-tipped on arrival or at induction. Limited to the percentage of those cattle arriving at the feedlot with visible horns or scurs.

% tipped before arrival treatment		Size category <1,000	1-5,000	5-10,000	>10,000	Totals	% of totals
	Respondents - all	15	12	7	13	47	
	NSW	5	6	3	7	21	
	QLD	5	2	4	4	15	
	% of ans treated						
All states	0	2	1	0	2	5	
	<10%	2	2	2	3	9	
	>10 - 50%	3	3	0	2	8	
	>50 & <100%	0	0	1	3	4	
	100%	8	6	4	3	21	44.7
NSW	0	0	0	0	4	4	
	<10%	0	2	0	2	4	
	>10 - 50%	2	1	0	1	4	
	>50 & <100%	0	0	1	2	3	
	100%	3	3	2	0	8	38.1
QLD	0	0	0	1	0	1	
	<10%	1	0	1	0	2	
	>10 - 50%	0	2	0	1	3	
	>50 & <100%	0	0	0	1	1	
	100%	4	0	2	2	8	53.3

Feedlots were asked to estimate the percentage of all intact female cattle that are subjected to a pregnancy test on arrival at the feedlot. A total of 39 of 47 feedlots indicated that they do not perform pregnancy testing of females on arrival at the feedlot. There were 8 feedlots that performed pregnancy testing:

- Two feedlots only pregnancy tested about 5% of females. Both were in the largest size category, one from each of QLD and Victoria,
- Six feedlots indicated that they pregnancy tested all female cattle on arrival. Five of these feedlots were in the smallest size category (2 from NSW and 3 from QLD), and the remaining feedlot was in the largest size category and from QLD.

None of the 47 respondent feedlots indicated that they had used mass medication at induction with antibiotic, while 6 feedlots reported using mass medication with antibiotic during the feeding period. Three of these feedlots were from size category=4 and one each from the other three categories. Comments indicated that these treatments were used to address footrot, respiratory disease and generally increased incidence of disease in autumn.

Feedlots reported occasionally using mass medication with prostaglandin at induction (6 feedlots: one each from size categories 1, 2 & 3, and three feedlots from size category=4). no feedlots reported using mass medication with prostaglandin during the feed period.

4.7 Feed management

Table 37: Summary statistics for percentage of grain fed in starter rations for short fed cattle (<100 days on feed). se= standard error, min=minimum, max=maximum.

	NSW	QLD	Total
Category=4 (>10,000)			
Feedlot (n)	3	4	9
Mean	46.7	44.6	44.3
se	8	4.3	3.1
min	35	37	35
max	62	56.5	62
Category=3 (5-10,000)			
Feedlot (n)	2	2	4
Mean	32	46	39
se	2	6	4.8
min	30	40	30
max	34	52	52
Category=2 (1-5,000)			
Feedlot (n)	6	2	12
Mean	45.9	31	46.3
se	2.5	1	2.7
min	35	30	30
max	50	32	60
Category=1 (<1,000)			
Feedlot (n)	3	5	12
Mean	50.7	52	45.1
se	0.7	7.5	4.6
min	50	40	10
max	52	80	80

Table 38: Summary statistics for percentage of grain fed in finisher rations for short fed cattle (<100 days on feed). se= standard error, min=minimum, max=maximum.

	NSW	QLD	Total
Category=4 (>10,000)			
Feedlot (n)	3	4	9
Mean	70.3	72.4	71.5
se	2.6	3.1	1.6
min	66	66	66
max	75	78	78
Category=3 (5-10,000)			
Feedlot (n)	2	2	4
Mean	60.0	71.0	65.5
se	0.0	1.0	3.2
min	60	70	60
max	60	72	72
Category=2 (1-5,000)			
Feedlot (n)	6	2	12
Mean	72.7	67.0	72.3
se	5.1	3.0	2.9
min	48.5	64	48.5
max	81.5	70	81.5
Category=1 (<1,000)			
Feedlot (n)	3	5	12
Mean	79.3	76.4	76.3
se	0.7	3.7	2.0
min	78	70	65
max	80	88	88

Table 39: Summary statistics for the percentage of grain in the starter ration for mid fed cattle (100 to 250 days on feed) and for long-fed cattle (>250 days on feed). Overall summary statistics only are presented for long-fed cattle because of the limited number of feedlots in any one state. se= standard error, min=minimum, max=maximum.

	Mid-fed			Long-fed
	NSW	**QLD**	**Total**	**Total**
Category=4 (>10,000)				
Feedlot (n)	7	4	12	5
Mean	39.0	44.6	40.5	42.7
se	5.7	4.3	3.6	5.2
min	24.0	37.0	24.0	24.0
max	62	56.5	62	56.5
Category=3 (5-10,000)				
Feedlot (n)	1	4	5	1
Mean	42	47	46	40
se		3.0	2.5	
min	42.0	40.0	40.0	40.0
max	42	52	52	40
Category=2 (1-5,000)				
Feedlot (n)	1	2	3	2
Mean	48.5	31	36.8	47.5
se		1.0	5.9	12.5
min	48.5	30.0	30.0	35.0
max	48.5	32	48.5	60
Category=1 (<1,000)				
Feedlot (n)	1	0	2	1
Mean	50		45	45
se			5.0	0.0
min	50.0		40.0	45.0
max	50		50	45

Table 40: Summary statistics for the percentage of grain in the finisher ration for mid fed cattle and for long-fed cattle. Overall summary statistics only are presented for long-fed cattle because of the limited number of feedlots in any one state. se= standard error, min=minimum, max=maximum.

finisher	Mid-fed			Long-fed
	NSW	QLD	Total	Total
Category=4 (>10,000)				
Feedlot (n)	7	4	12	5
Mean	71.3	72.4	72.0	69.1
se	2.4	3.1	1.7	4.7
min	65.0	66.0	65.0	52.5
max	83.2	78	83.2	78
Category=3 (5-10,000)				
Feedlot (n)	1	4	5	1
Mean	73	71.5	71.8	70
se		2.5	2.0	
min		66.0	66.0	
max		78	78	
Category=2 (1-5,000)				
Feedlot (n)	1	2	3	2
Mean	48.5	67	60.8	76
se		3.0	6.4	14.0
min		64.0	48.5	62.0
max		70	70	90
Category=1 (<1,000)				
Feedlot (n)	1	0	2	1
Mean	80		82.5	65
se			2.5	
min			80.0	
max			85	

Table 41: Summary statistics for the number of days from the first day of starter ration to the first day of the finisher ration, for short-fed cattle only. se= standard error, min=minimum, max=maximum.

Short-fed	NSW	QLD	Total
Category=4 (>10,000)			
Feedlot (n)	3	4	9
Mean	18.3	18.8	18.4
se	0.9	1.4	0.6
min	17	15	15
max	20	21	21
Category=3 (5-10,000)			
Feedlot (n)	2	2	4
Mean	18.0	15.0	16.5
se	4.0	5.0	2.8
min	14	10	10
max	22	20	22
Category=2 (1-5,000)			
Feedlot (n)	6	2	11
Mean	14.3	14.0	14.8
se	1.6	0.0	1.1
min	8	14	8
max	20	14	22
Category=1 (<1,000)			
Feedlot (n)	3	5	11
Mean	17.3	15.8	15.0
se	3.7	1.1	1.3
min	10	14	10
max	21	20	21

Table 42: Summary statistics for the number of days from the first day of starter ration to the first day of the finisher ration, for mid-fed and long-fed cattle only. Overall summary statistics only are presented for long-fed cattle because of the limited number of feedlots in any one state. se= standard error, min=minimum, max=maximum.

	Mid-fed			Long-fed
	NSW	QLD	Total	Total
Category=4 (>10,000)				
Feedlot (n)	7	4	12	5
Mean	18.7	18.8	18.7	101.0
se	1.0	1.4	0.7	51.2
min	15	15	15	17
max	23	21	23	250
Category=3 (5-10,000)				
Feedlot (n)	1	4	5	1
Mean	100	15.5	32.4	300.0
se		2.6	17.0	
min		10	10	
max		20	100	
Category=2 (1-5,000)				
Feedlot (n)	1	2	3	2
Mean	14	14.0	14.0	12.0
se		0.0	0.0	2.0
min		14	14	10
max		14	14	14
Category=1 (<1,000)				
Feedlot (n)	1	0	2	1
Mean	21		15.5	30.0
se			5.5	
min			10	
max			21	

Table 43: Count of responding feedlots arranged by the number of dietary steps (changes in % grain) in the diet from the first day of the starter ration to the first day of the finisher ration, for short-fed cattle only. The first three rows of information provides a summary of the count of responding feedlots (denominators). Subsequent rows provide a count of feedlots arranged into one of four categories summarising the number of dietary steps (1 to 2, 3, 4, 5+).

short-fed		Size category					% of
		<1,000	**1-5,000**	**5-10,000**	**>10,000**	**Totals**	**totals**
Respondents - all		11	12	4	9	36	
NSW		3	6	2	3	14	
QLD		5	2	2	4	13	
Dietary steps							
All states	1 to 2	3	2	1	1	7	19.4
	3	4	6	2	2	14	38.9
	4	3	4	1	5	13	36.1
	5+	1	0	0	1	2	5.6
NSW	1 to 2	1	0	1	0	2	14.3
	3	0	5	0	2	7	50.0
	4	2	1	1	1	5	35.7
	5+	0	0	0	0	0	0.0
QLD	1 to 2	1	1	0	0	2	15.4
	3	4	0	2	0	6	46.2
	4	0	1	0	2	3	23.1
	5+	0	0	0	0	0	0.0

Table 44: Summary for the number of dietary steps (changes in % grain) in the diet from the first day of the starter ration to the first day of the finisher ration, for mid-fed cattle only.

mid-fed		Size category					% of
		<1,000	**1-5,000**	**5-10,000**	**>10,000**	**Totals**	**totals**
Respondents - all		2	3	5	12	22	
NSW		1	1	1	7	10	
QLD		0	2	4	4	10	
Dietary steps							
All states	1 to 2	0	1	0	1	2	9.1
	3	0	1	4	4	9	40.9
	4	0	1	1	6	8	36.4
	5+	2	0	0	1	3	13.6
NSW	1 to 2	0	0	0	0	0	0.0
	3	0	1	0	4	5	50.0
	4	0	0	1	3	4	40.0
	5+	1	0	0	0	1	10.0
QLD	1 to 2	0	1	0	1	2	20.0
	3	0	0	4	0	4	40.0
	4	0	1	0	2	3	30.0
	5+	0	0	0	1	1	10.0

Table 45: Summary for the number of dietary steps (changes in % grain) in the diet from the first day of the starter ration to the first day of the finisher ration, for long-fed cattle only.

long-fed		Size category					% of
		<1,000	**1-5,000**	**5-10,000**	**>10,000**	**Totals**	**totals**
Respondents - all		1	2	1	5	9	
NSW		1	0	0	2	3	
QLD		0	1	1	2	4	
Dietary steps							
All states	1 to 2	1	2	0	0	3	33.3
	3	0	0	1	4	5	55.6
	4	0	0	0	1	1	11.1
	5+	0	0	0	0	0	0.0
NSW	1 to 2	1	0	0	0	1	33.3
	3	0	0	0	2	2	66.7
	4	0	0	0	0	0	0.0
	5+	0	0	0	0	0	0.0
QLD	1 to 2	0	1	0	0	1	25.0
	3	0	0	1	1	2	50.0
	4	0	0	0	1	1	25.0
	5+	0	0	0	0	0	0.0

Table 46: Summary of use of roughage sources in starter feed. Data based on combined responses from all classes of time on feed.

		Size category					% of
		<1,000	1-5,000	5-10,000	>10,000	Totals	totals
Respondents - all		15	12	7	13	47	
NSW		5	6	3	7	21	
QLD		5	2	4	4	15	
Hay							
	All states	13	11	5	12	41	87.2
	NSW	4	6	2	6	18	85.7
	QLD	4	2	3	4	13	86.7
Straw							
	All states	4	4	3	5	16	34.0
	NSW	2	3	1	3	9	42.9
	QLD	1	0	2	1	4	26.7
Silage							
	All states	1	2	4	2	9	19.1
	NSW	2	2	2	5	11	52.4
	QLD	1	2	4	2	9	60.0
Cotton seed hulls							
	All states	4	1	5	7	17	36.2
	NSW	1	1	2	5	9	42.9
	QLD	2	0	3	2	7	46.7
Other forms of roughage							
	All states	1	1	0	0	2	4.3
	NSW	1	0	0	0	1	4.8
	QLD	0	0	0	0	0	0.0

Table 47: Use of roughage in finisher feeds. Data based on combined responses from all classes of time on feed.

		Size category					% of
		<1,000	1-5,000	5-10,000	>10,000	Totals	totals
Respondents - all		15	12	7	13	47	
NSW		5	6	3	7	21	
QLD		5	2	4	4	15	
Hay							
	All states	12	10	3	4	29	61.7
	NSW	4	6	1	1	12	57.1
	QLD	4	1	2	1	8	53.3
Straw							
	All states	4	7	1	4	16	34.0
	NSW	2	3	0	0	5	23.8
	QLD	1	1	1	3	6	40.0
Silage							
	All states	5	5	7	9	26	55.3
	NSW	2	2	3	5	12	57.1
	QLD	1	2	4	3	10	66.7
Cotton seed hulls							
	All states	5	1	5	6	17	36.2
	NSW	1	1	2	5	9	42.9
	QLD	2	0	3	1	6	40.0
Other forms of roughage							
	All states	2	1	0	1	4	8.5
	NSW	1	0	0	0	1	4.8
	QLD	0	0	0	1	1	6.7

Sources of roughage used in feedlots appear to be broadly similar across different locations and size categories.

Table 48: Summary statistics for use of grains in starter feed. Data based on combined responses from all classes of time on feed.

		Size category					% of
		<1,000	1-5,000	5-10,000	>10,000	Totals	totals
Respondents - all		15	12	7	13	47	
NSW		5	6	3	7	21	
QLD		5	2	4	4	15	
Wheat							
	All states	9	10	7	9	35	74.5
	NSW	2	5	3	5	15	71.4
	QLD	4	2	4	4	14	93.3
Barley							
	All states	11	10	4	11	36	76.6
	NSW	5	5	3	7	20	95.2
	QLD	2	1	1	2	6	40.0
Sorghum							
	All states	3	3	2	5	13	27.7
	NSW	0	1	0	2	3	14.3
	QLD	3	2	2	3	10	66.7
Corn							
	All states	2	0	1	1	4	8.5
	NSW	1	0	0	0	1	4.8
	QLD	0	0	1	1	2	13.3
Other grains							
	All states	1	5	0	0	6	12.8
	NSW	0	1	0	0	1	4.8
	QLD	0	0	0	0	0	0.0

There appear to be some potent variations between states that may reflect availability and price of different grains. In NSW for example, most feedlots are using barley and relatively few are using sorghum. In QLD this trend is reversed. Similar effects are seen in the following table that describes grains used in finisher rations.

Table 49: Counts of feedlots using various grain sources in finisher feed. Data based on combined responses from all classes of time on feed.

		Size category					% of
		<1,000	1-5,000	5-10,000	>10,000	Totals	totals
Respondents - all		15	12	7	13	47	
NSW		5	6	3	7	21	
QLD		5	2	4	4	15	
Wheat							
	All states	9	10	7	9	35	74.5
	NSW	2	5	3	5	15	71.4
	QLD	4	2	4	4	14	93.3
Barley							
	All states	10	10	4	11	35	74.5
	NSW	4	5	3	7	19	90.5
	QLD	2	1	1	2	6	40.0
Sorghum							
	All states	3	3	2	5	13	27.7
	NSW	0	1	0	2	3	14.3
	QLD	3	2	2	3	10	66.7
Corn							
	All states	1	0	1	1	3	6.4
	NSW	0	0	0	0	0	0.0
	QLD	0	0	1	1	2	13.3
Other grains							
	All states	1	4	0	0	5	10.6
	NSW	0	1	0	0	1	4.8
	QLD	0	0	0	0	0	0.0

4.8 Assessment of importance of common feedlot diseases

Table 50: Average severity score for various disease conditions. Feedlots were asked to provide responses specifically for short-fed cattle only (less than 100 days on feed). Diseases were scored on a 6-point scale ranging from 0=no importance to 5=most important.

	NSW				QLD				Combined states				All
Size category	<1,000	1-5,000	5-10,000	>10,000	<1,000	1-5,000	5-10,000	>10,000	<1,000	1-5,000	5-10,000	>10,000	
Feedlots (n)	3	6	2	3	5	2	3	4	13	12	5	9	39
Diseases													
Respiratory	4.0	4.8	4.0	5.0	3.0	0.5	3.7	4.5	3.2	4.2	3.8	4.8	3.9
Muscular - foot	1.0	3.2	2.5	4.0	1.8	1.0	1.7	3.4	1.9	2.7	2.0	3.8	2.6
Heat stress	3.3	3.0	3.5	1.0	2.8	0.5	2.3	2.5	2.1	2.2	2.8	2.4	2.3
Non-eater	2.3	2.5	1.0	1.7	2.2	1.5	1.7	1.9	1.8	2.3	1.4	2.3	2.0
Feed related diseases	3.0	1.8	2.5	2.0	1.0	1.5	2.0	0.9	1.5	2.0	2.2	2.1	1.9
Reproductive	1.7	1.8	2.5	1.7	1.6	1.5	3.0	3.0	1.4	1.6	2.8	2.3	1.8
Sudden death	1.7	1.8	0.5	2.7	1.2	0.5	1.0	2.5	1.1	1.8	0.8	3.0	1.7
Gastro-intestinal (GIT)	0.7	1.5	1.5	3.7	1.0	1.5	1.7	1.5	0.8	1.8	1.6	2.8	1.7
Eye	1.3	1.7	1.0	1.3	0.4	1.0	1.0	1.4	0.8	2.1	1.0	1.8	1.5
Muscular - non-foot	0.7	1.7	1.0	2.3	0.8	0.0	1.3	1.5	0.7	1.6	1.2	2.4	1.4
Skin	1.7	1.3	4.0	0.7	1.0	0.5	2.0	0.8	1.1	1.7	2.5	1.0	1.4
Nervous conditions	0.3	1.5	0.5	0.7	0.2	0.0	1.0	2.9	0.2	1.4	0.8	2.2	1.1

Other conditions added by respondents

Buller
3-day fever
laryngitis
trucking tetany
urinary obstruction

Respiratory disease and muscular conditions received the highest severity scoring, followed by a range of other specific conditions. The patterns were broadly similar across the different classes of time on feed as seen in the following tables.

Table 51: Average severity score for various disease conditions. Feedlots were asked to provide responses specifically for mid-fed cattle (100-250 days) only. Diseases were scored on a 6-point scale ranging from 0=no importance to 5=most important.

	NSW				QLD				Combined states				All
Size category	**<1,000**	**1-5,000**	**5-10,000**	**>10,000**	**<1,000**	**1-5,000**	**5-10,000**	**>10,000**	**<1,000**	**1-5,000**	**5-10,000**	**>10,000**	
Feedlots (n)	1	0	3	7	0	2	4	4	2	2	7	11	22
Diseases													
Respiratory	3.0		3.0	4.7		0.5	2.8	4.5	3.0	0.5	2.9	4.6	3.5
Muscular - foot	5.0		2.7	3.9		2.0	1.5	3.4	4.0	2.0	2.0	3.7	3.0
Heat stress	3.0		2.5	2.0		1.0	2.3	2.5	1.5	1.0	2.3	2.2	2.0
Non-eater	2.0		1.5	1.6		1.0	1.5	2.1	1.5	1.0	1.5	1.8	1.6
Feed related diseases	3.0		2.0	2.1		1.5	1.5	0.9	1.5	1.5	1.7	1.7	1.6
Reproductive	1.0		1.0	1.6		1.0	3.2	2.4	1.0	1.0	2.3	1.9	1.8
Sudden death	1.0		0.5	2.7		0.5	1.0	2.5	1.0	0.5	0.8	2.6	1.8
Gastro-intestinal (GIT)	5.0		1.0	2.9		1.5	1.5	1.5	3.0	1.5	1.3	2.4	2.0
Eye	3.0		1.3	1.5		0.0	0.8	1.4	2.0	0.0	1.0	1.5	1.2
Muscular - non-foot	5.0		1.3	2.3		0.0	1.0	1.5	5.0	0.0	1.1	2.0	1.7
Skin	3.0		2.0	0.6		0.5	1.5	0.8	2.5	0.5	1.7	0.6	1.1
Nervous	4.0		0.3	1.1		0.0	0.8	2.9	2.0	0.0	0.6	1.8	1.3

Other conditions added by respondents

Buller

3-day fever

Table 52: Average severity score for various disease conditions. Feedlots were asked to provide responses specifically for long-fed cattle. Diseases were scored on a 6-point scale ranging from 0=no importance to 5=most important.

	NSW				QLD				Combined states				All
Size category	**<1,000**	**1-5,000**	**5-10,000**	**>10,000**	**<1,000**	**1-5,000**	**5-10,000**	**>10,000**	**<1,000**	**1-5,000**	**5-10,000**	**>10,000**	
Feedlots (n)	1	0	0	2	0	1	2	2	1	2	2	5	10
Diseases													
Respiratory	4.0			3.0		2.0	2.5	5.0	4.0	3.5	2.5	4.2	3.7
Muscular - foot	4.0			4.5		1.0	2.0	2.5	4.0	2.0	2.0	3.8	3.1
Heat stress	3.0			0.5		1.0	2.5	2.0	3.0	1.5	2.5	2.0	2.1
Non-eater	3.0			0.0		1.0	2.5	1.5	3.0	2.0	2.5	1.4	1.9
Feed related diseases	4.0			0.5		0.0	2.0	0.5	4.0	2.0	2.0	1.4	1.9
Reproductive	2.0			1.5		0.0	4.0	1.5	2.0	0.0	4.0	1.4	1.4
Sudden death	3.0			4.0		1.0	2.5	3.0	3.0	1.5	2.5	3.8	3.0
Gastro-intestinal (GIT)	0.0			4.0		1.0	1.0	2.0	0.0	1.0	1.0	3.4	2.1
Eye	3.0			1.5		0.0	1.5	1.5	3.0	2.5	1.5	1.8	2.0
Muscular - non-foot	3.0			3.0		3.0	2.0	3.0	3.0	3.5	2.0	3.4	3.1
Skin	3.0			0.0		2.0	2.5	1.5	3.0	3.5	2.5	1.2	2.1
Nervous	0.0			0.5		2.0	0.5	2.3	0.0	1.5	0.5	1.7	1.3

Other conditions added by respondents:
Buller
3-day fever

Table 53: Specific diseases identified by respondents as being the more important component diseases within each broader category of disease syndromes

Disease syndrome	Most important diseases
Eye	pink eye
GIT	bloat
	diarrhoea
Nervous	polioencephalomalacia
Muscular - foot	foot abscess
	foot rot
	injury
	laminitis
	hoof cracks
Muscular non-foot	injuries
	swollen limbs
Respiratory	bovine respiratory disease(s)
	IBR
Skin	lice
	ringworm
Reproductive	calving
	prepuce problems

4.9 Economic impact for selected diseases

Table 54: Summary statistics for estimated treatment costs ($) associated with treatment of respiratory disease cases. Estimates based on the costs of drugs administered to pulled animals during treatment. se= standard error, CI=confidence interval, min=minimum, max=maximum.

	NSW	Other	QLD	Total
Category=4 (>10,000)				
Feedlot (n)	7	2	3	12
Mean	29.61	28.00	19.67	26.86
se	4.74	3.00	4.26	3.12
95% CI lower	20.32	22.12	11.33	20.75
95% CI upper	38.90	33.88	28.01	32.96
min	15.00	25.00	14.00	14.00
max	48.03	31.00	28.00	48.03
Category=3 (5-10,000)				
Feedlot (n)	2	0	3	5
Mean	50.00		36.67	42.00
se	0.00		18.56	10.68
95% CI lower	50.00		0.29	21.07
95% CI upper	50.00		73.04	62.93
min	50.00		0	0
max	50.00		60.00	60.000
Category=2 (1-5,000)				
Feedlot (n)	5	4	2	11
Mean	17.20	22.25	9.00	17.54
se	3.40	2.25	9.00	2.50
95% CI lower	10.54	17.84	0.00	12.64
95% CI upper	23.85	26.66	26.64	22.45
min	10.00	17.00	0	0
max	28.99	28.00	18.00	28.99
Category=1 (<1,000)				
Feedlot (n)	5	3	4	12
Mean	33.40	20.00	17.25	24.67
se	11.69	11.55	7.25	6.05
95% CI lower	10.50	0.00	3.04	12.81
95% CI upper	56.30	42.63	31.46	36.52
min	20.00	0	0	0
max	80.00	40.00	35.00	80.00

There were three feedlots that reported average treatment costs for respiratory disease of $0 (appearing as minimum estimates in some categories in the above table). These included one feedlot from each of three size categories (size category 1, 2 and 3). Comments included in the questionnaire indicated that this estimate was based either on a decision to turn affected cattle out onto pasture and not treat them (reported by two of the three feedlots), or on a view that respiratory disease was not an issue that required treatment.

Table 55: Summary statistics for estimates of the average reduction in value ($) of animals at the time of exit from the feedlot after it has been treated for respiratory disease. se= standard error, CI=confidence interval, min=minimum, max=maximum.

	State		
	NSW	QLD	Total
Category=4 (>10,000)			
Feedlot (n)	6	0	8
Mean	126.67		107.50
se	56.80		44.44
95% CI lower	15.34		20.40
95% CI upper	237.99		194.60
min	30.00		0.00
max	400		400.00
Category=3 (5-10,000)			
Feedlot (n)	2	3	5
Mean	145.00	140.00	142.00
se	55.00	106.93	61.11
95% CI lower	37.20	0.00	22.23
95% CI upper	252.80	349.58	261.77
min	90.00	0.00	0
max	200.00	350.00	350.00
Category=2 (1-5,000)			
Feedlot (n)	4	2	10
Mean	337.50	20.00	169.50
se	157.29	20.00	74.36
95% CI lower	29.22	0.00	23.76
95% CI upper	645.78	59.20	315.24
min	50.00	0.00	0
max	700	40.00	700.00
Category=1 (<1,000)			
Feedlot (n)	5	1	10
Mean	56.00	300.00	93.00
se	11.66		28.75
95% CI lower	33.14		36.64
95% CI upper	78.86		149.36
min	30.00		0
max	100.00		300.00

Table 56: Summary statistics for estimated treatment costs associated with various conditions. In order to be included in the table each estimate had at least 2 or more separate estimates from individual feedlots.

	Costs ($)		
Condition	**Average**	**Min**	**Max**
Abortion induction	3.66	2.42	4.34
Bloat	12.50	5.00	20.00
Buller	18.33	8.00	27.00
Calving problems	33.95	13.30	55.00
Grain overload	12.50	10.00	15.00
Muscular - foot	8.24	4.00	20.00
Muscular - non-foot	8.07	2.00	20.50
Non-eater	9.68	5.00	15.88
Pink eye	7.37	2.00	16.00
Polioencephalomalacia	32.00	30.00	34.00
Prolapsed rectum	13.50	10.00	20.00

An attempt was made to produce an overall average treatment cost using detailed data on pulls and treatment costs from a single feedlot over a 12 month period and drawing on more than 1300 separate animal records. The overall average treatment cost per pull was estimated by collecting data on all treatments administered to each animal in association with each pull. The overall average cost per pull was $15.65 and the range was from $0 to $176.68.

Table 57: Summary statistics for estimates of the average reduction in value of animals at the time of exit from the feedlot after it has been treated for various other conditions.

	Value($)		
Condition	**Average**	**Min**	**Max**
Bloat	115.00	30.00	200.00
Calving problems & abortion	126.00	30.00	200.00
Muscular - foot	73.57	25.00	250.00
Muscular non-foot	292.00	20.00	1200.00
Non-eater	253.75	35.00	850.00
Pink eye	23.80	0.00	50.00
Prolapse rectum	82.50	65.00	100.00

4.10 Feedlot performance from questionnaire information

As outlined in the methods section, Part B of the questionnaire asked participating feedlots to provide information on feedlot performance. Feedlots were provided with two options for responding to this section of the questionnaire.

The preferred option was for feedlots to provide electronic records of cattle performance data. If this was not possible for any reason, then feedlots were asked to provide summary figures by filling in responses to a series of paper-based questions that asked for month-by-month or annual estimates of parameters relating to performance (number of cattle on feed, average daily gain, number of pulls, mortalities etc).

This section presents numeric summaries from the information provided in the form of paper-based summary estimates.

Some caution is required in interpreting the responses to the paper-based part of the questionnaire that asked for estimates of cattle numbers on feed and numbers of pulls and mortalities. An initial review of responses to the paper-based questionnaire indicated that some feedlots appeared to be providing actual counts that were considered likely to be drawn from records, while other feedlots appeared to provide rounded estimates that in many cases were entered as the same number for all months of the year. These issues reflect difficulties in collecting this information in a simple questionnaire format. More detailed summary statistics have been obtained from electronic files of cattle numbers and these are presented in a subsequent section of this report.

Table 58: Count of number of feedlots providing completed forms with summary information on cattle numbers and performance, arranged by market class and size category

	Size	State			
feed class	**category**	**NSW**	**Other**	**QLD**	**Total**
short	<1,000	3	4	4	11
	1-5,000	5	3	1	9
	5-10,000	1	0	0	1
	>10,000	0	0	0	0
mid	<1,000	2	0	0	2
	1-5,000	0	0	1	1
	5-10,000	0	0	0	0
	>10,000	4	0	0	4
long	<1,000	1	0	0	1
	1-5,000	0	1	0	1
	5-10,000	0	0	0	0
	>10,000	1	0	0	1

There were relatively few feedlots from the Mid-fed and Long-fed market classes that provided paper-based responses to Part B of the questionnaire. There were more responses from the Short-fed market class, and particularly for feedlots in the smaller size categories. Part of the reason for this may be that smaller feedlots were less likely to have electronic recording systems in place.

Because of concerns over the validity of the estimates provided in the paper-based questionnaire, this section of the report is limited to summary statistics for Short-fed feedlots only. Additional results from the paper-based responses to the questionnaire are provided in an appendix to this report.

4.10.1 Summary statistics for short fed cattle only (<100 days on feed)

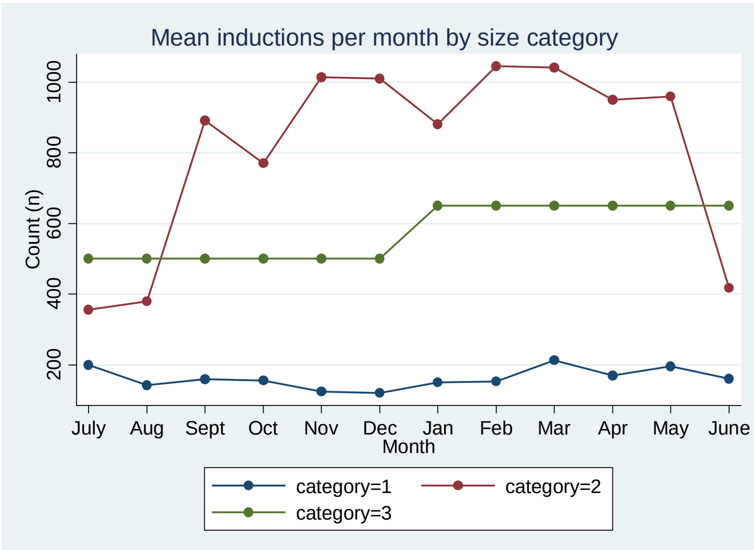

Figure 1: Mean number of cattle inducted per month for short-fed cattle

Although the patterns appear variable, the data for the two smallest size categories (size category=1 and 2) are consistent with peak incoming cattle numbers in Feb-March, followed by a decline in the middle of the year (apparent in the line for size category=2) and a second peak in incoming numbers in the latter part of the year.

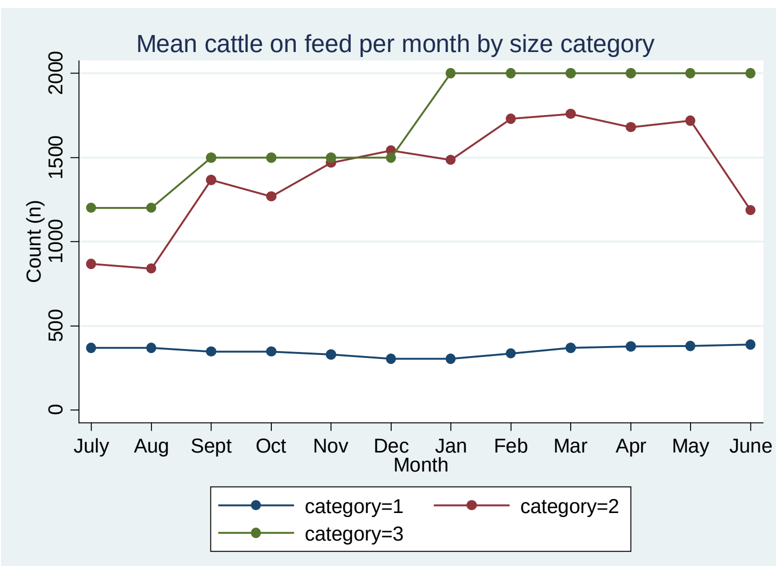

Figure 2: Mean total cattle on feed by month for short-fed cattle

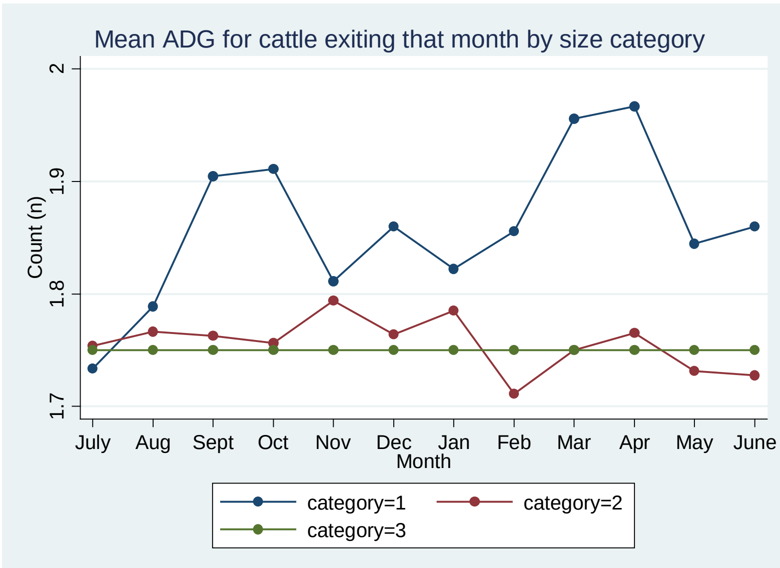

Figure 3: Mean monthly Average Daily Gain (ADG) for cattle exiting the feedlot in that month, for short-fed cattle

There was a suggestion of monthly variation in ADG but there was no statistical difference between the ADG estimates. The estimate for size category =3 is constant because it was derived from a single feedlot.

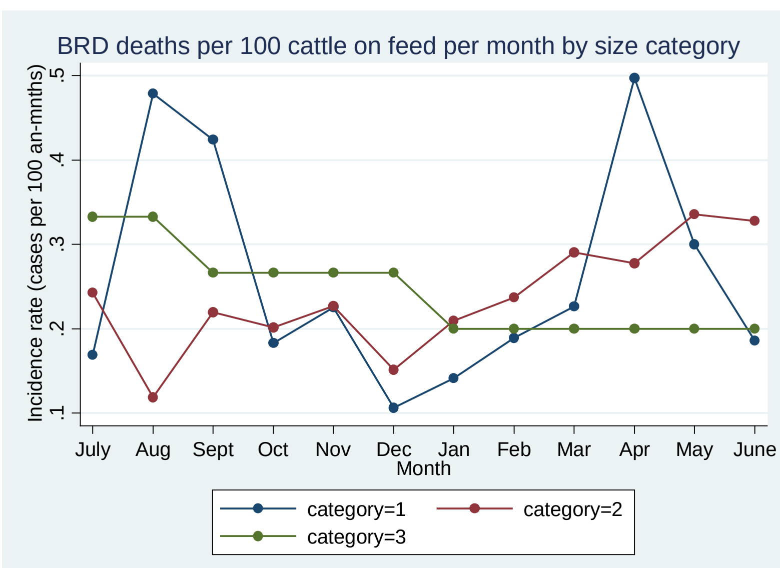

Figure 4: Incidence rate for respiratory disease deaths reported as cases per 100 animal-months. Limited to short-fed cattle only.

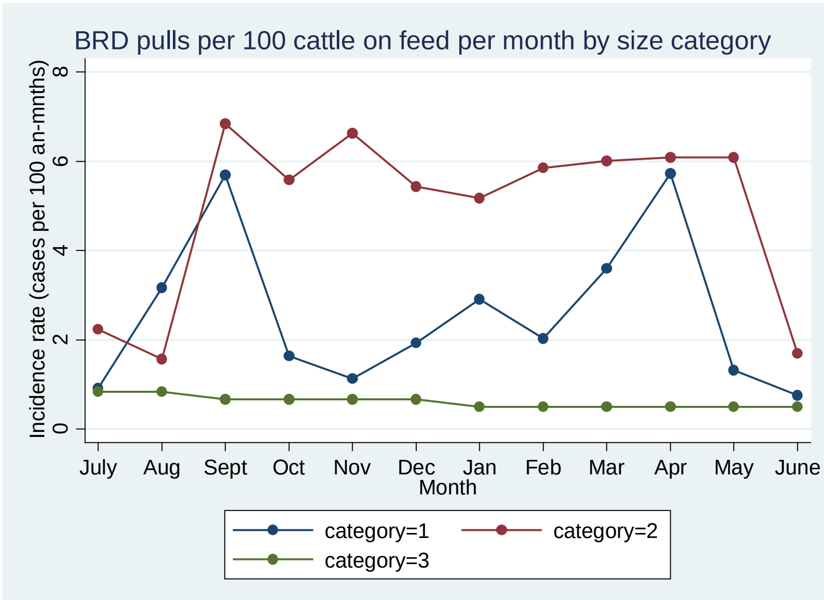

Figure 5: Monthly incidence rate of respiratory disease pulls for short fed cattle.

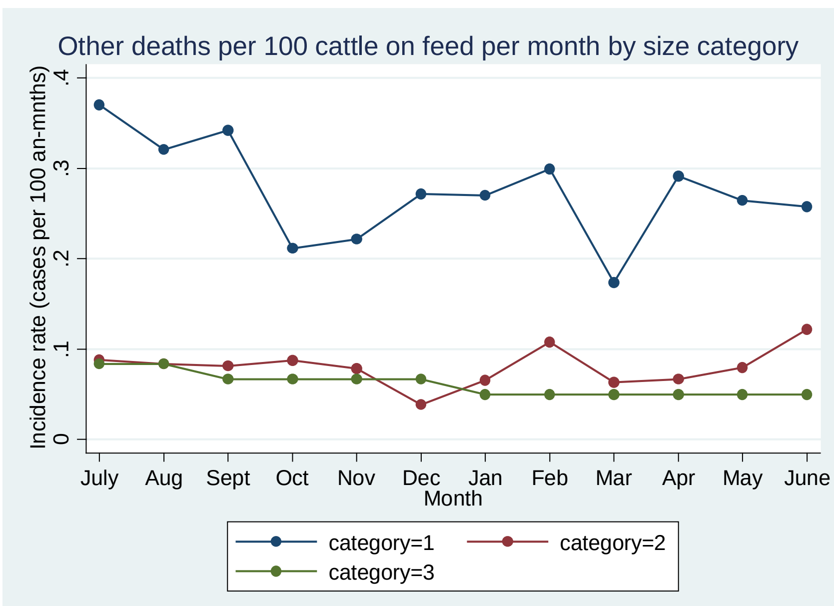

Figure 6: Monthly incidence rate of deaths due to any cause other than respiratory disease. Limited to short fed cattle only.

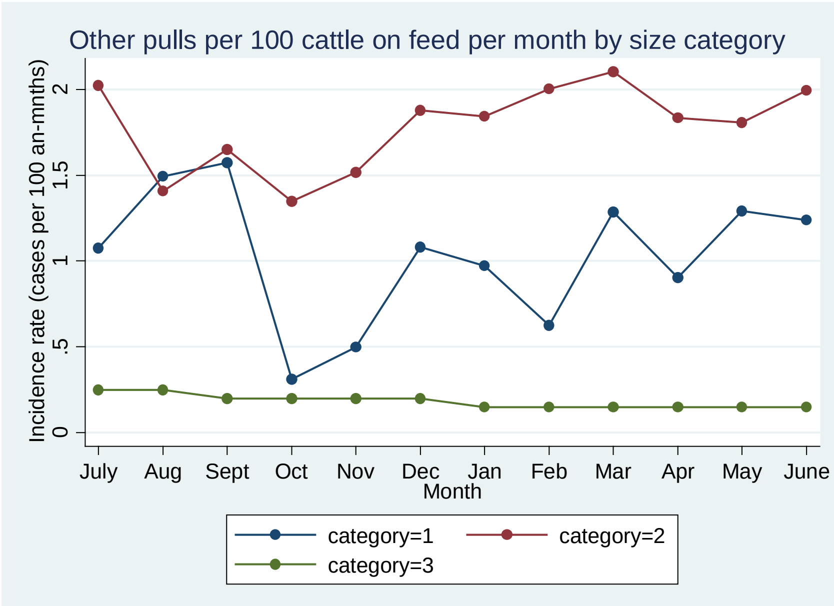

Figure 7: Monthly incidence rate of pulls due to any condition other than respiratory disease. Limited to short fed cattle only. Arranged by month of year and feedlot size category.

4.11 Feedlot performance from electronic data

As indicated earlier in this report, feedlots were asked to provide information on feedlot performance and were informed that the preferred format would be to provide electronic data files based on actual records of animal performance measures for animals that entered the feedlot in a 12 month period ending in June 2010. Electronic records were preferred because it was felt that summary statistics derived from electronic records would provide a more detailed, valid and precise record of performance.

Where feedlots were unable or unwilling to provide electronic data records, they were asked to provide paper-based estimates in response to questions on feedlot performance. The previous section provides summary statistics drawn from paper-based responses for Mid-fed market class cattle.

This section presents summary information drawn from those feedlots that did provide electronic records in response to Part B of the questionnaire.

Participating feedlots were asked if they would be prepared to provide detailed electronic data records covering performance, morbidity (pulls) and mortality (deaths) for a defined period. The request incorporated the following records:

- Performance data at the lot level to cover all cattle that entered the feedlot between 1 July 2009 and 30 June 2010, recognising that the data file may extend into 2011 to cover close out for all these lots. This file was expected to include entry date, counts of cattle (entering, exiting, deaths), market class, weight (optional) and average daily gain for the period on feed.
- Hospital pulls for the 24 month period from 1 July 2009 to 30 June 2011. This file was expected to include individual animal records at the level of each pull with each animal being identified by lot number also so these records could be linked to lot-level performance data.
- Deaths for the 24 month period from 1 July 2009 to 30 June 2011. This file was expected to include individual animal records for each mortality with each animal being identified by lot number also so these records could be linked to the lot-level performance data.

The longer period for pulls and deaths was an attempt to ensure data on pulls and deaths covered the full period on feed for those lots entering the feedlot between 1 July 2009 and 30 June 2010.

A total of 13 feedlots provided electronic data files in response to this request.

Files provided by three feedlots were unable to be used for analysis because they represented relatively simple summary statistics of various measures of performance and did not contain any data at the lot level or at the individual animal level.

A total of ten feedlots provided performance data at the lot level that allowed files to be combined and analysed to produce estimates of average daily gain. These included two feedlots in size category=2 (1000 to 5000 cattle capacity), one feedlot in size category =3 (5000-10000) and seven feedlots in the largest size category. There were no feedlots from the smallest size category represented in this dataset. There were insufficient feedlots present in all size categories or states to allow effective comparison of performance between levels of these factors so all analyses were performed on the combined dataset (averaged over all three size categories and over all states).

The data file contained one row for each lot. Average daily gain was estimated for each lot and analytical weights were used in the analysis to account for the number of cattle in each lot. This ensured that larger lots were given more analytical weight in determining the overall measures of performance. Regression models were run with average daily gain as the outcome and with predictors including feedlot, year (year of exit), month of exit and market class. After initially using three levels of market class (<100 days, 100 to 250 and >250 days) a decision was made to alter the categories to try and glean additional information from the data. Market class was therefore split into four levels based on duration of days on feed (<85, 85 to <120, 120 to 250, >250 days).

There was variability between feedlots in terms of recording systems used and as a result the structure and format of data files. Records were checked to ensure that totals recorded as being inducted for a lot were reconciled with the number recorded at exit, to ensure that calculated ADG measures for example were based on all head where possible. In some cases this was not able to be checked and it is possible that some data files may have had cattle recorded at induction and then no exit details recorded because they had died or had been sent for salvage slaughter for example.

Because of the variable duration of time on feed for different markets and lots, the data files included lots that entered the feedlot in 2009 and 2010, and covered exit dates that ranged from 2009 through to mid 2011.

A total of six feedlots (five from size category=4 and one from size category=3) provided detailed pull and mortality data at the individual animal level that allowed analysis of pull and mortality rates. A number of participating feedlots indicated that they did not have electronic records of pulls and mortalities and some feedlots appeared to have difficulty in extracting these data from their record systems. A small number of participating feedlots were unwilling to provide electronic data files. The electronic data files provide an excellent opportunity to examine in more detail the patterns of performance from Australian feedlots but these results may not be representative of the overall feedlot population since records were only available from larger feedlots.

4.11.1 Summary measures of performance

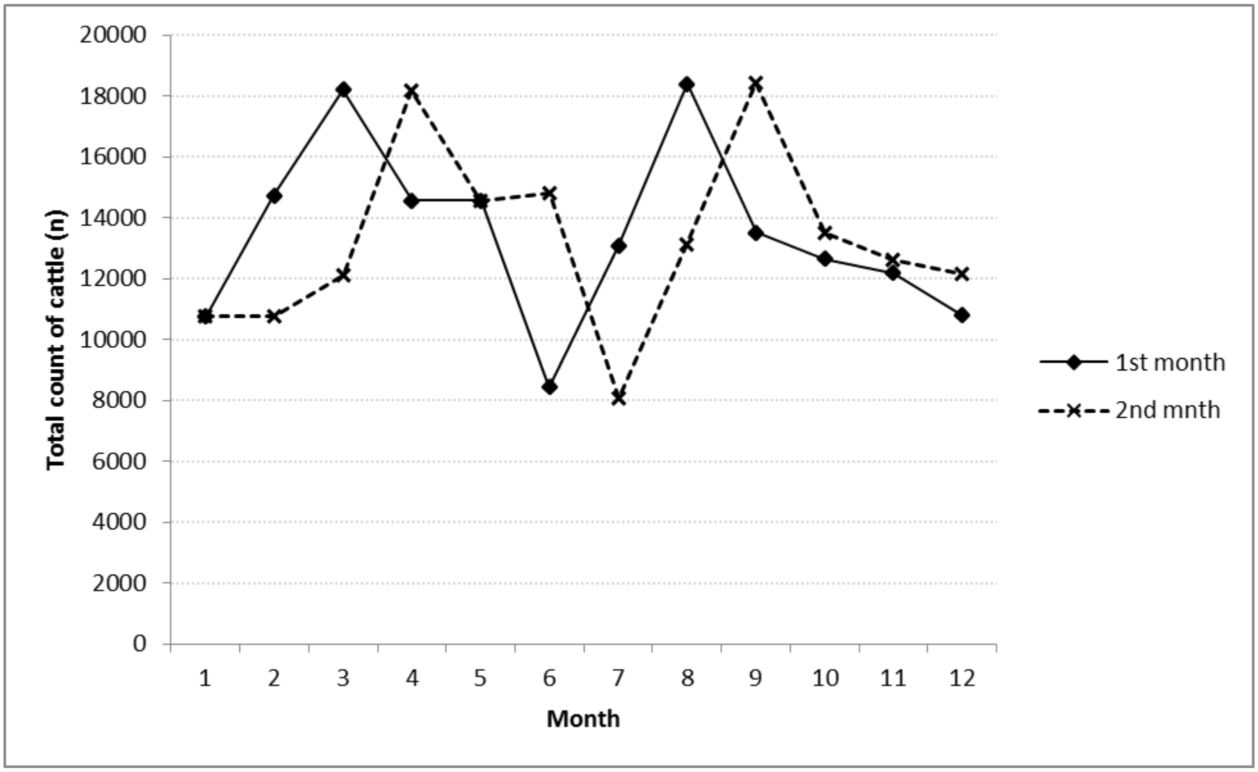

Figure 8: Count of cattle in their first month of days on fed and the second month of days on feed, arranged by calendar month over a 12 month period.

Figure 8 shows the broad pattern of arriving cattle, drawn from all contributing feedlots. There is an initial peak of incoming cattle in Feb-March, followed by a decline to an annual low in June and then a second peak in August. The numbers of cattle on feed in the second month of time on feed, is a lagged image of the first month estimate.

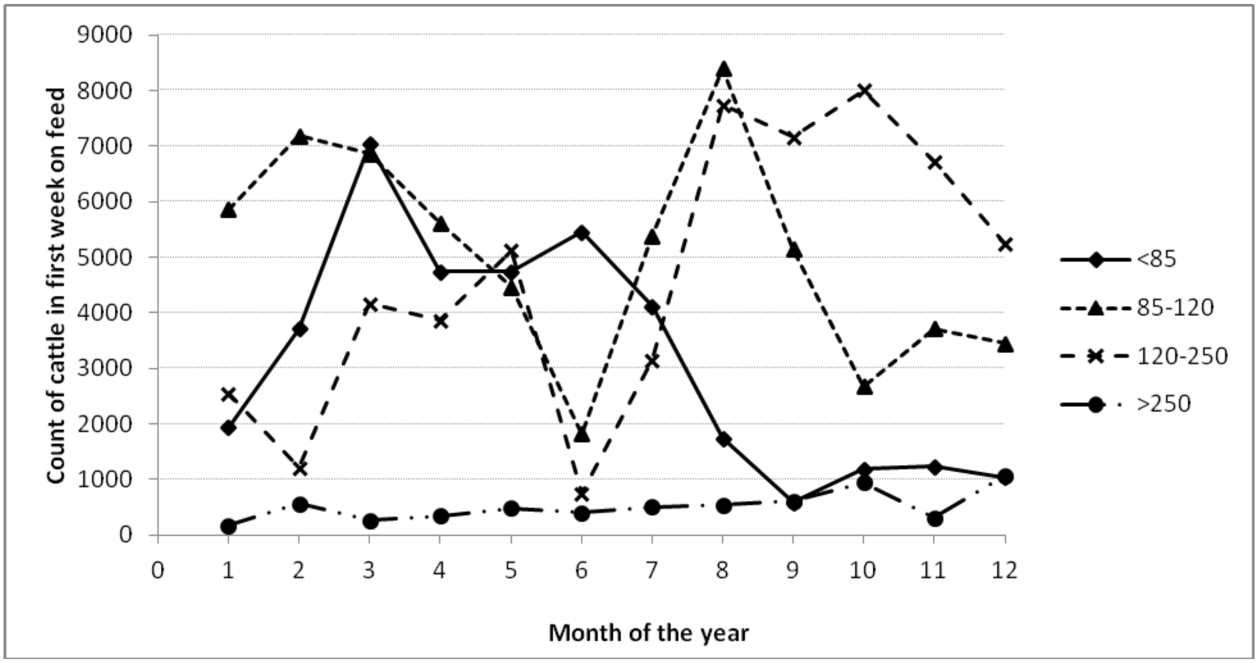

Figure 9: Plot showing monthly totals of cattle in their first week on feed, arranged with separate lines by market class. Limited to just those cattle in their first week on feed.

Figure 9 provides additional details on the numbers of incoming cattle by market class during different months of the year. The data indicate that there is considerable variation both within and between market class. The two shorter feed categories (<85 and 85-120 days) of cattle are the major contributors to the peak numbers of cattle starting on feed in the earlier part of the year. These animals are also considered likely to be the younger animals. In contrast, the second peak of incoming animals in August is due to a large spike in the 85-120 day class and a large contribution from the 120-250 day class. These animals are considered likely to be older. This pattern is likely to be drive in part by the typical seasonal pattern of calving in beef herds and animal availability. The very long fed animals have a reasonably constant arrival pattern with possibly a rise in the second half of the year. This pattern is obscured slightly by the scale of the other arrivals.

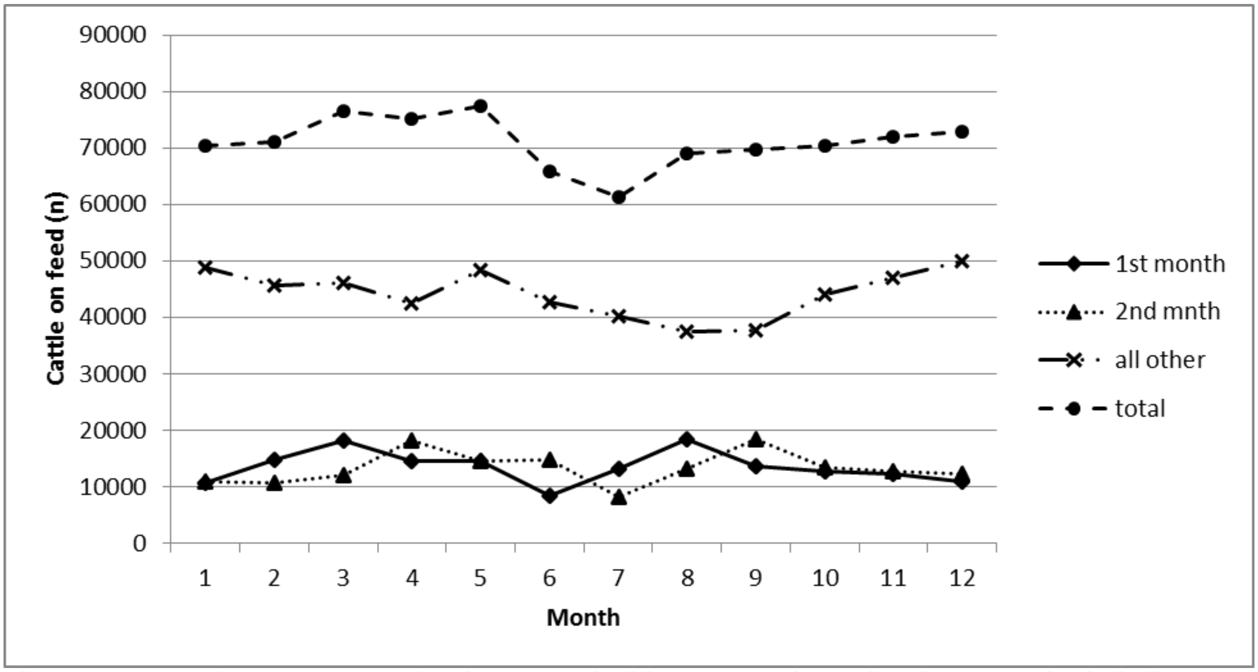

Figure 10: Plot of Total cattle on feed, arranged with separate lines showing cattle in their first month on feed, second month on feed, all other months and total cattle on feed.

This figure is intended to show the overall pattern of cattle numbers on feed for the feedlots providing electronic data files. The broad pattern shows a peak between March and May followed by a decline in July and then a gradual increase through the latter part of the year.

Table 59: Estimates of the mean average daily gain (ADG) for each market class. Derived from a regression model containing fixed effects for feedlot, year, month, market class and the month*market class interaction.

			95% CI	
Market class	**ADG**	**se**	**Lower**	**Upper**
<85 days	1.66	0.01	1.64	1.68
85 to <120 d	1.71	0.01	1.70	1.73
120 to <250 d	1.67	0.01	1.65	1.69
250+ d	1.15	0.03	1.10	1.21

The long fed animals (>250 days) had a significantly lower ADG than all other market class groups ($p<0.001$).

There was no difference between any of the other three market class groups ($p>0.05$).

There was also significant variation between feedlots and years. Model output for these variables will not be discussed but including explanatory variables coding for feedlot and for year ensured that the effects of these factors were incorporated in to the modelling and that more valid estimates were derived for effects associated with the main factors of interest – market class and month of exit.

Table 60: Mean ADG estimated for each combination of month of exit and market class (se=standard error)

	<85 days		85 to <120 d		120 to <250 d		>250 d	
Month	**ADG**	**se**	**ADG**	**se**	**ADG**	**se**	**ADG**	**se**
1	1.73	0.04	1.77	0.03	1.76	0.02	1.18	0.08
2	1.63	0.04	1.79	0.03	1.78	0.02	1.21	0.10
3	1.69	0.04	1.77	0.02	1.71	0.02	1.24	0.07
4	1.61	0.03	1.75	0.03	1.62	0.02	1.18	0.09
5	1.72	0.03	1.79	0.02	1.66	0.03	1.14	0.07
6	1.72	0.02	1.75	0.02	1.66	0.03	1.26	0.06
7	1.60	0.03	1.71	0.02	1.64	0.03	1.09	0.08
8	1.56	0.03	1.64	0.02	1.64	0.03	1.18	0.12
9	1.57	0.03	1.53	0.02	1.59	0.03	1.07	0.09
10	1.70	0.04	1.64	0.03	1.60	0.03	1.10	0.09
11	1.80	0.05	1.69	0.02	1.67	0.04	1.09	0.09
12	1.68	0.05	1.75	0.03	1.73	0.04	1.02	0.12

Table 60 shows mean ADG over the time on feed arranged by month of exit for cattle by market class. Figure 11 shows a plot of the mean ADG estimates to provide a visual display of the pattern over the course of a year.

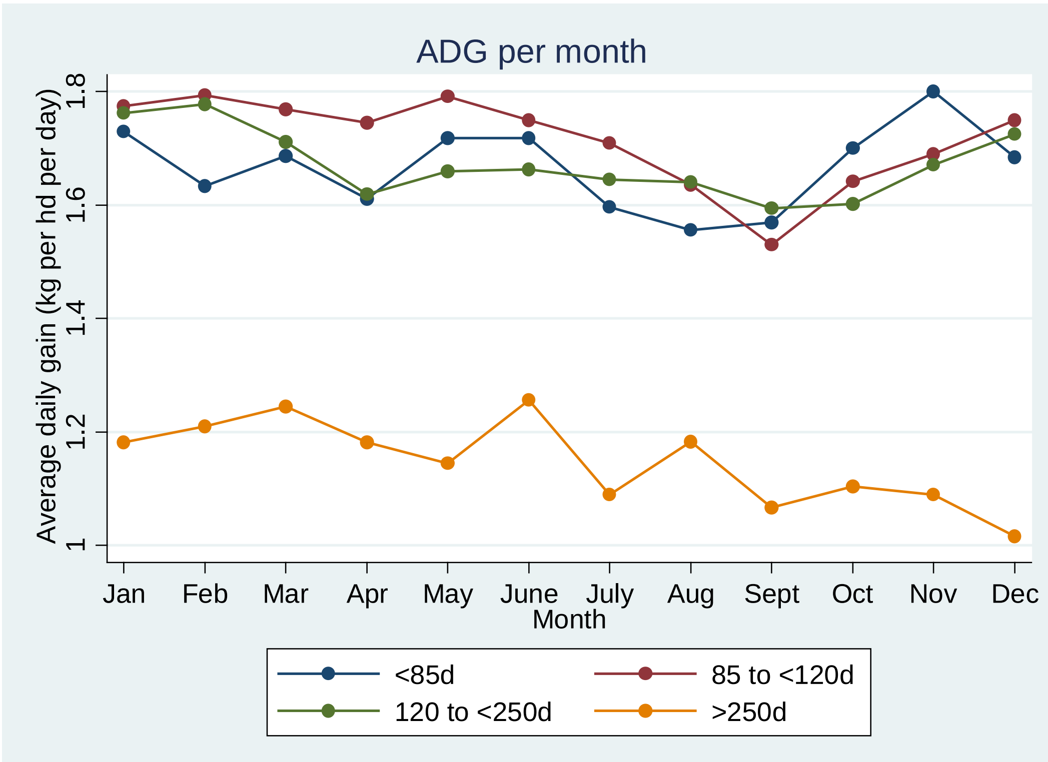

Figure 11: Average Daily Gain (ADG) per month of exit for each of four market classes

There are a number of significant differences between market classes at varying months of the year. The long fed animals remain significantly lower than other classes throughout the year.

Animals in the 85-120 class have the highest ADG for much of the year and this class is significantly higher than other classes in April and May for example. In contrast, the shortest fed category has the highest ADG in October and November and is significantly higher than all other categories in November. The general pattern appears similar in all three of the shorter fed classes. There is a slight decline in monthly ADG from Jan to April and then a rebound followed by a more obvious decline to a nadir in September which is then followed by a climb to peak values again around Dec to January.

The long fed cattle show a different pattern with a gradual decline in ADG throughout the year, interrupted by rises from January to March and in June and August.

4.11.2 Mortality rate by month

Electronic data files from participating feedlots provided information on hospital pulls, treatments, diagnoses and mortalities. These files were used to generate counts of mortalities by cause of death and market class.

Table 61: Count of deaths by market class and diagnosis category. Musc=muscular, resp=respiratory, unkn=unknown.

Market	Digestive	Infection	Musc	Other	Repro	Resp	Unkn	Total deaths
<85d	24	15	45	26	29	238	45	422
85-120d	75	35	142	81	35	420	58	846
120-250d	94	24	119	66	11	551	91	956
>250d	6	5	41	9	5	17	9	92
Total	199	79	347	182	80	1226	203	2316
% of total	8.59	3.41	14.98	7.86	3.45	52.94	8.77	100.00

Respiratory disease accounted for 53% of all mortalities with musculoskeletal conditions being next important, accounting for 15% of all mortalities.

Comparisons of counts of mortalities may be misleading because the number of animals at risk may be different between groups being compared. The more useful approach to describing and comparing mortality is by estimation of mortality rates. A mortality rate involves a numerator (generally the count of mortalities in a defined period) and a denominator (count of animals at risk of dying during a specified time period).

In this report mortality rates were estimated as deaths per 100 animal-months on feed or per 100 animal-weeks on feed. These mortality rates may then be expressed as a percentage mortality per month or week on feed.

Table 62: Mortality rates (deaths per 100 animal months)

	Mortality rate		95% CI	
	deaths per 100 an-mnths	se	Lower	Upper
Total mortalities	0.274	0.0086	0.257	0.291
Respiratory	0.139	0.006	0.126	0.151
Muscular system	0.042	0.0025	0.038	0.047
Digestive	0.023	0.002	0.02	0.027
Infection	0.01	0.0011	0.007	0.012
Reproductive	0.01	0.0014	0.007	0.012
Other	0.021	0.002	0.018	0.025
Unknown	0.024	0.002	0.02	0.028

Table 62 provides estimates of mortality rates in cattle on Australian feedlots.

When data from all causes of death were combined, the overall mortality rate for all cattle on feed, was 0.274 per 100 animal-months. This may be expressed as 0.274% of animals dying for every month on feed.

A total of 0.139% of animals on feed died from respiratory disease each month and 0.042% of animals died from muscular system conditions.

Table 63: Estimate of mortality rate (deaths per 100 animal months on feed) expressed for each calendar month and averaged over all market classes and over all causes of death

Month	Mortality rate deaths per 100 an-mnths	se	95% CI Lower	95% CI Upper
1	0.273	0.027	0.221	0.325
2	0.318	0.036	0.247	0.390
3	0.314	0.033	0.249	0.380
4	0.279	0.029	0.223	0.335
5	0.408	0.039	0.332	0.484
6	0.337	0.033	0.273	0.401
7	0.207	0.026	0.155	0.258
8	0.184	0.021	0.142	0.225
9	0.190	0.018	0.155	0.225
10	0.187	0.022	0.144	0.231
11	0.243	0.028	0.188	0.298
12	0.249	0.024	0.201	0.297

The overall mortality rate varied by month of the year. It was lowest during the late winter and spring and highest in late summer and autumn.

Mortality rate has been expressed in earlier surveys as deaths per 1000 head turned off. In the current survey the total count of head turned off was estimated and used as a denominator to express cumulative mortality rate as deaths per 1000 head turned off. The rates for respiratory, muscular and total deaths were 7.8, 2.2 and 14.7 deaths per 1000 head turned off, respectively.

Estimates can be made of case fatality rates by comparing the number of mortalities for a particular diagnosis to the number of pulls. Case fatality rates for respiratory cases, muscular conditions and all pulls combined were 4.1%, 8.4% and 6.5%, respectively.

At the individual lot level, the mortality rate expressed as deaths per 100 cattle inducted, ranged from a low of 0% to a high of 9.64%.

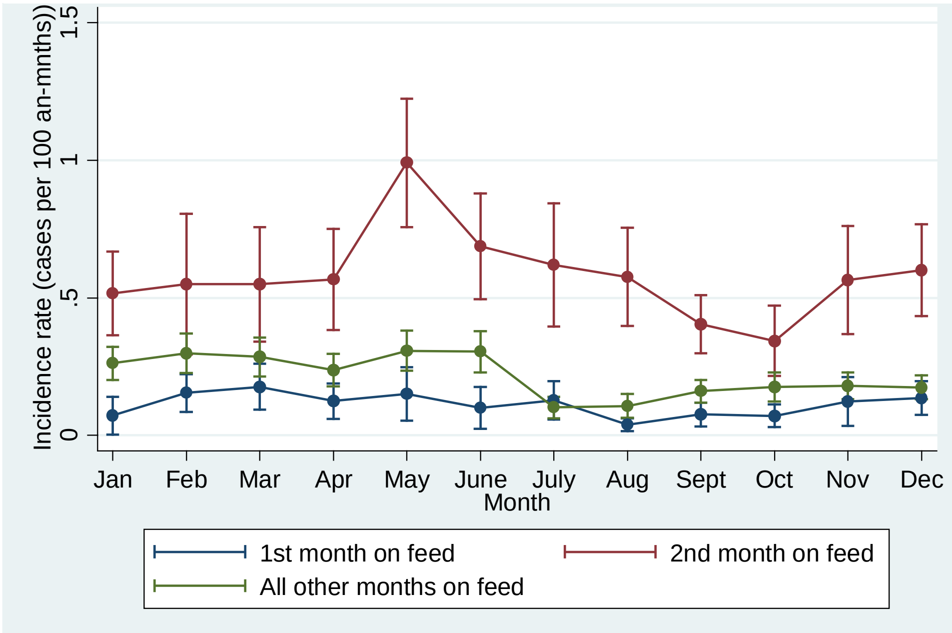

Figure 12: Overall mortality rate displayed by category of time on feed. All types of mortality combined. IR = incidence rate. Bars represent the 95% confidence interval.

Figure 12 shows the variation in mortality rate by month of the year and by category of time on feed. The x-axis displays calendar month to allow appraisal of patterns over the course of the year. The blue line reflects animals in their first month on feed, the red line reflects animals in their second month on feed and the green line is an aggregation of animals at all other stages of their time on feed.

The plot shows that the highest mortality rate is experienced in animals that are in their second month on feed and over most of the year the lowest mortality rate is experienced by animals in their first month on feed. In addition there is a peak in the mortality rate that occurs in May. This is then followed by a decline in mortality rate to a low in October (for those animals in their second month on feed).

The pattern displayed for respiratory deaths is very similar to that shown for all deaths combined, reflecting the fact that respiratory deaths are the major single cause of death in feedlot cattle.

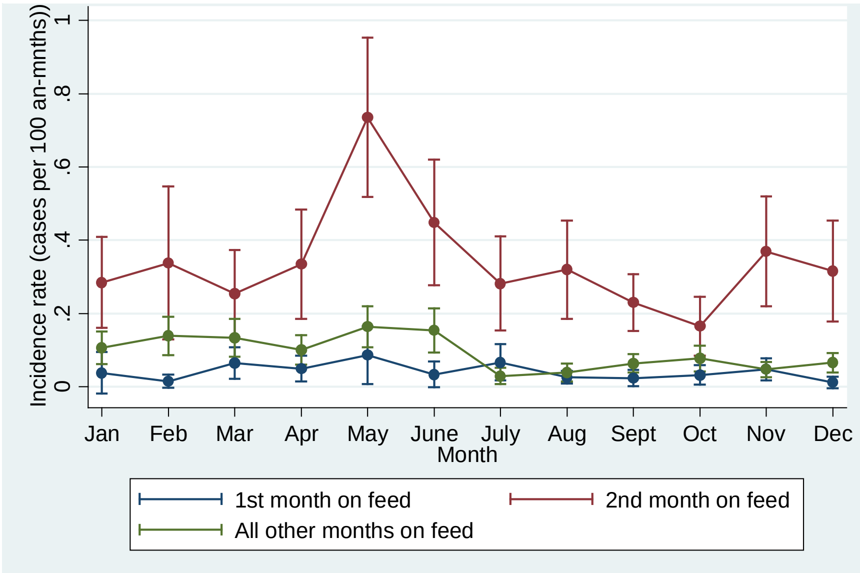

Figure 13: Mortality rate (deaths per 100 animal-months) due to respiratory disease alone, arranged by month on feed and calendar month. Bars represent the 95% confidence interval.

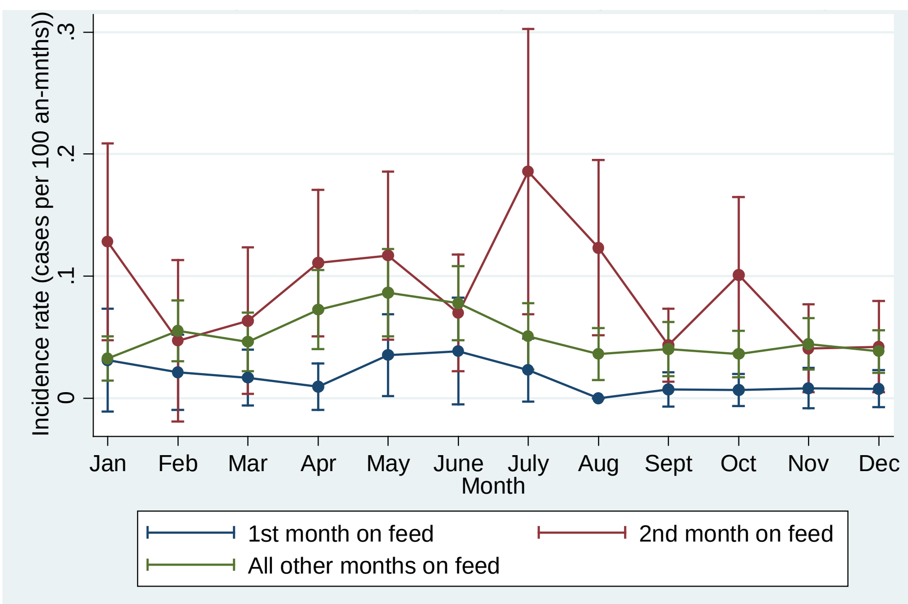

Figure 14: Mortality rate (deaths per 100 animal-months) due to muscular system conditions, arranged by month on feed and calendar month. Bars represent the 95% confidence interval.

There is less evidence for a clear pattern in muscular mortality rate over the course of the year with more variation and wider confidence intervals.

4.11.3 Mortality rates by week on feed

A separate set of analyses was then conducted to assess mortality (and pull rates) based on time on feed as determined by the number of weeks from when animals started on feed, independent of which month of the year they started on feed. Weeks on feed were coded as 1 for the first week on feed and increased by 1 unit for each additional week on feed until the animals exited the feedlot. This approach is useful for looking at patterns based on time on feed.

Data on animal mortalities were combined with performance data to produce a dataset arranged by lot and week on feed. Poisson models were then used to analyse mortality rate using the number of animals on feed in a given lot and week as the denominator. Denominators were adjusted each week by subtracting counts of mortalities that occurred in that week. Models contained fixed effects coding for feedlot, year that feeding period began and week on feed. All models contained an offset based on the natural log of the denominator (animal weeks at risk) for each week.

A starting model was run that used total mortalities as the outcome and that just contained a single explanatory variable coding for market class (four levels of days on feed). This model was used to generate overall estimates of mortality rate for each market class.

Separate models were then run for each of four market classes based on duration of time on feed (<85days, 85 to 120 days, >120 to 250 days and >250 days).

A variable coding for season when animals started on feed was also generated in this dataset, based on the month when animals started on feed (categorised into summer, autumn, winter and spring). Season of start was considered for inclusion in all models but was found to be not-significant and was removed from models. Models were then used to generate estimates of mortality rate by week on feed for each of the four market classes.

Table 64: Summary statistics for mortality rate by market class

Market class (days on feed)	Animal time at risk (animal-weeks)	Deaths (n)	Mortality rate (deaths per 100 an-wks)	95% CI Lower	95% CI Upper
<85 days	376,444	422	0.112	0.096	0.129
85 to <120 d	931,115	846	0.091	0.082	0.1
120 to <250 d	1,175,207	956	0.081	0.074	0.09
250+ d	3,807,361	92	0.024	0.02	0.03
Total	2,863,497	2,316	0.08	0.076	0.086

Table 64 provides model output from a poisson model estimating overall mortality rates by market class. The denominators (animal weeks at risk) are based on the number of animals recorded as entering the feedlot for each lot, adjusted for mortalities in any given week on feed.

The highest overall mortality rate was observed in the shortest fed class and this was significantly higher than the overall mortality rate in the other three classes (p<0.05).

The overall mortality rate in the longest fed class was significantly lower than the other three class (p<0.05).

There was no difference in overall mortality rate between the two middle classes (85 to <120 days vs 120 to <250 d; p=0.11).

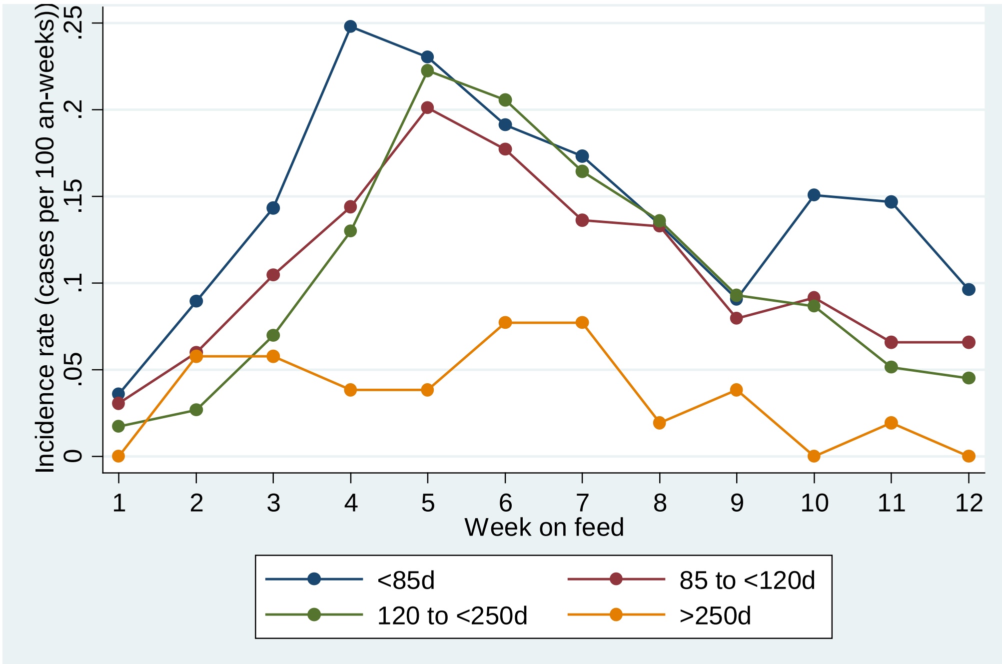

Figure 15: Plot of mortality rate (deaths per 100 animal weeks on feed) by week on feed and market class

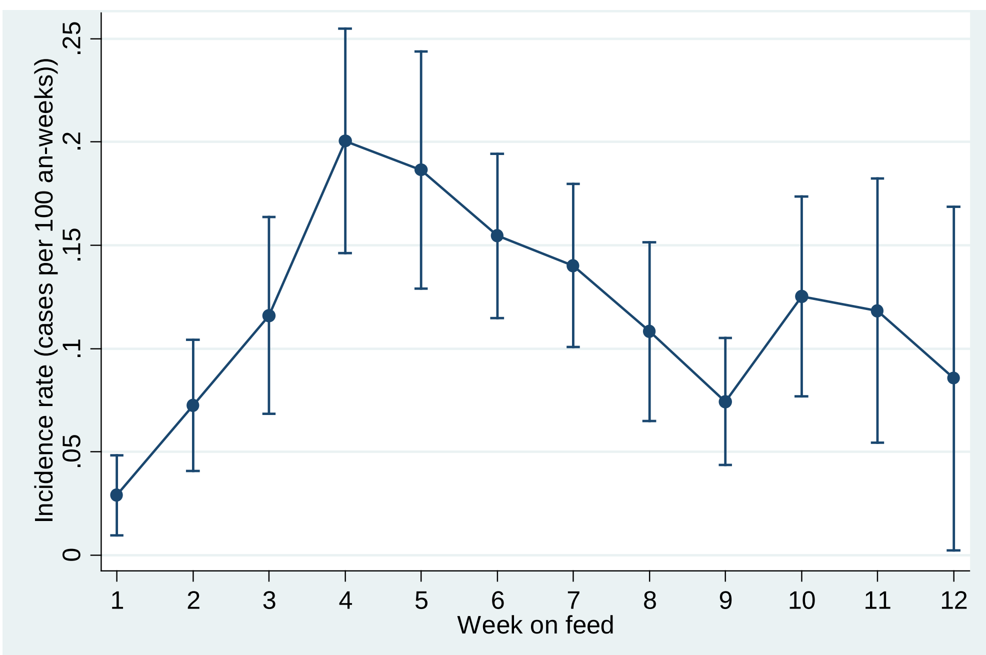

Figure 16: Mortality rate (deaths per 100 animal-weeks), arranged by week on feed. Limited to those lots that were on feed for up to 85 days. Bars represent 95% confidence intervals.

The lowest overall mortality rate was observed in the first week on feed. All other weeks showed a significantly higher mortality rate when compared to the first week on feed ($p<0.05$).

There was a progressive rise in mortality rate to peak at week 4. The mortality rate at weeks 4 and 5 was significantly higher than the rate at week 3 ($p<0.05$).

There was a progressive decline in mortality rate after week 4 but the drop in mortality rate from week 4 to week 7 was not statistically significant and it was not until week 8 that the mortality rate became statistically different to the peak rate observed in week 4.

These findings indicate that mortality progressively rises each week on feed for the first 4 weeks or so and remains high for most of the second month on feed.

There was variability in the mortality rate between weeks 8 and 12 on feed but comparison of these rates indicated that there was no statistical difference between any of these weekly estimates ($p>0.05$). The wider confidence intervals for these estimates indicates that there were fewer denominators (lots on feed) as the total time on feed approached 12 weeks. A number of short fed lots tend to be on feed for periods up to about 70 days.

It is interesting to note that season of the year was not a significant factor contributing to the pattern of mortality rates over time. These findings suggest that it the more important explanatory pattern is the time in weeks from when animals started on feed, regardless of what season of the year animals started on feed.

Table 65: Count of total deaths by category for animals on feed for up to 85 days

Week on feed	Digestive	Infection	Musc	Other	Repro	Resp	Unkn	Total deaths
1	3		2	1	1	3		10
2	4	1	2	3		10	5	25
3	1	1	2	1	2	30	3	40
4	2	3	8	4	3	40	9	69
5	4	3	10	3	2	37	5	64
6	1	1	4	4	3	37	3	53
7	3	4	6	2		28	5	48
8	1	1	4	2	5	20	4	37
9	2	1	1	1		12	5	22
10	1		3	3	5	16	5	33
11	2		3	2	6	5		18
12					2		1	3
Total	24	15	45	26	29	238	45	422

The most important single cause of death was respiratory disease, accounting for 56% of all deaths in short-fed cattle (238 of 422). The next most important cause was muscular conditions which included traumatic conditions, animals with injuries associated with buller activity, foot conditions and septic arthritis.

Separate mortality rate estimates were then derived for respiratory and muscular deaths. The respiratory death plot shows the same pattern as the overall death plot since respiratory deaths are the single most important cause of death. The muscular deaths also show a similar peak at 4-5 weeks on feed.

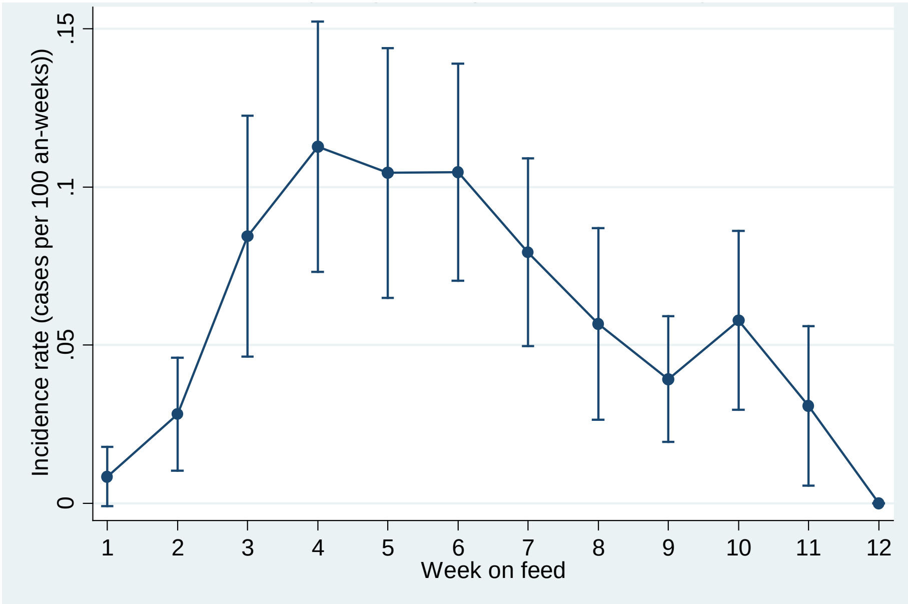

Figure 17: Mortality rate (cases per 100 animal-weeks on feed) for respiratory deaths only. Limited to animals on feed for up to 85 days. Bars represent 95% confidence interval.

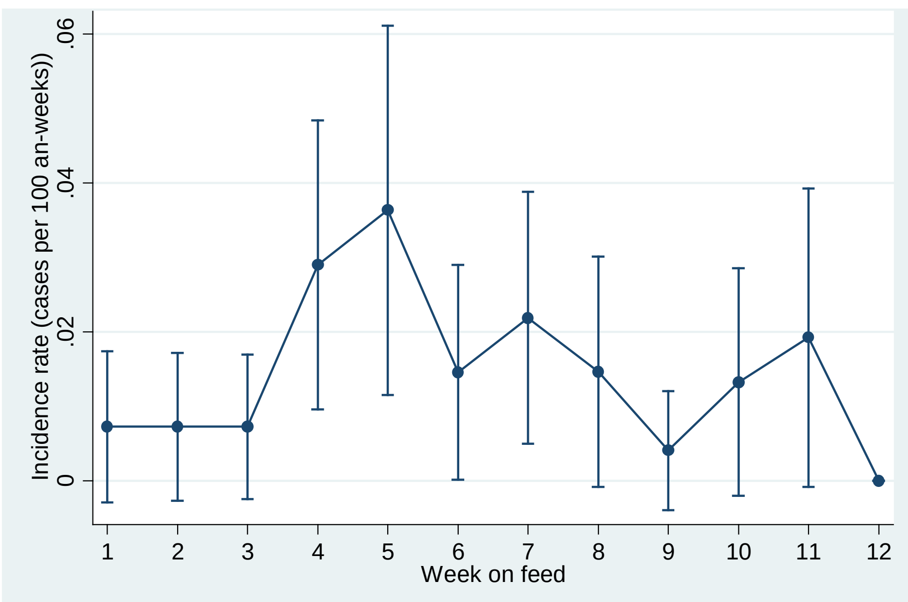

Figure 18: Mortality rate for muscular deaths only. Limited to animals on feed for up to 85 days. Bars represent 95% confidence interval.

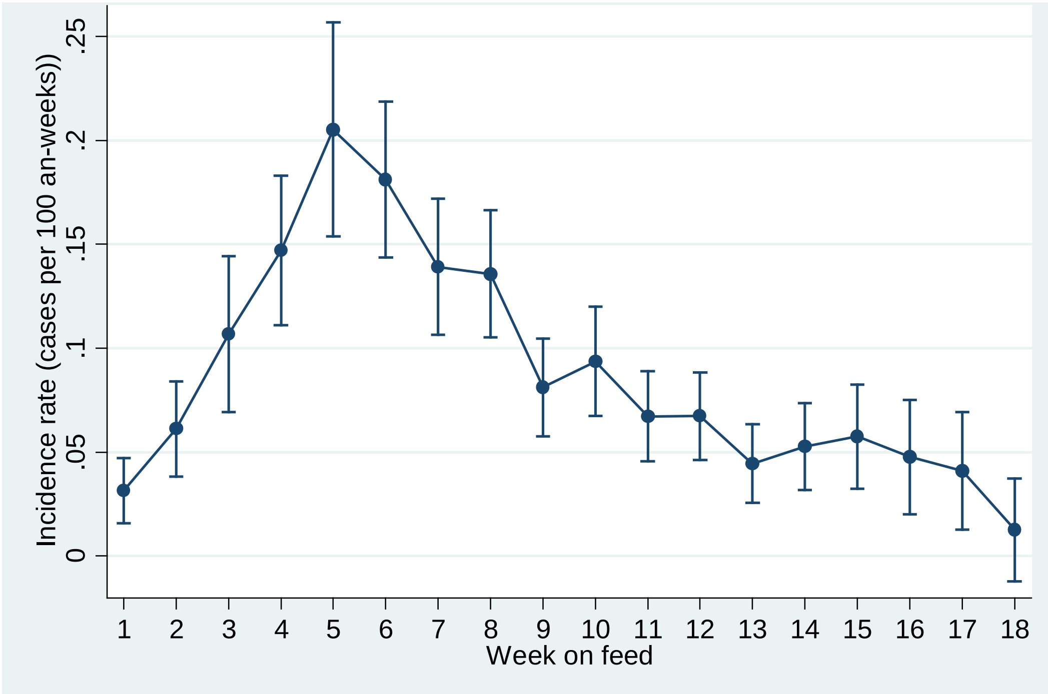

Figure 19: Mortality rate of all mortalities expressed as deaths per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for between 85 and 120 days. Bars represent 95% confidence intervals.

The overall mortality rate in animals on feed for 85 to 120 days shows a similar pattern to the shorter feed animals. The mortality rate rises progressively over the first few weeks on feed to a peak between 5 and 6 weeks on feed. There is then a progressive decline in mortality rate and by week 13 the rate is no longer statistically different to that observed in the first week on feed ($p>0.05$).

The major cause of deaths was respiratory disease, accounting for 50% of all deaths. The second most important cause of death was muscular conditions, accounting for 17% of all deaths.

Table 66: Summary count of deaths by week on feed and diagnosis category. Limited to those animals on feed for between 85 and 120 days.

Week on feed	Digestive	Infection	Musc	Other	Repro	Resp	Unkn	Total deaths
1	6	2	4	3		1	2	18
2	5	7	7	6		5	5	35
3	11	3	4	11	4	22	6	61
4	8	4	19	4	1	45	3	84
5	5	2	10	7		90	3	117
6	4	3	15	9	2	65	5	103
7	1	1	10	9	2	49	7	79
8	4	3	14	5	1	46	4	77
9	3	3	10	3	2	24	1	46
10	5	4	10	5	4	20	5	53
11	2		8	6	1	18	3	38
12	4	1	9	3	7	12	2	38
13	4	1	8	3	3	4	1	24
14	3		5	3		11	4	26
15	5		2	2	5	4	4	22
16	3	1	3	1	3	2	2	15
17	2		3	1		2	1	9
18			1					1
Total	75	35	142	81	35	420	58	846

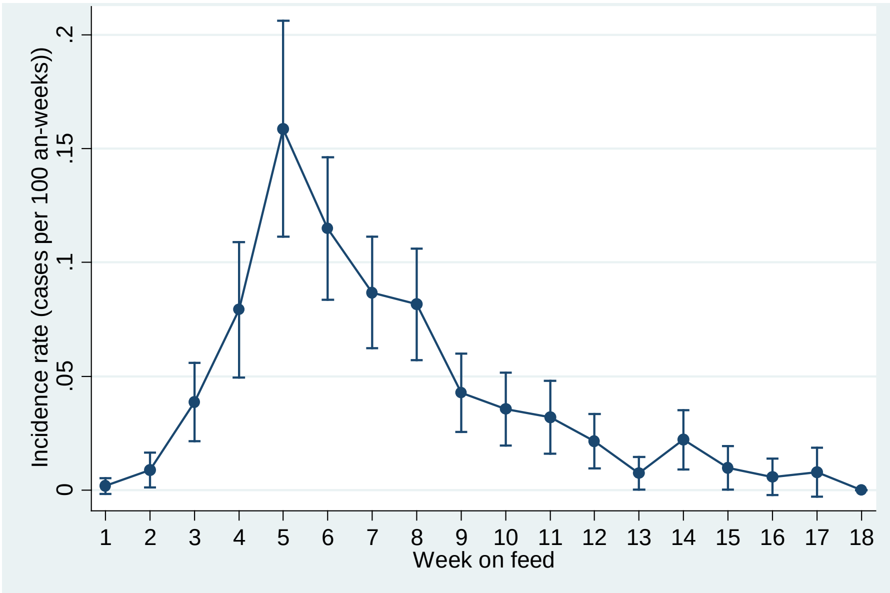

Figure 20: Mortality rate by week on feed for deaths due to respiratory disease only. Limited to those lots that were on feed for between 85 and 120 days. Bars represent 95% confidence intervals.

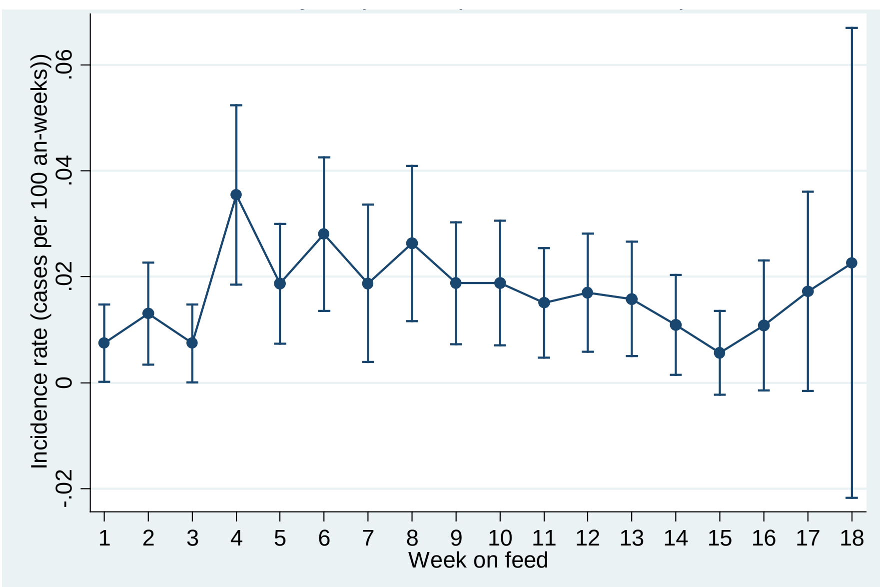

Figure 21: Mortality rate by week on feed for deaths due to muscular conditions only. Limited to those lots that were on feed for between 85 and 120 days. Bars represent 95% confidence intervals.

The difference in mortality rate plots for respiratory disease and muscular conditions is dramatic and is likely to reflect differences in the causal pathways for these two groups of diseases. The respiratory disease pattern is consistent with that seen for an infectious disease with a period of initial replication of infectious agents and exposure of an increasing number of susceptible animals soon after they are brought together. Over time animals then either succumb or recover and the mortality rate reduces to low levels again. In contrast the muscular conditions are low for the first few weeks on feed and then elevate and remain within a reasonably narrow band for most of the remainder of the period on feed. There is some suggestion of a decline and then a rise as time on feed progresses but from about week 9 onwards the rates are not different to those seen in week 1 (p>0.05).

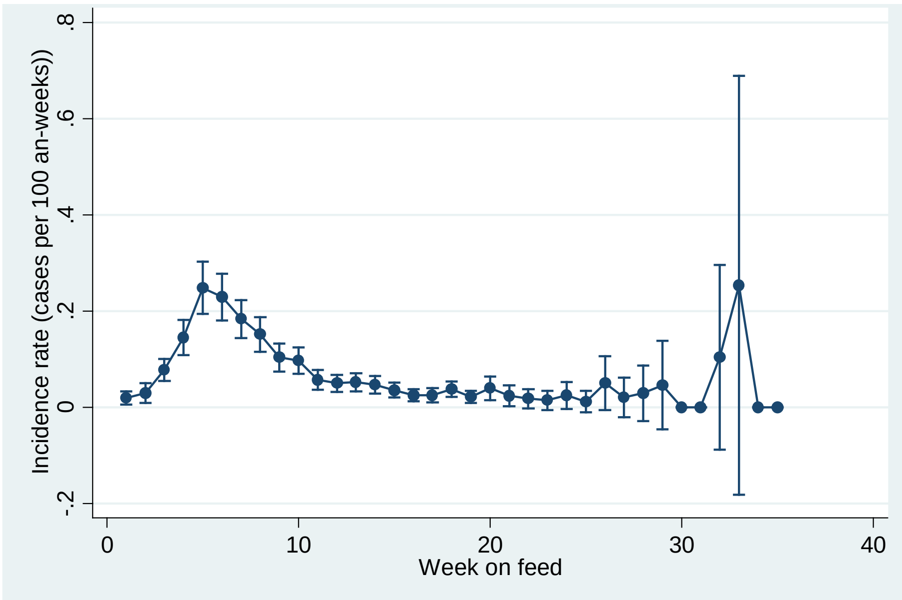

Figure 22: Mortality rate (deaths per 100 animal-weeks) for all causes combined, arranged by week on feed. Limited to those lots that were on feed for between 120 and 250 days. Bars represent 95% confidence intervals.

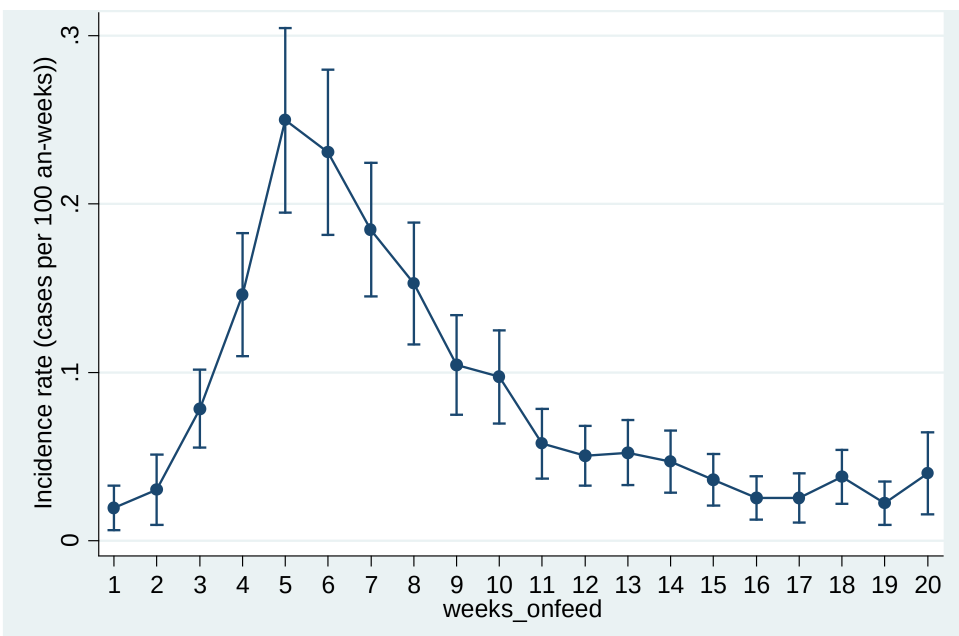

Figure 23: Mortality rate from all causes (deaths per 100 animal-weeks), arranged by week on feed. Limited to those lots that were on feed for between 120 and 250 days. Bars represent 95% confidence intervals. This is the same plot as in the previous graph but is limited to the first 20 weeks on feed.

The overall pattern of mortality is very similar to that presented for animals on shorter durations of feed. There is a progressive rise in mortality rate for the first several weeks on feed, and a peak mortality rate is reached at 5-6 weeks on feed. After this there is a progressive decline in mortality rate back to levels that are similar to week 1. From week 15 onwards the weekly mortality rate is not different to week 1. As duration on feed increases, there were fewer lots on feed and there is much more variation in the plot and wider confidence intervals. Out at the extremes of duration on feed, the smaller denominators mean that small fluctuations in mortalities can alter mortality rate estimates quite a bit and these fluctuations are more likely to reflect these factors rather than any meaningful changes in mortality risk.

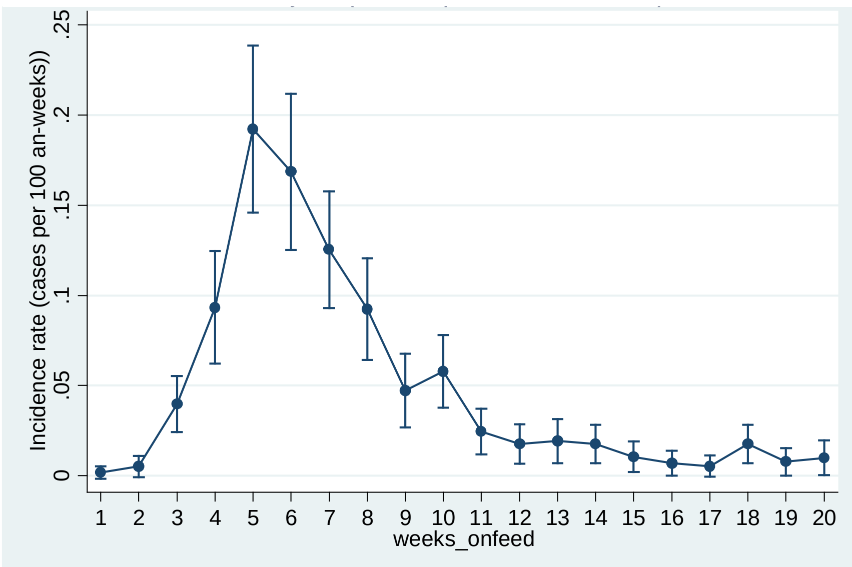

Figure 24: Mortality rate due to respiratory disease (deaths per 100 animal-weeks), arranged by week on feed. Limited to those lots that were on feed for between 120 and 250 days. Bars represent 95% confidence intervals. Limited to the first 20 weeks on feed.

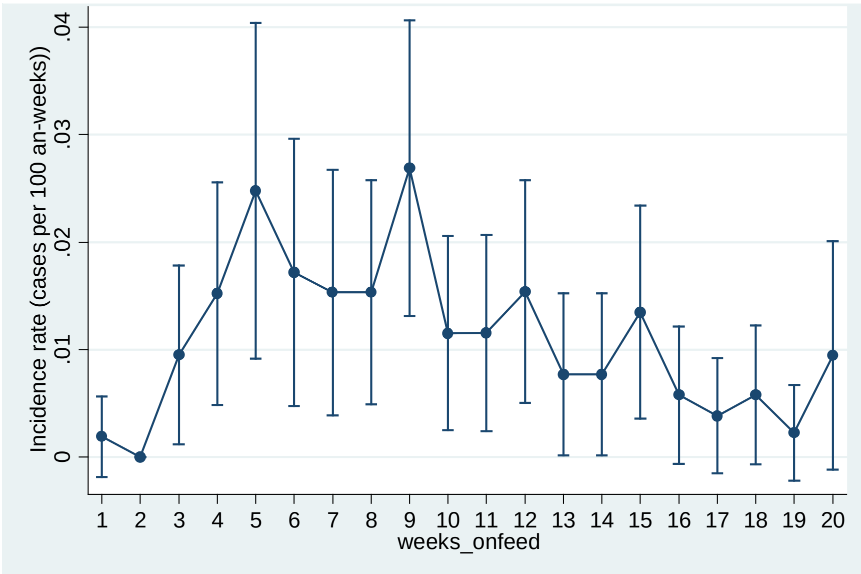

Figure 25: Mortality rate due to muscular conditions only (deaths per 100 animal-weeks), arranged by week on feed. Limited to those lots that were on feed for between 120 and 250 days. Bars represent 95% confidence intervals. Limited to the first 20 weeks on feed.

There are fewer muscular mortalities than respiratory and the estimates show a less apparent pattern. There is a gradual rise to a peak between 5 and 9 weeks and then a gradual decline over the remaining period to week 20.

Table 67: Summary count of deaths by week on feed and diagnosis category, for those animals on feed for between 120 and 250 days. Musc=muscular conditions, repro=reproductive, resp=respiratory, unkn=unknown cause.

Week on feed	Digestive	Infection	Musc	Other	Repro	Resp	Unkn	Total deaths
1	8		1			1	1	11
2	11	1				3	2	17
3	6	1	5	4	1	23	4	44
4	3	2	8	7		54	8	82
5	3	4	13	4		111	5	140
6	5	2	9	8	1	97	7	129
7	5	4	8	9	1	72	4	103
8	6	3	8	6		53	9	85
9	4	2	14	5	1	27	5	58
10	3		6	3	1	33	8	54
11	2	1	6	2		14	7	32
12	4		8	3		10	3	28
13	8		4	3		11	3	29
14	4	1	4	3		10	4	26
15	2		7	2	1	6	2	20
16	5		3	2		4		14
17	3		2	1	1	3	4	14
18	3	3	3			10	2	21
19	2		1			4	4	11
20	2		3	1	1	4	4	15
21	1			1	2		2	6
22	1		1		1			3
23	1						1	2
24			1	1		1		3
25							1	1
26	1		1				1	3
27			1					1
28	1							1
29			1					1
32			1					1
33				1				1
Total	94	24	119	66	11	551	91	956

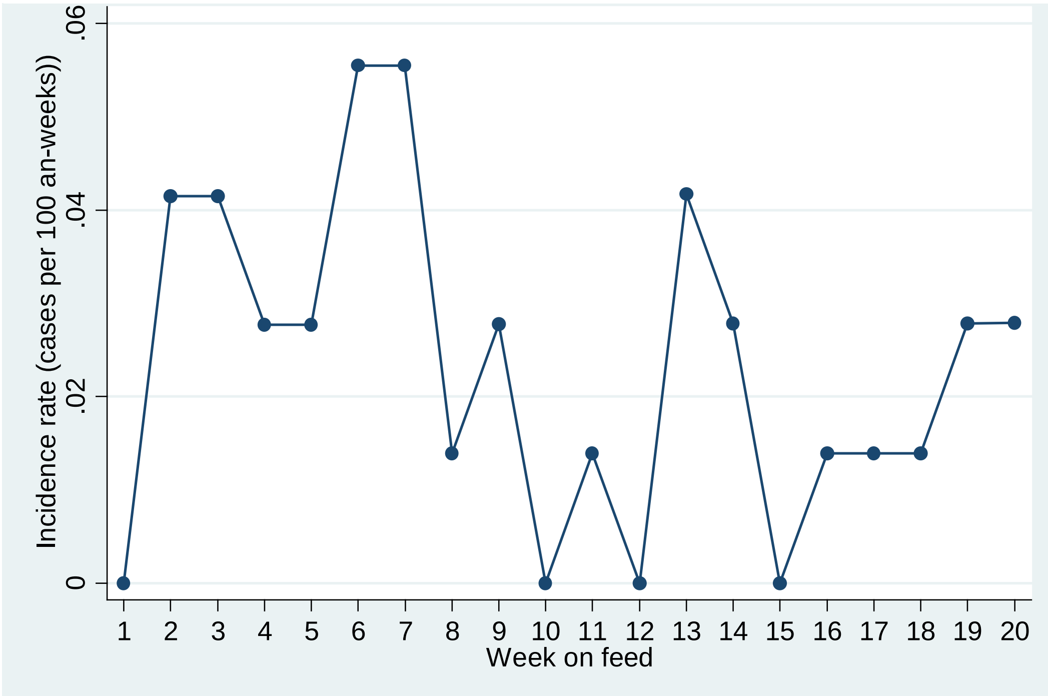

Figure 26: Mortality rate of all mortalities (deaths per 100 animal-weeks) for animals in the longest fed category of market class (>250 days on feed). Limited to the first 20 weeks on feed.

Table 68: Count of mortalities by week on feed and diagnosis class, for animals in the longest fed category of market class (>250 days on feed)

Week on feed	Digestive	Infection	Musc	Other	Repro	Resp	Unkn	Total deaths
2	1		1	1				3
3		1	1		1			3
4	1					1		2
5				1		1		2
6				1		3		4
7	1		1				2	4
8						1		1
9			1	1				2
11						1		1
13		1	2					3
14			1			1		2
16							1	1
17				1				1
18					1			1
19						2		2
20	1		1					2
21			1					1
22							1	1
23				1		1		2
24			1				1	2
25		1						1
26		1			1			2
27						1		1
28					1			1
29			2					2
30				1				1
31					1			1
33			2					2
34			2					2
35						1		1
37			2					2
39	1		3					4
40			1					1
41							1	1
43			2			1		3
45			3				1	4
46			1					1
47			1					1
48		1	1			1		3
49			1					1
50			1					1
51			2					2
53							1	1
55						2		2

56	1		2					3
57			4				1	5
61			1					1
65				1				1
68				1				1
Total	6	5	41	9	5	17	9	92

4.11.4 Pulls (morbidity) by month

Pulls represented records of animals pulled from pens by pen riders or other staff responsible for monitoring animal health. Pulls were examined and assigned to one of a number of categories of conditions. Different feedlots used different lists of pulls-reasons or diagnoses and these were reviewed and re-coded to produce a relatively simple, consistent set of syndromes or causes.

Pull rates were estimated using the same approach as for mortality rates. The numerator was a count of the number of pulls and the denominator was a measure of animal time at risk.

Table 69: Morbidity rate (pulls per 100 animal months) by cause.

	Morbidity rate		95% CI	
PULL rate	pulls per 100 an-mnths	se	Lower	Upper
All pulls	4.2	0.13	3.95	4.45
Respiratory	3.52	0.12	3.28	3.77
Muscular system	0.48	0.025	0.44	0.53
Digestive	0.02	0.003	0.014	0.027
Infection	0.007	0.0011	0.0047	0.0091
Reproductive	0.056	0.009	0.039	0.073
Other	0.088	0.0071	0.074	0.102
Unknown	0.018	0.002	0.014	0.022

The overall estimate (all reasons combined) indicated that 4.2% of animals were pulled each month. The most important disease category was pulls associated with respiratory disease, accounting for 84% of all pulls and producing a pull rate of 3.52% of animals per month on feed.

Table 70: Estimate of morbidity rate (pulls per 100 animal months on feed) expressed for each calendar month and averaged over all market classes and over all causes of pulls

Month	Pull rate		95% CI	
	pulls per 100 an-mnths	se	Lower	Upper
1	3.502	0.404	2.711	4.294
2	3.820	0.394	3.047	4.592
3	4.829	0.465	3.916	5.741
4	3.812	0.380	3.068	4.557
5	5.188	0.506	4.195	6.180
6	3.225	0.335	2.569	3.881
7	2.201	0.207	1.795	2.606
8	2.925	0.261	2.413	3.437
9	3.259	0.283	2.705	3.813
10	2.618	0.255	2.119	3.118
11	2.700	0.278	2.156	3.245
12	2.891	0.300	2.303	3.479

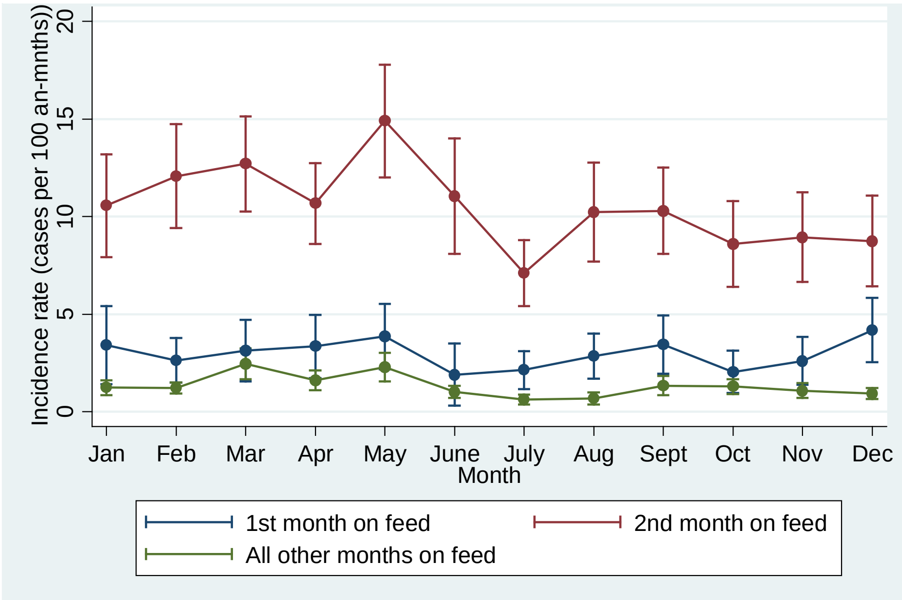

Figure 27: Morbidity rate for all pulls combined (pulls per 100 animal-months), arranged by month on feed and calendar month. Bars represent the 95% confidence interval.

There was an important association between month on feed and pull rate with those animals in their second month on feed having a higher pull rate than animals in their first month on feed or those animals in any other period of time on feed. Animals in their first month on feed also had a higher pull rate than animals in any other period of time on feed.

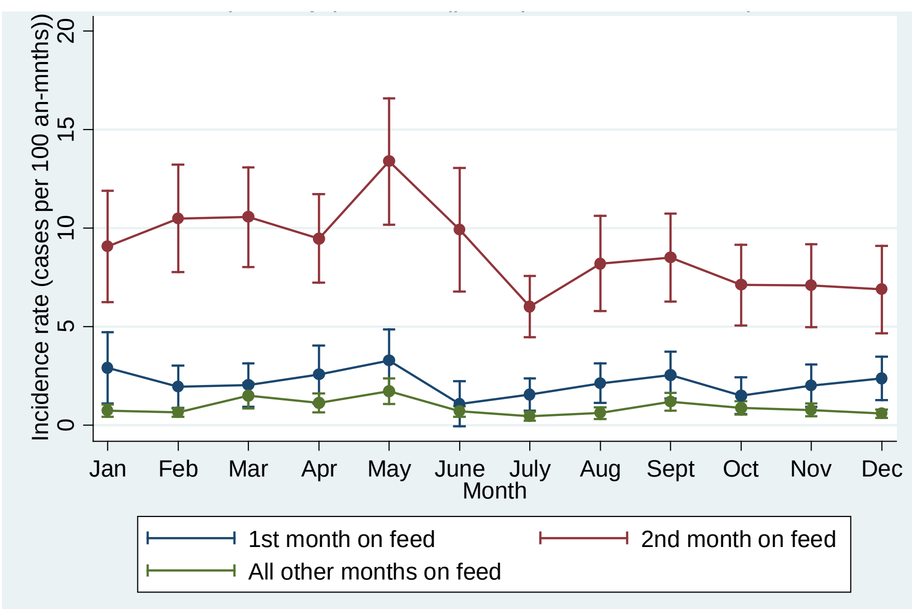

Figure 28: Morbidity rate for respiratory pulls only (pulls per 100 animal-months), arranged by month on feed and calendar month. Bars represent the 95% confidence interval.

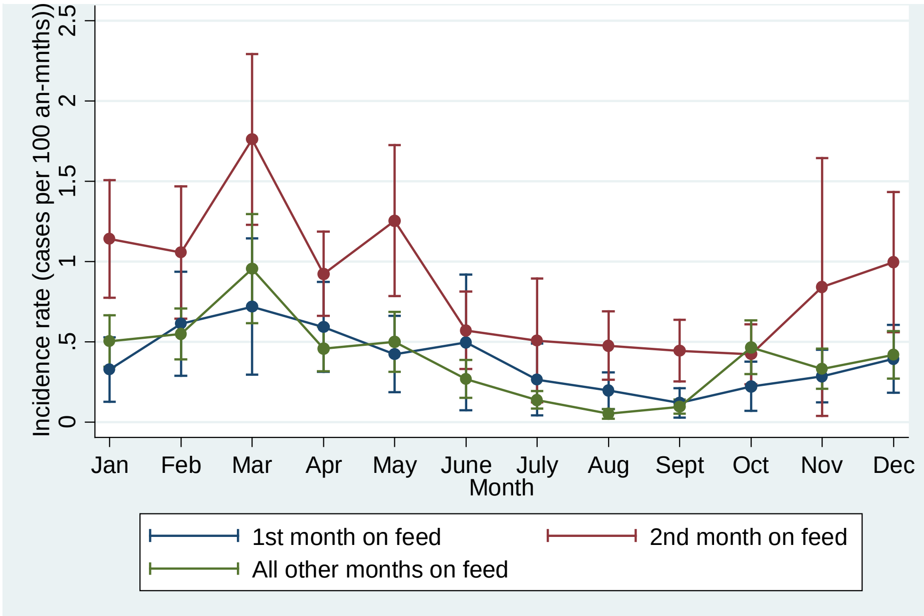

Figure 29: Morbidity rate for muscular system pulls only (pulls per 100 animal-months), arranged by month on feed and calendar month. Bars represent the 95% confidence interval.

4.11.5 Pull rates by week on feed

Data on morbidities were analysed by week on feed with week=1 indicating the start of the period on feed regardless of the month of the year.

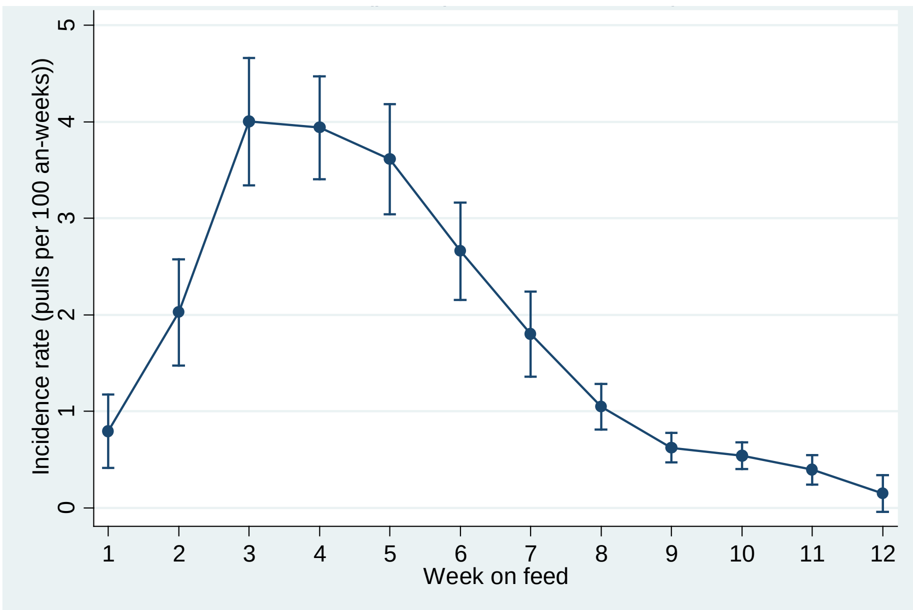

Figure 30: Morbidity rate for all conditions combined, expressed as pulls per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for up to 85 days. Bars represent 95% confidence intervals.

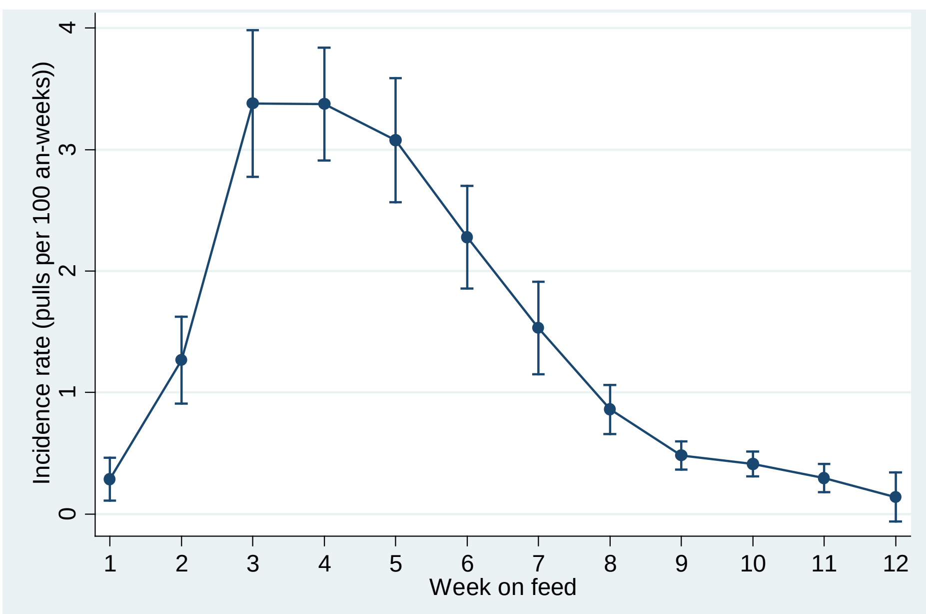

Figure 31: Morbidity rate for respiratory disease only, expressed as pulls per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for up to 85 days. Bars represent 95% confidence intervals.

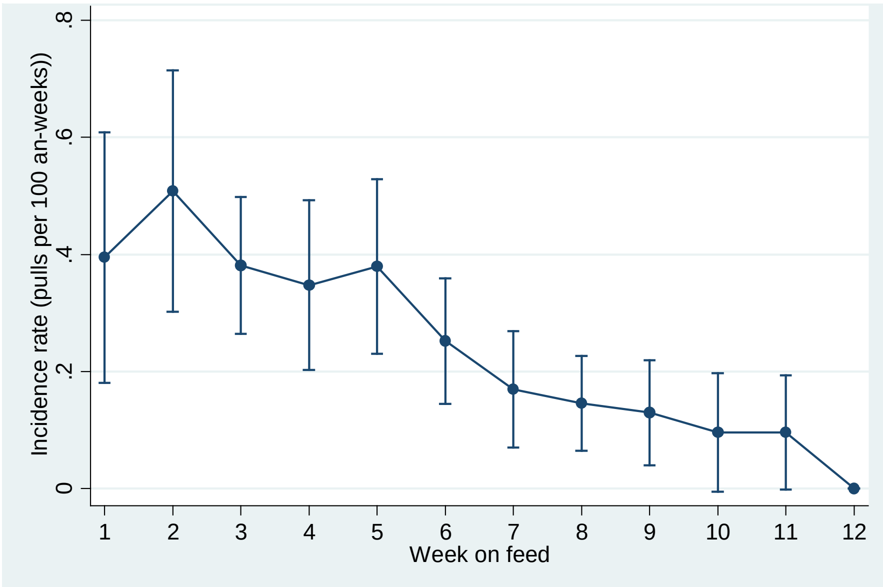

Figure 32: Morbidity rate for muscular conditions only, expressed as pulls per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for up to 85 days. Bars represent 95% confidence intervals.

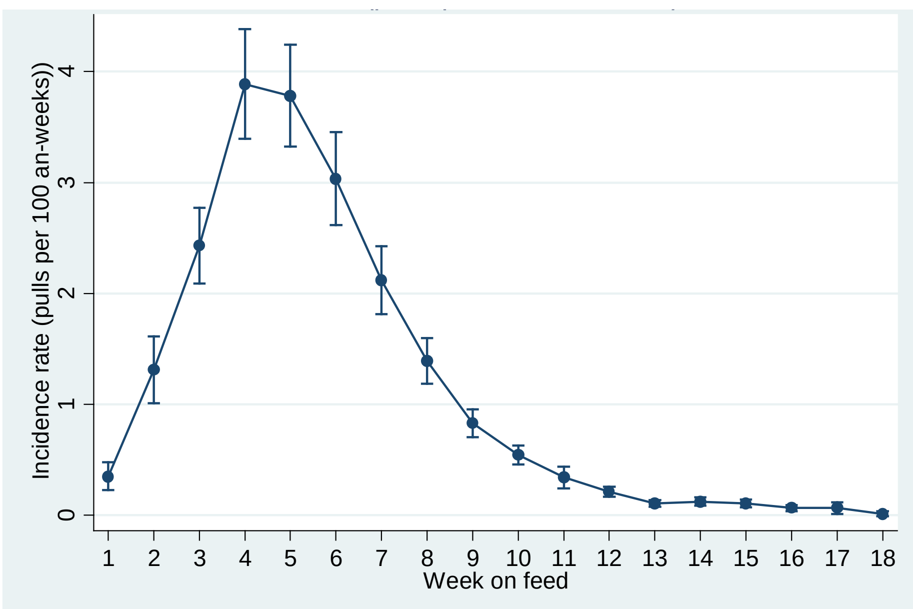

Figure 33: Morbidity rate for all conditions combined, expressed as pulls per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for between 85 and 120 days. Bars represent 95% confidence intervals.

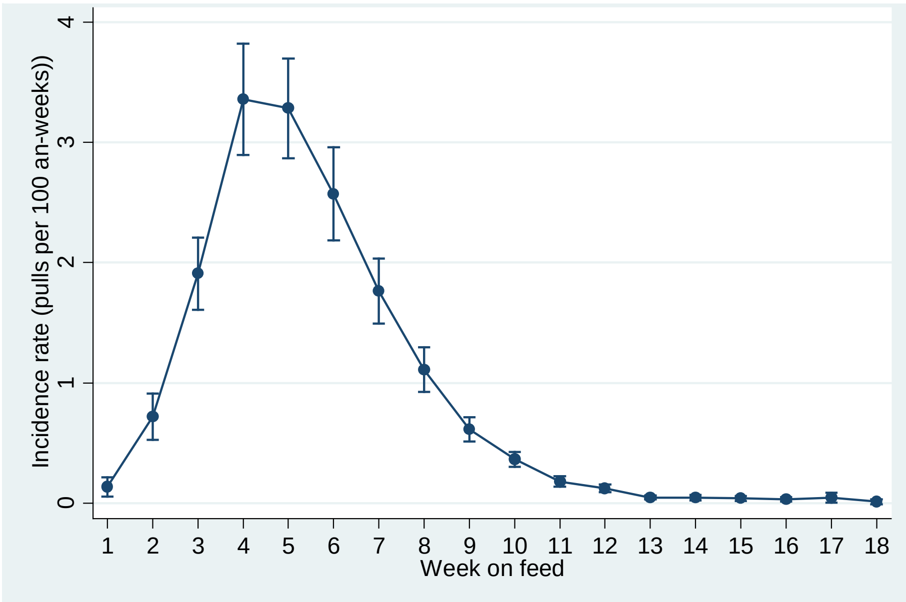

Figure 34: Morbidity rate for respiratory disease only, expressed as pulls per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for between 85 and 120 days. Bars represent 95% confidence intervals.

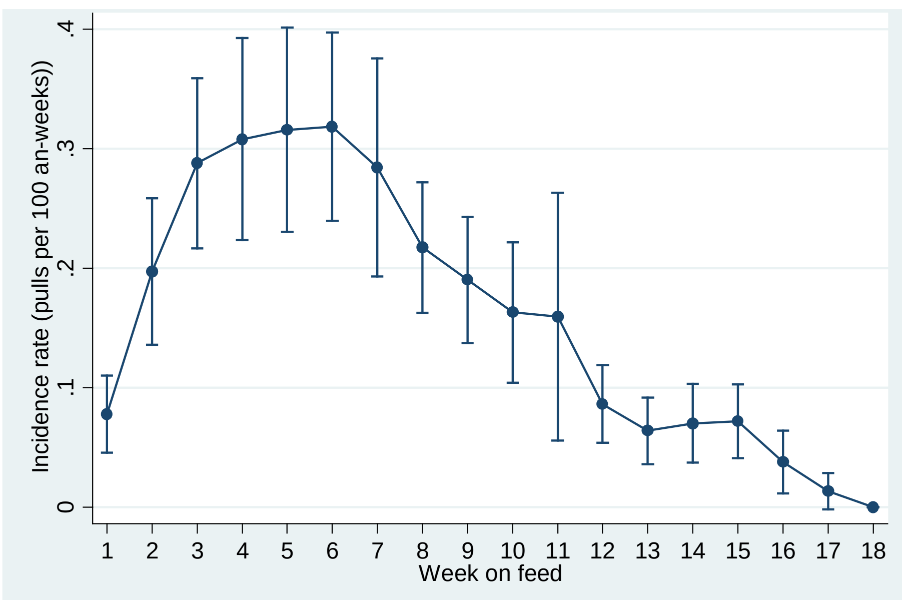

Figure 35: Morbidity rate for muscular conditions only, expressed as pulls per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for between 85 and 120 days. Bars represent 95% confidence intervals.

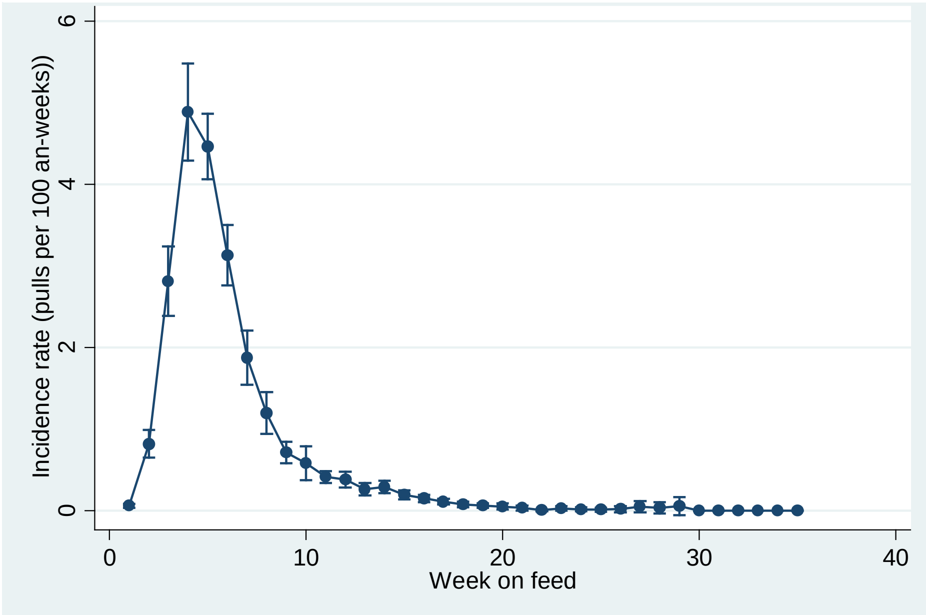

Figure 36: Morbidity rate for all conditions combined, expressed as pulls per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for between 120 and 250 days. Bars represent 95% confidence intervals.

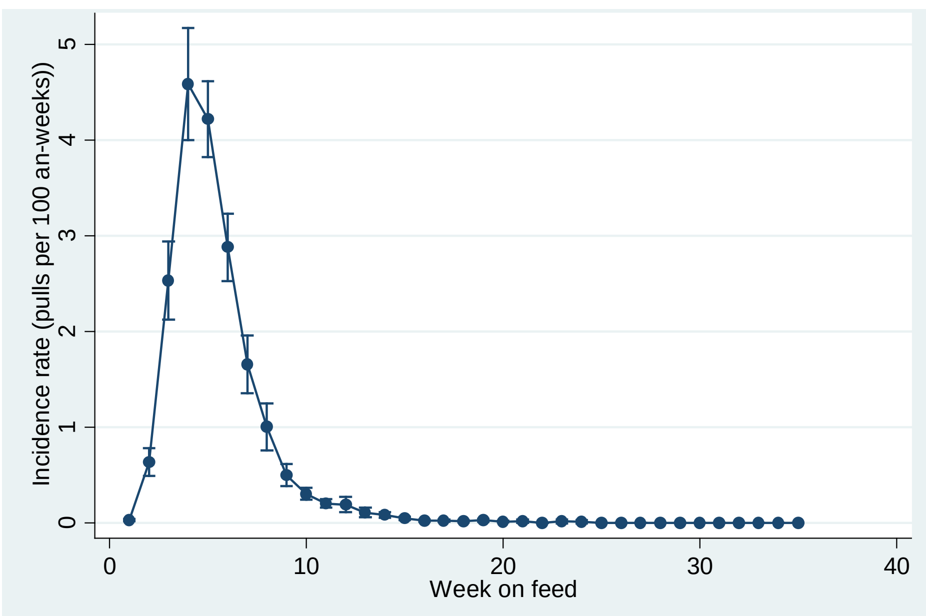

Figure 37: Morbidity rate for respiratory disease only, expressed as pulls per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for between 120 and 250 days. Bars represent 95% confidence intervals.

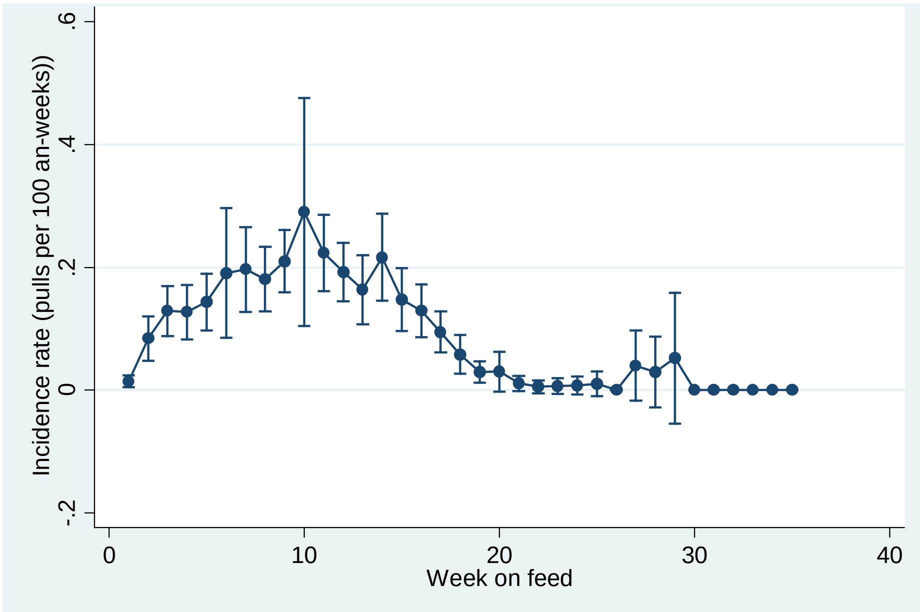

Figure 38: Morbidity rate for muscular conditions only, expressed as pulls per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for between 120 and 250 days. Bars represent 95% confidence intervals.

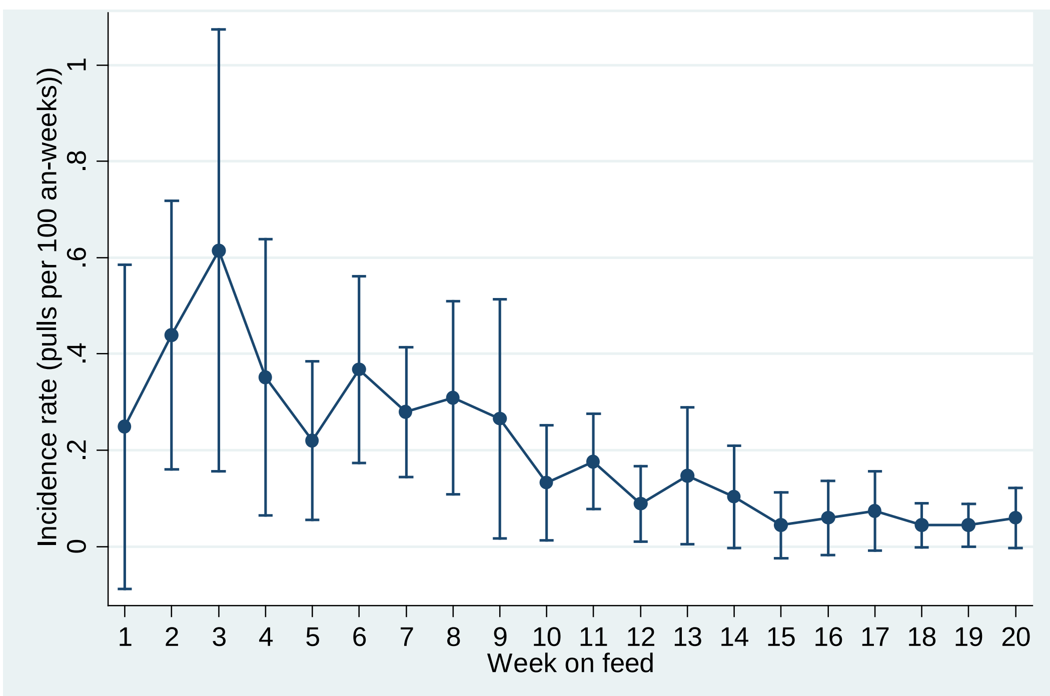

Figure 39: Morbidity rate for all conditions combined, expressed as pulls per 100 animal-weeks, arranged by week on feed. Limited to those lots that were on feed for more than 250 days. Bars represent 95% confidence intervals.

Plots of pull rates for specific conditions were not generated for long fed animals because the data were more sparse and estimates tended to fluctuate.

4.11.6 Relationship between pull rate and mortality rate

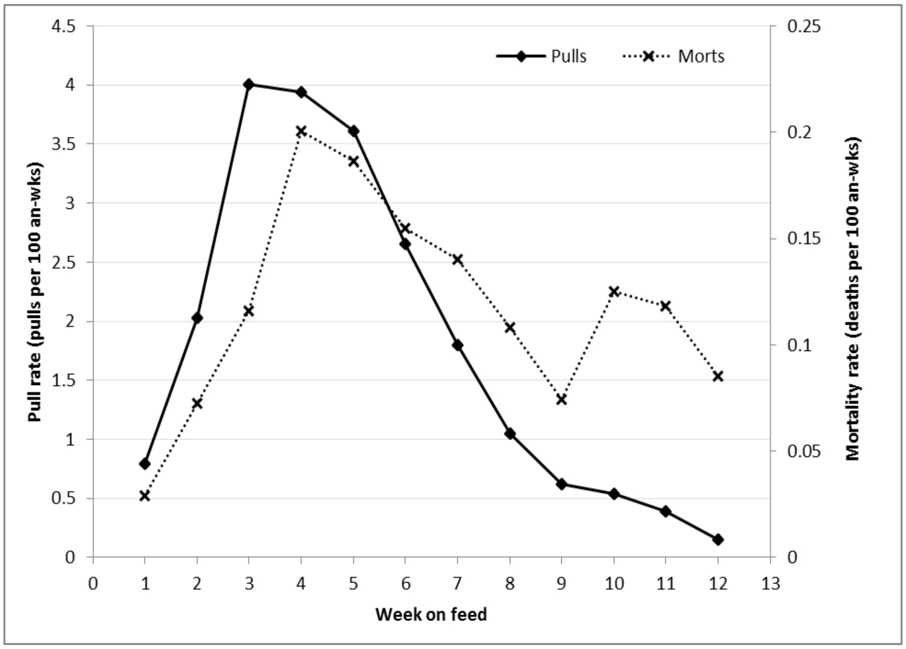

Figure 40: Pull rate (left vertical axis) and mortality rate (right vertical axis) by week on feed for animals in the shortest fed category only (<85 days on feed)

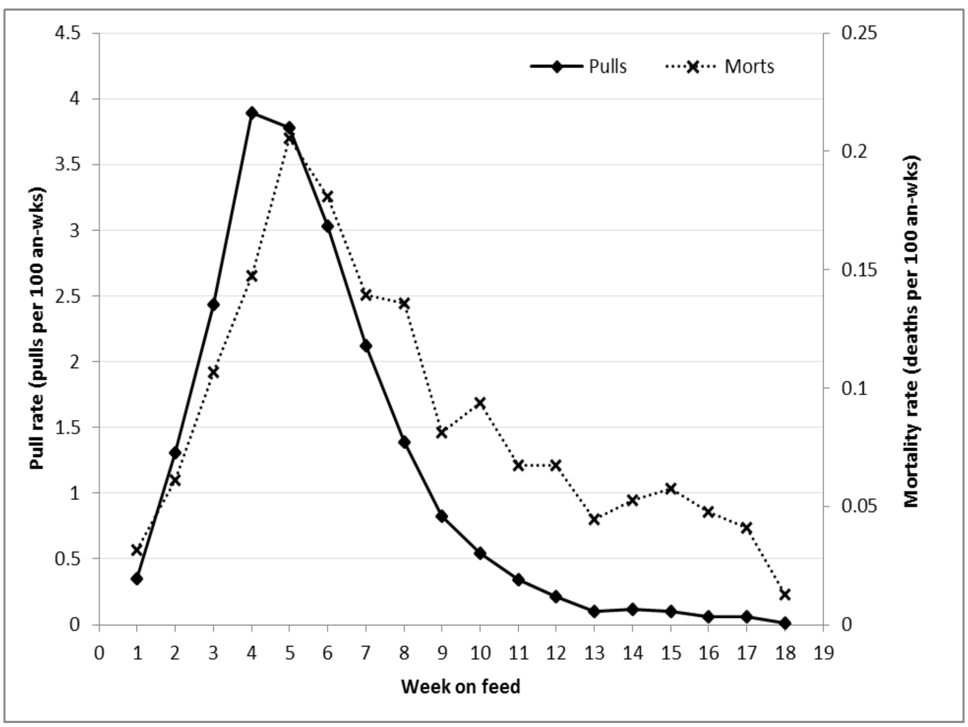

Figure 41: Pull rate (left vertical axis) and mortality rate (right vertical axis) by week on feed for animals on feed for between 85 and 120 days only.

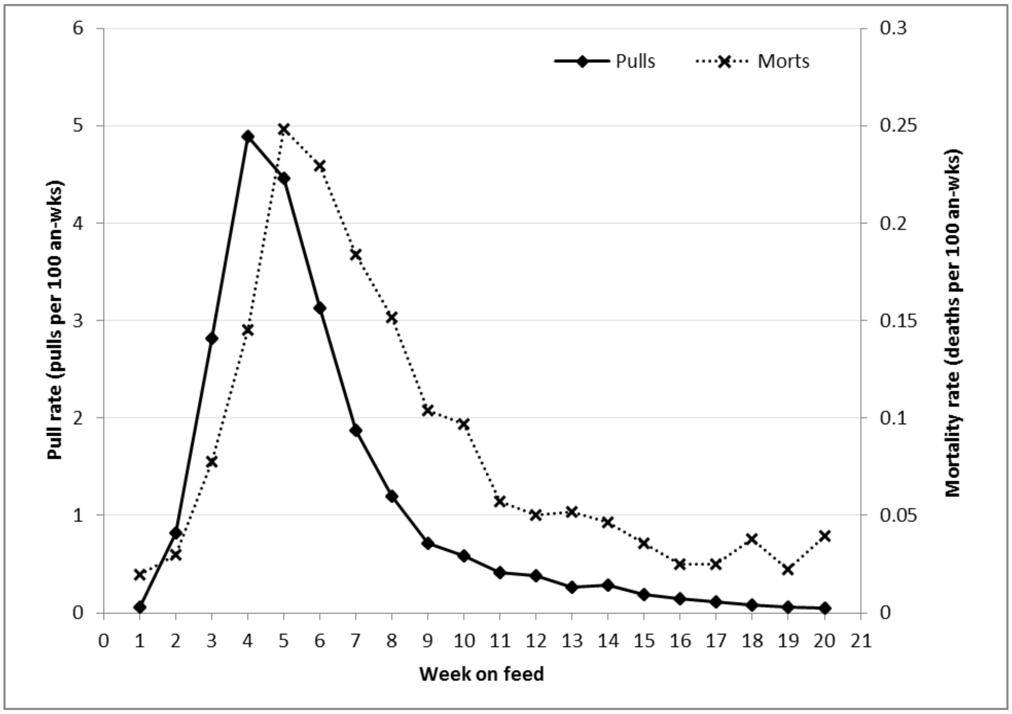

Figure 42: Pull rate (left vertical axis) and mortality rate (right vertical axis) by week on feed for animals on feed for between 120 and 250 days only.

The previous three plots show a very consistent relationship between pulls and mortalities. Pull rates rise and fall about one week ahead of mortality rate estimates, particularly on the initial increasing part of the plot. There is more variability on the declining part of the plot with morbidity rates tending to fall faster and at a more consistent rate of decline than mortality rates.

4.11.7 Association between morbidity / mortality and weight gain

There was an expectation that animals that were sick and possibly lots of animals that had experienced a high death loss, might have a measurable reduction in ADG over the period on feed.

An attempt was made to assign lots of animals to categories based on the proportion of pulls in those lots, and then to see if those lots that had a higher proportion of pulls might also have a reduction in ADG when compared to lots that had a lower proportion of pulls. It was necessary to assess pulls at the lot level since ADG estimates were recorded at the lot level and not at individual animal level. These comparisons were limited to those lots that had information on pulls and weight gain and that were on feed for less than 250 days to exclude the very long fed animals. There was a reduction ranging from 0.05 to 0.1 kg/hd/day in ADG for those lots that had more than 35% pulls throughout the period on feed when compared to lots that had fewer than 35% pulls. It was not possible to assess individual animal ADG estimates because this information was not available in the data used in the current survey. The choice of a threshold at 35% pulls was arbitrary and was based on exploration of differing thresholds in an attempt to try and identify a threshold that did appear to be associated with a measurable reduction in ADG. It may be that individual feedlots have varying policies for determining when to pull an animal and some feedlots may pull animals early in an attempt to treat animals before serious disease develops. Depending on the feedlot policy concerning identification of animals to pull, it is plausible that there might be variation in any association between pulls and ADG.

An attempt was also made to look for an association between mortality risk at the lot level and ADG. The total count of mortalities per lot was assessed and lots were assigned to one of three categories of severity (<1% death, 1 to 5% death and >5% death). Average ADG was then assessed for each of these categories of percentage death.

Table 71: Summary statistics for average daily gain by category of death per lot during the entire time on feed.

			95% CI	
% death per lot	**ADG**	**se**	**Lower**	**Upper**
<1%	1.68	0.01	1.67	1.69
1 to 5%	1.65	0.01	1.64	1.67
>5%	1.38	0.02	1.34	1.42

There was a progressive and significant decline in overall ADG estimates as the mortality rate per lot rose. Lots with less than 1% death expressed as a cumulative percentage of the total count of cattle inducted for each lot, had a significantly higher overall ADG compared with those lots with higher death rates. The lots with the highest overall death rate, had the lowest overall ADG during their time on feed.

When the total number of cattle in lots with >5% mortality was assessed it was equivalent to 4% of all cattle inducted. The interpretation of this finding is that those lots with an elevated mortality rate may have surviving animals that are also compromised at some level and the ADG in the surviving animals in those same lots appears to be reduced relative to lots with fewer mortalities. It is possible that there may be other explanations for this apparent effect but it does seem plausible to expect some level of non-fatal effect of disease in a lot that has had a higher rate of mortalities.

4.11.8 Discussion of mortality and morbidity rates

Initial estimates of pull rates and mortality rates were arranged by month of year (see Section 4.11.2) and preliminary inspection of these results is suggestive that there is a peak in mortality rate and pull rate in May.

Evidence has also been presented to show that peak numbers of inductions occur in March for the shortest category of days on feed and in March and August for the next category (85 to 120 days on feed) (see Section 0). When aggregated to a total count the two peaks (March and August) are associated with about equal numbers of incoming animals but the March peak is dominated by similar numbers of the <85 day class and the 85 to 120 day class. In contrast the August peak is dominated by the 85 to 120 day class and the 120-250 day class, with the <85 day class contributing very few cattle to this peak.

There was significant variation between market classes with respect to mortality rates. The <85 day class has the highest overall mortality rate (across all days on feed) and it is significantly higher than all other classes.

In multivariable models based on weeks-on-feed where time on feed was measured from the start of the feeding period regardless of the month of the year, there appeared to be very strong associations between morbidity and mortality rates and weeks from the start of the period on feed. A variable coding for season at the start of the period on feed was created for each lot to assess whether season might have an association with mortality and morbidity. There was no significant association between season when animals started on feed and either mortality or morbidity rate. The major driver of pull rates and mortality rates was the actual weeks on feed.

There was a very clear pattern of peak rates of pulls occurring 3 to 4 weeks after the start of the feeding period, and a subsequent peak rate of mortalities that occurred about one week later (4 to 5 weeks after the start of time on feed. The elevated rates of morbidity and mortality then remain high through to the second month on feed and then decline.

In general the results described above suggest that the overall elevation in pull and mortality rates that is observed in May is more likely to reflect the combination of a peak in inductions that occurs in March (4 to 6 weeks prior to the peak in pulls and mortalities), and particularly the fact that the March induction peak contains a large proportion of <85 day animals which have a higher mortality rate than other market classes. There is a second peak in inductions in August but this peak has very few cattle in the <85 day class and the overall total mortalities then do not rise substantially above baseline levels.

There is evidence to suggest that elevated morbidities and mortalities is associated with reduced ADG in surviving animals in affected lots, supporting the conclusion that pulls and deaths represent the more apparent tip of a broader impact of disease that is likely to produce effects in other animals that were not pulled or treated.

4.12 Cost of disease

Results from analyses reported in the body of this report were used to develop assumptions about impacts and costs for pulls and mortalities and these were applied to industry estimates of cattle turnoff at the national level in order to generate an estimate of the total cost of disease in the Australian feedlot industry.

Table 72: Annual estimated industry costs of disease for the Australian feedlot industry

Parameter	Assumptions	
Pulls per 1000 head turned off	225	
Deaths per 1000 head turned off	14.7	
Value per head ($)	$1,000	
Treatment cost per head	$16	
Liveweight value $/kg	$2	
Ave days on feed	160	
ADG for unaffected animals	1.68	
ADG - sick animals	1.38	
% cattle with reduced ADG	4%	
Total turnoff	2400000	
Estimated outcomes		
Deaths	35280	=14.7*(2400000/1000)
Cost of deaths	$35,280,000	=35280*1000
Number treated	540000	=225*(2400000/1000)
Cost of treatment	$8,640,000	=540000*16
Lost gain (kg)	4608000	=(1.68-1.38)*160*0.04*2400000
Value of lost gain	$9,216,000	=4608000*2
Total disease cost	$53,136,000	

A brief explanation of assumptions and inputs is provided here:

- Pull rates and mortality rates per 1000 head turned off were derived directly from the current survey data.
- A value of $1000 per head was used as the estimated liveweight value of a steer on feed.
- A treatment cost of $16 per pull was based on an overall average cost of all pulls that was produced in the current survey.
- The liveweight value per kg of $2 was drawn from market prices for crossbred steers on the Darling Downs.
- The average days on feed was based on an overall average (sum of total animal months on feed across all records analysed in the current survey divided by a count of the total number of animals turned off). Animals were on feed for an average of 5.25 months and this was equivalent to 160 days.
- The ADG estimates for unaffected and sick animals were derived from Section 4.11.2.
- The estimate of the % of cattle with reduced ADG is based on the finding that about 4% of total cattle inductions were found to be in lots with an elevated mortality rate and a reduced ADG. This is therefore an estimate of the overall percentage of cattle that may have a reduced ADG as a result of some disease process or other condition.
- The total turnoff value of 2.4 million is based on national industry figures for the past several years that suggest total Australian feedlot turnoff ranged from 2.1 to 2.6 million per year.

These assumptions were then used to produce estimates of the total number of pulls and deaths and the total amount of lost kg of growth. Dollar values were then assigned to each of these estimates and the sum of these component estimates produced an overall estimate of the annual cost of disease and death in Australian feedlots.

The total annual cost of morbidity and mortality to the feedlot industry is estimated to be in excess of $50 million per year which is equivalent to about $22,000 per 1000 head turned off.

Data collected in the current survey were then assessed at the individual feedlot level to examine the variability in mortality in particular at the feedlot level as a percentage of total head inducted. The 25^{th} percentile of all feedlots was used as a measure of achievable performance since this threshold can be used to separate the best performing 25% of all feedlots from the remainder. With respect to mortality rate per 1000 head turned off, the achievable threshold represented a 20% reduction in mortality from the overall industry average of 14.7 deaths per 1000 head turned off.

If the broad figure of 20% reduction in mortality is also assigned to losses associated with morbidity, then a simple estimate of achievable savings at the industry level is represented by 20% of the total industry cost of $53 million per annum, or $10.6 million. This is equivalent to a savings of $4,400 per 1000 head turned off.

4.13 Comparison with previous surveys

There have been two previous surveys of Australian feedlot health and performance (Dunn 1991; Sergeant 2001). The survey completed in the current project incorporates fewer feedlots than the 2001 survey and more feedlots than the 1991 survey.

The stratified random selection process adopted in the current survey was an attempt to ensure that feedlots were enrolled in the study from all four major size categories, and that the survey dataset could be considered representative of the broader Australian feedlot population. The collection of participating feedlots in the current survey include a broader range of size categories and involve more total feedlot capacity than both previous surveys. The current study is also considered to provide descriptive findings that are more representative than previous surveys because of the random selection process and this means the findings from the current report can be extrapolated directly to the broader Australian feedlot population. The selection process has specifically enrolled more feedlots from the larger capacity sizes than previous surveys.

The questionnaire used in the current survey was based in part on the questionnaires used in the previous two surveys to allow some comparisons to be made between the findings from the completed surveys. Additional questions were added to reflect changes in the management practices since the last survey. Electronic data collection was incorporated into the current survey because it was felt that a reasonable proportion of feedlots would be using computerised record keeping and that detailed records on animal performance and health outcomes would provide an opportunity to apply more rigorous statistical analyses to data.

It is difficult to directly compare many of the descriptive findings from the current survey to the previous surveys in part because of uncertainties over how responses were coded and analysed in previous surveys. In addition the current survey collected information by feedlot size category and state which allowed more detailed summary statistics to be generated. Given the possibility of differences between feedlot size categories in how feedlots may be managed this approach was seen to be important.

The following table provides summary statistics for a number of outcomes that were presented in the previous two surveys to allow comparison.

Table 73: Comparison of summary statistics for the current survey project and for the previous two surveys, completed in 2001 and 1991

Variable	Level	2012	2001	1991
Number of responses		47	27	72
Size category	<1000 hd	15	10 small	58 small
	1-5000 hd	12		
	5-10000 hd	7	3 medium	5 medium
	>10000 hd	13	8 large	8 large
			3 unknown	4 unknown
Total capacity	(head)	328,878	275,170	224,520
Average capacity	(head)	6,997	3,988	9,300
Total turnoff	(head)	710,051	575,502	430,715
Average turnoff	(head)	15,107	8,854	19,000
Ave max pen size	sq metre	217	227	273
Ave min pen size	sq metre	84	120	112
Ave number of pens	count	44	25	43
% cattle delivered direct to feedlot	%	69	64	41
Average rating for BRD	score	3.80	2.9	2.8
Average rating or foot problems	score	2.80	2.2	2.3
Average rating for feed problems	score	1.84	2.4	2
Ave monthly mortality - all causes	deaths per 1000 an-mths	2.74	4.4	1.65
Ave monthly mortality - BRD	deaths per 1000 an-mths	1.4	2.3	
Ave monthly pulls - all causes	pulls per 1000 an-mths	42.0	38.6	11.2
Ave monthly pulls - BRD only	pulls per 1000 an-mths	35.2	22.7	
Mortality /1000 turnoff - all causes	deaths per 1000 hd turned off	14.7	6.5	6.9
Mortality /1000 turnoff - BRD only	deaths per 1000 hd turned off	7.8	4.3	2.7
Pulls /1000 turnoff - all causes	pulls per 1000 hd turned off	225	71	58
Pulls /1000 turnoff - BRD only	pulls per 1000 hd turned off	190	46.5	26.2
% all mortalities due to BRD	%	53%	64%	40%
% all pulls due to BRD	%	84%	64%	44%
ADG - normal	kg / hd / day	1.68	1.67	1.4
ADG - most affected animals	kg / hd / day	1.38	1.38	1.2

The current survey includes fewer feedlots from the smallest size category and more feedlots from the larger size categories and all four size categories are represented. The total capacity and turnoff for feedlots included in the current survey is larger than either of the previous two surveys.

When compared to summary figures on national feedlot capacity and turnoff available on the Australian Lot Feeders' Association (ALFA) website, the capacity and turnoff figures for feedlots included in the current survey represent about 25% and 28% of estimated national capacity and turnoff, respectively for the similar time period represented by the survey. While the percentage of national turnoff represented by the survey sample has fallen from the estimate of 76% for the 1991 survey, this reflects the overall growth in capacity of the national feedlot industry since the survey sample capacity and turnoff have increased in the current survey over the 1991 survey. The current survey does provide representative findings from a substantial sample of the national capacity.

The number of pens within feedlots covers a similarly broad range to previous reports. Overall average numbers of pens are difficult to compare particularly since the previous surveys were dominated by smaller feedlots. The current survey reports findings by feedlot size category which provide a more meaningful summary of feedlot statistics.

The percentage of cattle delivered directly to the feedlot in the current survey was considered to be represented by those cattle that were not purchased via saleyard. In the current survey these animals were distinguished between cattle coming directly from the property where they were bred and cattle coming from a property other than the property where they were bred. The total of direct movements from property to feedlot was 69% of all incoming cattle, an increase over both previous surveys.

Previous surveys reported on the percentage of animals that were able to be traced to pen, lot and property of origin. Since the National Livestock Identification System (NLIS) was introduced in 1999, all animals are now expected to be identified with a NLIS tag that allows tracing of movements back to property of origin. Most animals are also identified by a visual ID tag applied in the feedlot.

Diseases rated as most important by feedlot respondents appear to have remained consistent with responses in previous surveys, though the mean rating score for the two most important conditions (respiratory disease and muscular conditions involving the foot) appear to be higher in the current survey than in previous surveys. In contrast the mean score for feed related conditions (digestive conditions) in the current survey appears to be lower than reported in the previous surveys.

There are difficulties in directly comparing pull rates and mortality rates. The previous surveys did not collect any electronic records and all estimates were derived from questionnaire responses that included monthly estimates of animals on feed and pulls and mortalities. The previous surveys reported pull rates and mortality rates as events per 1000 cattle turned-off using summary total estimates, and as monthly rates (events per 1000 cattle on feed per month). It is possible that variability in how respondents provided information for the questionnaire and variability in how data were coded, entered and analysed, may have contributed to differences in results for the different surveys.

The electronic records provided in the current survey are considered to represent the most reliable and valid estimates of pull rates and mortality rates. This is because the measures are not reliant on respondents recalling information for entering into the questionnaire. Instead the electronic records should provide an accurate estimation of the denominators (counts of animals on feed) and the numerators (counts of deaths or pulls) for each lot and feedlot. The summary measures for pulls and mortalities in the current survey that are derived from the electronic records are therefore preferred over the summary measures derived from questionnaire responses.

The current survey has provided direct estimates of monthly mortality rates (and pull rates) expressed as events per 100 animal-months on feed. These can be easily converted to estimates per 1000 animal months by multiplying them by ten.

Monthly mortality rates (deaths per 1000 animal months on feed) for all causes combined (2.74 deaths per 1000 animal months) and for respiratory disease (1.4 deaths per 1000 animal months) are both lower than similar estimates reported in the 2001 survey.

Monthly pull rates (pulls per 1000 animal months) for all causes combined (42 pulls per 1000 animal months) and for respiratory disease only (35.2 pulls per 1000 animal months) are both higher than estimates in previous surveys.

Previous surveys also reported pull rates and mortality rates using a denominator of 1000 head turned off. These estimates may be more problematic because they do not appear to incorporate any consideration of time spent on feed but they do provide a cumulative and relatively simple measure of mortality risk. Estimates derived from the current survey appear to be substantially higher than estimates from the previous surveys for mortality rate per 1000 head turned off and pull rate per 1000 head turned off.

It seems problematic that one measure (per 1000 animal months) is suggestive of improvements from the previous survey to the current survey, while another measure (per 1000 head turned off) might be suggestive of a deterioration in performance in the current survey.

It is not clear why this discrepancy might be present. In the current survey there is a logical link between the rate estimates using events per 1000 animal months on feed and estimates per 1000 head turned off. When summary totals were assessed in the current survey dataset for head turned off and total animal months on feed, the overall average number of months spent on feed by all animals was 5.25 months (recognising that some animals were only on feed for less than 2 months and others were on feed for more than 12 months). If the estimated mortality rate expressed as deaths per 1000 animal months is multiplied by 5.25, it produces a value that is consistent with the reported mortality rate per 1000 head turned off. The same consistency applies to the pull rate estimates for the current survey. The two separate rate estimates in the current survey are therefore believed to be consistent and to be reflecting the same underlying disease/event pressures, with the numeric differences between the estimates simply reflecting the difference in denominator calculation.

The apparently lower estimates for pulls and mortalities in the previous surveys when using the per 1000 head turned off approach, may be influenced by under reporting in the respondent questionnaires, or by animals having shorter average times on feed at those periods compared to the current trend.

Respiratory cases continued to be the single biggest cause of pulls and mortalities, as had been described in both previous surveys.

In general the estimates in the current survey are likely to be more accurate since they were derived mainly from electronic records and were estimated using formal epidemiologic methods. Current pull rates may be higher because of more effective monitoring and detection. It is unclear why current mortality rates may be higher and some caution is suggested in performing these direct comparisons because of uncertainties in how 1991 estimates were derived.

Estimates of mean weight gain (ADG) appear to have risen considerably since the 1991 survey, reflecting improvements in management and nutrition of feedlot cattle. There is little evidence of a change in ADG between the current survey and the 2001 survey. All surveys show a reduction in ADG for animals that may have been affected with any condition or disease.

4.14 Future studies

There is potential to use retrospective data for more detailed analyses to better define the patterns that have been described in this report and in particular to explore associations between health outcomes (risk of morbidity or mortality with major conditions such as respiratory disease). It seems likely that larger feedlots using custom or commercial software to keep animal performance records, may be able to provide many years of records for analysis, sufficient to accurately characterise patterns of disease over time, assess the potential questions over association between seasonal climate factors vs cattle supply and weeks on feed as the major drivers of pull and mortality rates.

The real value in exploring additional analyses, however, is considered to depend on whether retrospective data records also contain information that can be used to characterise risk factors. Examples of risk factors that are likely to be of interest include things such as breed, age, sex, distance travelled, source type (integrated supply vs saleyard), weaning management, and vaccination or other treatment. A large dataset sourced from multiple feedlots and covering multiple years has the potential to provide practically useful information to industry about what management practices and interventions may be effective at reducing morbidity and mortality risk and maximising growth and turnoff.

In order to achieve this goal it would be most useful if the same (or similar) information was being recorded in the same way across multiple feedlots. If retrospective data can be sourced that has these characteristics then further epidemiologic analyses would be likely to yield practical results of immediate value to the industry in managing feedlots to reduce risk of major diseases.

It is not clear whether retrospective data might be available and of suitable quality to be useful for further detailed epidemiologic analyses. The author has previously been involved in the development of a framework for assessing data quality for situations where disparate records may be sought from multiple sources in an attempt to produce a combined dataset for a common purpose. The approach in developing this framework has been to apply principles as described in mainstream statistical quality assessment guidelines in a manner similar to that outlined by Paiba et al (2006) in a veterinary surveillance example.

The quality dimensions of most interest are relevance, accuracy, accessibility and clarity, comparability and coherence.

The term ***relevance*** relates to each dataset containing records related to a pre-defined list of variables of interest and whether data records are complete or not. ***Accuracy*** refers to how well a recorded record reflects the truth for that measure. It is difficult to assess directly but may be able to be assessed subjectively based on the nature of the record and how data are measured and recorded. ***Accessibility*** and ***clarity*** relate to how easy it is to gain access to the records (paper vs electronic, ease of retrieval etc) and whether the records are able to be understood and interpreted (includes issues such as coding methods, use of standardised entries etc). ***Comparability*** refers particularly to data records that are collected over time within an organisation (are the records stored for the current year able to be compared directly to those stored from previous years or have coding methods and fields changed over time). ***Coherence*** relates more to whether data from different sources be combined in a broader (perhaps national) database that in turn can be used to make inference about national patterns and risk factors.

If further studies were to be considered using retrospective datasets sourced from commercial feedlots, then it is suggested that an initial scoping study be performed to assess characteristics such as availability and quality of retrospective data from Australian feedlots, specifically for the purpose of assessing risk factors for feedlot diseases and particularly respiratory disease. A short term scoping study could be completed that provides a formal assessment of the potential value in trying to collect further and more detailed retrospective data. If data are likely to be available and accessible and of sufficient quality to allow analyses to effectively assess risk factors, then a more detailed study involving collection, collation and analyses of such data can be considered. The benefit of an initial scoping study is that constraints and difficulties can be identified and assessed and if a more detailed data collection exercise is not warranted then it can be avoided, and alternative approaches considered.

5 Conclusions and recommendations

This report presents findings from a survey conducted in 2011 of a randomly selected set of Australian feedlots. A total of 121 feedlots were selected from each of four size strata with selection probability weighted more heavily for the larger feedlot size categories. The target number of responses was 57 and the survey team received response from 47 feedlots (82.5% of the target number and 39% of the 121 feedlots that were contacted to ask if they would participate).

Responses were obtained from feedlots in all four size classes. The sampling strategy reflected the fact that most feedlots are located in NSW and QLD. An attempt was made to sample feedlots from other states (SA, Vict and WA) and responses were obtained from feedlots in each of these states. However, there were few feedlots in these states and there were often insufficient responses to characterise results separately from all states. Most results are therefore presented as summary statistics for NSW, QLD and for all feedlots combined.

The survey asked for information and data from participating feedlots that was focused on the year ending 30 June 2010. With respect to measures such as growth and health outcomes (morbidity and mortality) a decision was made to concentrate on those cattle entering the feedlot in the 12 month period ending 30 June 2010. Since cattle may be maintained on feed for periods of time that range from 50-70 days up to 400 days and even longer, it was necessary for respondents to consider time windows that extended into 2011 in order to describe exit performance measures such as average daily growth and pulls and mortalities for the full period on feed.

All responding feedlots generally provided written responses to questions asked in a paper-based questionnaire that was mailed to all participating feedlots. The number of responses for individual questions tended to vary since some feedlots did not provide responses to every question.

Participating feedlots were also asked to provide electronic data files containing detailed records on performance by lot of cattle (counts in and out, date of entry and exit, growth rate and losses), pull records for individual cattle and mortality records for individual cattle. A total of 13 feedlots provided electronic records. Of these ten provided estimates that were suitable to combine for analysis of average daily gain and six feedlots provided records that were able to be combined and used for analysis of morbidities (pulls) and mortalities.

Responses from the questionnaire were aggregated and analysed to produce summary statistics that can be used to describe patterns and performance in Australian feedlots. The results provide a useful summary of management practices across all feedlots in Australia with summaries presented by size category and with separate results for the two states with most feedlots (NSW and QLD). These results are considered able to be extrapolated to the overall population of all feedlots in Australia because of the random selection process applied in choosing feedlots for inclusion in the study and the fact that all size classes and multiple states were represented in the survey.

More detailed analyses were possible for outcomes drawn from electronic files. Since these records were only obtained from larger feedlots (no electronic files were obtained from feedlots in the smallest size category and most records were from feedlots in the largest category), the findings from these analyses may not represent performance in all feedlots. Since most of the cattle on feed in Australia are likely to be held in the larger feedlots, the findings from these analyses are still of direct use for the industry.
Summary measures of average daily gain (ADG) derived from electronic records provide an accurate measure of performance in feedlots in larger size classes across Australia.

The epidemiologic information presented in summary statistics for induction by market feed class and month of the year, and for pull rates and mortality rates, represent an excellent summary of patterns for Australian feedlots. There is a clear pattern in induction of cattle with a peak in March that is comprised of <85 day cattle and cattle in the 85 to <120 day class. There is then a second peak in inductions in August that is comprised of cattle in the 85 to <120 day and 120 to <250 day classes. These patterns are likely to reflect supply and the fact that most beef cattle in Australia are likely to be calved in a seasonal pattern though the seasonal pattern is likely to be different in northern Australia compared to southern regions.

Pull rates and mortality rates are presented by month of the year and by week on feed. There is a clear association between pull rates and mortality rates with pull rates rising and falling about a week ahead of mortality rates.

The highest mortality rates are seen in animals in the shortest feed duration (<85 days) and the lowest mortality rates in the animals in the longest market feed class (>250 days on feed).

Respiratory disease is the major cause of morbidity and mortality by a very clear margin.

There is also a very clear association between mortality rates and weeks on feed, particularly for animals in the shorter three market classes (<85d, 85 to <120d and 120 to <250d). There is a progressive rise in mortality rate from the first week on feed to a peak between 4 and 6 weeks on feed. There is then a progressive decline to levels that are not different to the first week rate by about week 12 to 15. Given that the shortest feed category (<85d) are generally finished by about week 12, the mortality rate at the end of the feed period is still significantly higher than the rate in the first week on feed. In other feed categories the mortality rate continues to decline over time to a rate not different to the first week. This pattern appears to be very consistent across the three market feed classes and independent of the time of year when animals enter the feedlot. This information has potential ramifications for management of feedlots and animals to minimise disease risk.

There are some interesting comparisons that can be made with patterns of disease described in feedlot cattle in Canada and the USA. Ribble et al (1995a & b) describe patterns of respiratory disease in Canadian feedlot cattle. Key findings included the observations that patterns of mortality appeared to reflect incoming numbers of cattle and were reliably found to be associated with weeks on feed and not on time of year or weather. These findings are consistent with the observations made in this report. In addition, Ribble et al (1995a & b) indicated that peak risk of respiratory disease mortality was earlier in the period on feed (about 16 to 19 days after arrival at the feedlot). The authors hypothesised that the consistent and early pattern of peak mortalities indicated that exposure was likely occurring prior to animals entering the feedlot and that preventive efforts needed to be directed to the period prior to animals arriving or to interventions such as medications administered at arrival to animals suspected of showing signs of impending morbidity.

A similar consistent pattern appears to be evident in the Australian feedlot system based on the information presented in this report. However, peak mortalities associated with respiratory disease do not occur until week 4 or at the earliest and generally between weeks 4 and 6.

Given that the diseases and causal agents are often similar in Australian feedlots and north American feedlots, it seems reasonable to think that the time period from exposure and predisposing events to disease expression may be similar. An explanation for the later occurrence of peak mortalities in the Australian feedlot system may therefore be associated with later exposure to causal agents and other causal factors. It seems possible that Australian cattle may not be subjected to causal factors until arrival at the feedlot or the period of transportation immediately prior to arrival.

It is important to note that the current study did not collect any data on climatic variables and that extremes in weather events may be associated with impacts on occurrence and severity of respiratory disease (Cusack et al 2003, 2007). Cusack et al (2007) note that elevated incidence of respiratory disease in autumn and winter may indicate that disease is associated with climate factors. However, further information is required to define more accurately the effect of local weather events and to distinguish these from the broader pattern of numbers of incoming animals as drivers of outcomes such as morbidity and mortality from respiratory disease.

This study has provided very useful descriptions of common management practices across feedlots in Australia. It has relied on collection of survey information through a questionnaire, and through limited provision of retrospective electronic records. Questionnaire data do not allow detailed analysis to identify risk factors that may be influencing morbidity or mortality risk. Similarly the electronic records obtained during this study did not contain information on risk factors. As a result this study has been limited to largely descriptive analyses.

It is recommended that consideration be given to a study that assesses the potential usefulness and availability, accessibility and statistical quality of retrospective records from the feedlot industry for the purpose of risk factor analyses for bovine respiratory disease in feedlot cattle.

6 Acknowledgements

This project was jointly funded by Pfizer Animal Health and Meat and Livestock Australia.

The project would not have been possible without the assistance of a number of people and organisations. Mr Des Rinehart from MLA and representatives from the Australian Lot Feeders' Association provided important support for the project through contributions to design of the project and by encouraging feedlot owners and managers to cooperate with the project. A number of veterinarians involved in feedlot consultancy work contributed to the design of the project and in particular to drafting of the questionnaire. These included Drs Kev Sullivan, Paul Cusack and David Frith. Dr Lee Taylor from Pfizer Animal Health has provided input into the project design and also has reviewed draft reports. Researchers from the MLA-funded National BRD Project (Drs Tamsin Barnes and Tim Mahony) have also assisted in the design of the project. A number of individuals have assisted in the collection of questionnaire information and electronic data records from participating feedlots, including Drs Evan Sergeant, David Kennedy, Tristan Jubb, John House and Ian Perkins. Finally, the participating feedlots and their staff are gratefully acknowledged for their willingness to participate in this project and to provide information both through completing the questionnaire and by providing electronic data records.

7 Bibliography

Cusack PMV, McMeniman N and Lean IJ (2003). The medicine and epidemiology of bovine respiratory disease in feedlots. *Australian Veterinary Journal;* 81: 480-487.

Cusack PMV, McMeniman N and Lean IJ (2007). Feedlot entry characteristics and climate: their relationship with cattle growth rate, bovine respiratory disease and mortality. *Australian Veterinary Journal;* 85: 311-316.

Dunn SE. Survey of extent and causes of illness in feedlot cattle. Report to the Australian Meat Research Corporation – DAN 64, 1991.

Dunn SE, Godwin J, Hoare RT, Kirkland PD and Walker KH. Diseases of feedlot cattle in eastern Australia – MRC Project DAN 064 (1990-1994). Proceedings of the Australian Association of Cattle Veterinarians Pp 76-81, 2000.

Office for National Statistics (2007). Guidelines for measuring Statistical quality, version 3,1. HMSO, London 2007. unstats.un.org/unsd/dnss/docViewer.aspx?docID=1795. Accessed 10 May 2012

Paiba G, Roberts S, Houston C, et al (2006). UK Surveillance: combining datasets to provide quality assured surveillance measures. Proceedings of the 11th International Symposium on Veterinary Epidemiology and Economics 2006. Available at www.sciquest.org.nz:

Perkins NR. Respiratory disease in feedlot and export cattle: a literature review. Report to Meat and Livestock Australia – B.LIV.0248, 2008.

Ribble CS, Meek AH, Janzen ED, Guichon PT and Jim GK (1995a). Effect of time of year, weather, and the pattern of auction market sales on fatal fibrinous pneumonia (shipping fever) in calves in a large feedlot in Alberta (1985-1988). *Canadian Journal of Veterinary Research*; 59:167-172.

Ribble CS, Meek AH, Jim GK and Guichon PT (1995b). The pattern of fatal fibrinous pneumonia (shipping fever) affecting calves in a large feedlot in Alberta (1985-1988). *Canadian Veterinary Journal*; 36:753-757.

Sergeant ES. Survey of feedlot disease in Australia. Analysis of results for Meat and Livestock Australia. Report to Meat and Livestock Australia, 2001.

8 Appendix 1: Summary of feedlot performance from paper-based responses for mid- and long-fed market classes of cattle

Section 4.10 provided summary information for Short-fed market class cattle based on feedlots who provided paper-based responses to Part B of the questionnaire that related to feedlot performance (number of cattle on feed, average daily gain, number of pulls, mortalities etc).

This section presents similar summary information for the Mid- and Long-fed market classes.

Caution is urged in interpreting these responses because of the relatively small number of responses and because of concerns over the validity of paper-based estimates derived from questionnaire responses.

8.1.1 Summary statistics for mid fed cattle (100 to 250 days on feed)

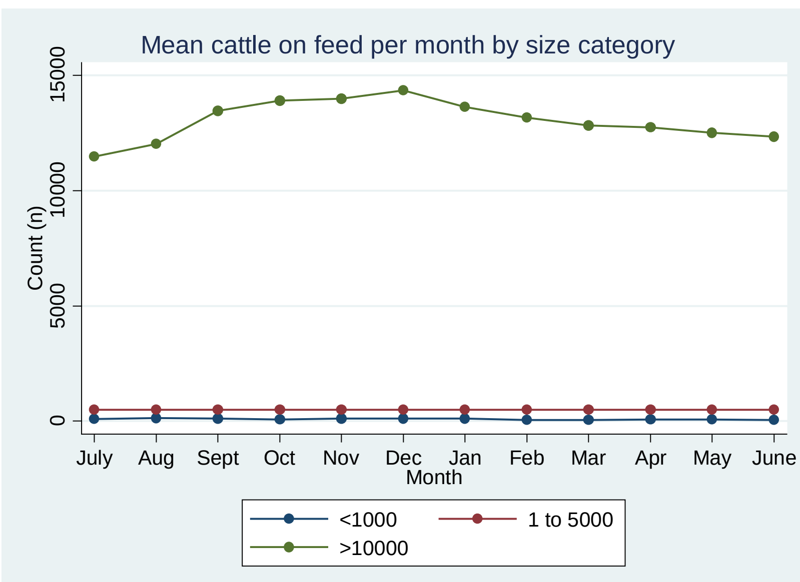

Figure 43: Mean monthly totals of cattle on feed for mid-fed cattle, arranged by month of year and feedlot size category

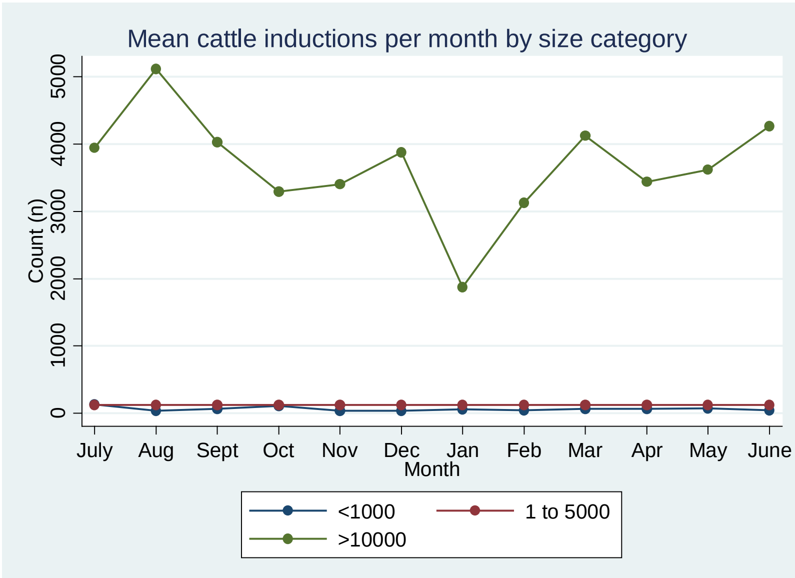

Figure 44: Mean monthly inductions for mid-fed cattle, arranged by month of year and feedlot size category

These data suggest that for large feedlots and mid-fed cattle, there is a peak in inductions in August and smaller peaks in February and possibly December.

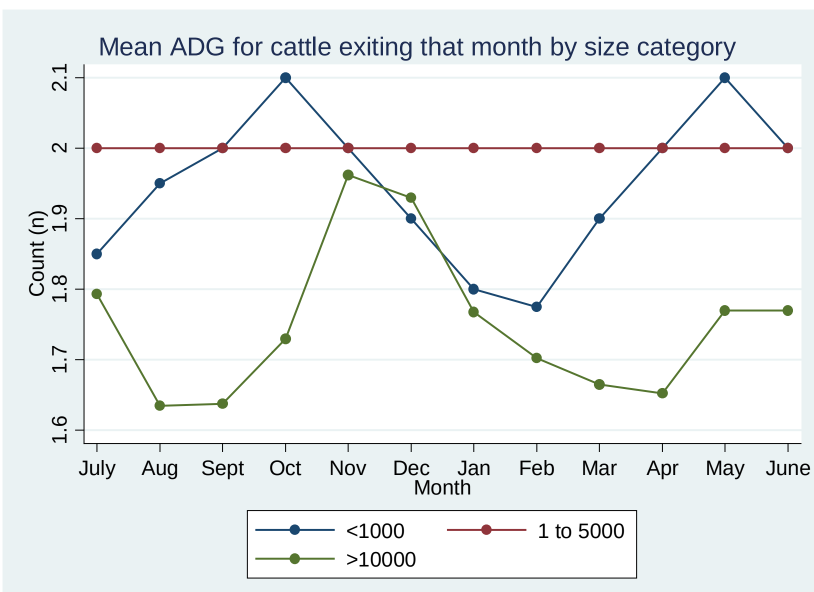

Figure 45: Mean estimated Average Daily Gain for mid-fed cattle, arranged by month of year and feedlot size category

There is a suggestion of monthly variation in ADG and also variation between size category (different lines) but statistical comparisons indicate that there was no difference between ADG for the three size categories, or between the different months. The lack of statistical difference is likely to reflect the small sample size and the lack of variability in estimates with a number of feedlots indicating that their ADG was constant through the year.

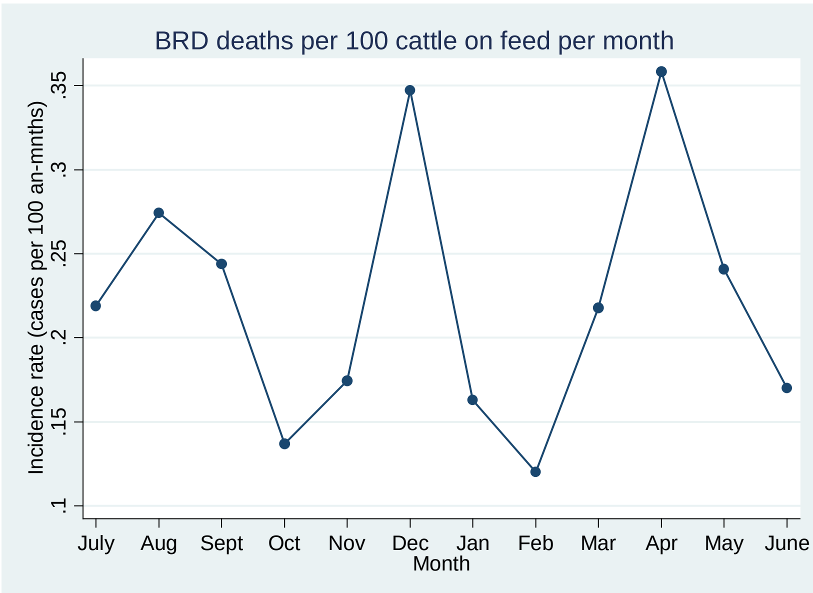

Figure 46: Incidence rate of respiratory deaths in mid fed cattle, arranged by month of year.

There were insufficient data from feedlots of different size categories to allow modelling of BRD incidence rate by feedlot size. The above figure therefore represents average incidence rates derived from all 7 feedlots that reported managing mid fed cattle.

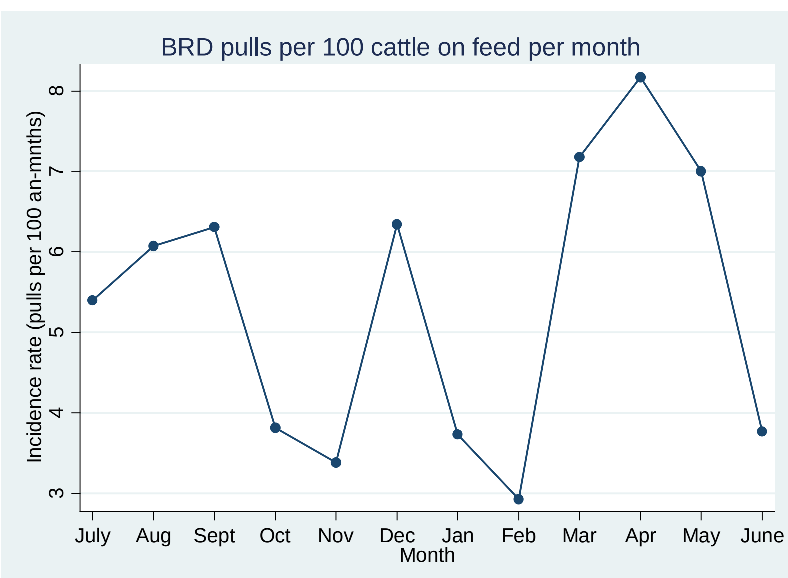

Figure 47: Incidence rate of respiratory pulls for each month for mid-fed cattle

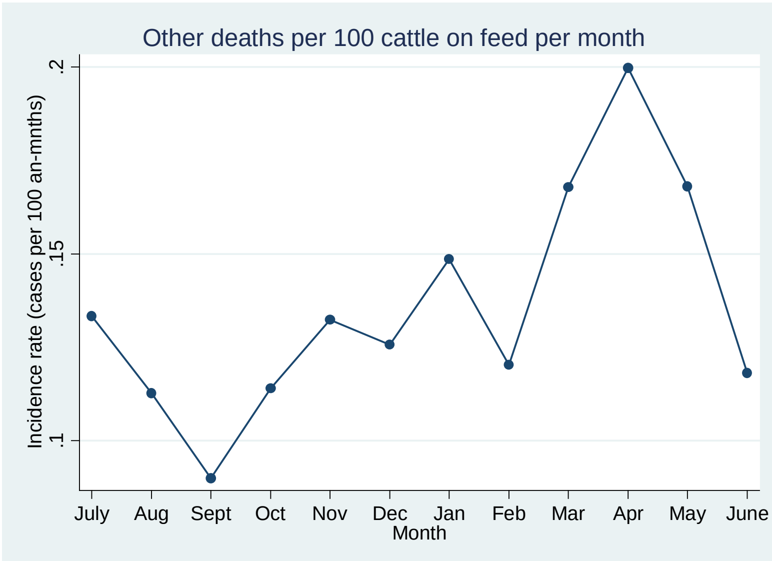

Figure 48: Incidence rate for other deaths in mid fed cattle

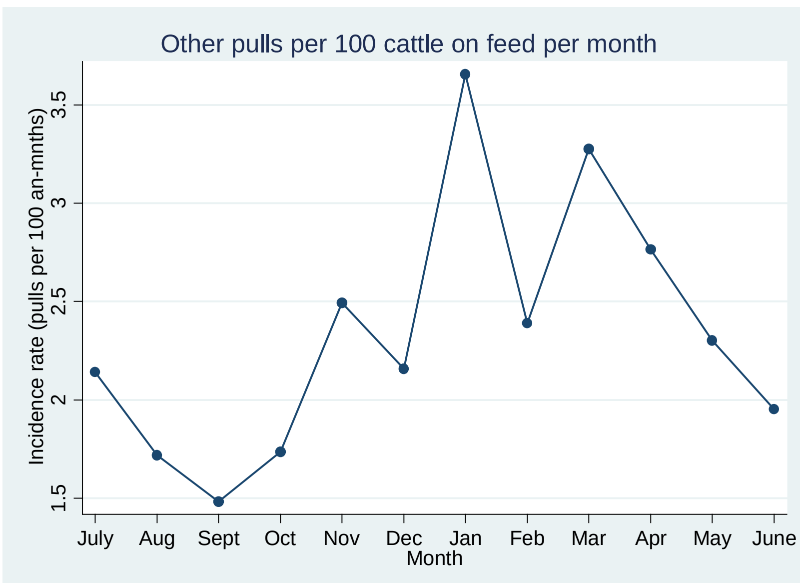

Figure 49: Incidence rate for other pulls in mid-fed cattle

8.1.2 Summary statistics for long fed cattle (>250 days on feed)

There were insufficient responses within the long-fed market class to allow summary statistics to be generated for size categories or for some of the outcomes of interest (ADG, pulls, mortalities). Summary information was limited to counts of animals on feed and inductions per month.

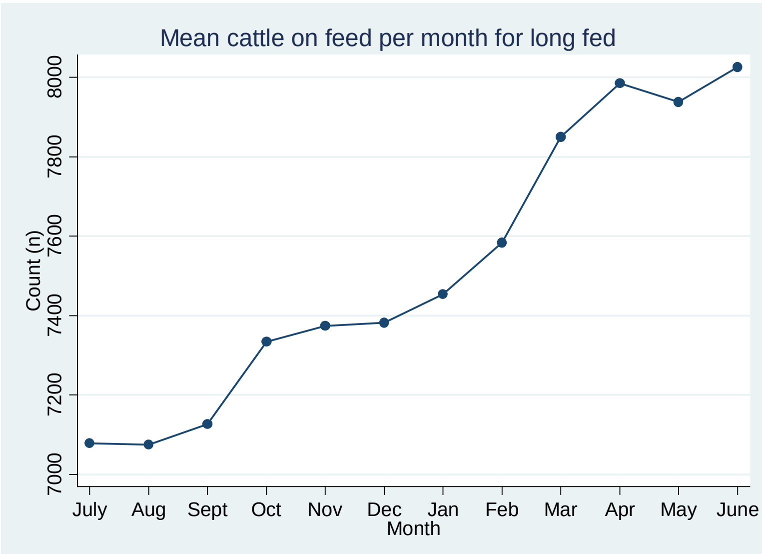

Figure 50: Mean numbers of cattle on feed by month for the three feedlots reporting long-fed cattle

The gradual and progressive rise in numbers of long fed cattle on feed during the period of interest is suggestive that feedlots were in a building up phase for long fed cattle during this period. It should be noted that questionnaire information on long fed cattle was limited to responses from two feedlots.

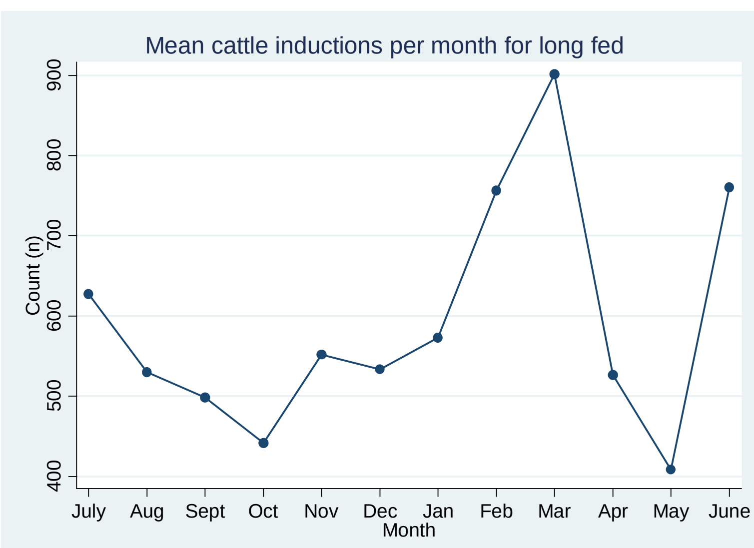

Figure 51: Mean inductions per month for the three feedlots reporting long fed cattle

Data for long fed cattle reflect the fact that two feedlots were inducting only small numbers each month (between 70 and 90 cattle) and one feedlot was inducting between 800 and 2600 cattle each month with inductions increasing as the 12 month period progressed. These data may not reflect long term trends associated with the population of feedlots that are managing long-fed cattle because of the combination of small sample size and limited time frame of the study period relative to the period on feed for some of these cattle.

9 Appendix 2: Questionnaire

The survey questionnaire sent to participating feedlots is provided on the following pages.

Note that all questions apply to the year ending 30 June 2010

FEEDLOT SURVEY 2010

Version 4.1

Background

This project aims to conduct a survey of Australian cattle feedlots. The project report will describe routine animal health practices at feedlots as well as describing the occurrence and cost of diseases and deaths in feedlot cattle. This information will be useful for benchmarking purposes as well as to inform future R&D investment to address priority areas for industry.

The project is supported by MLA and ALFA.

All information collected during this project will be treated as confidential and will be stored in a secure manner. No data or information concerning individual cattle or individual feedlots will be released in any form. Aggregated data in summary form will be used to describe feedlot practices and common diseases in Australian feedlots.

If you have any questions about this project or the questionnaire, please do not hesitate to contact the following people for further information:

Local contact (Project team member who you will be dealing with)

Name: **Phone:** **Mobile:**

Email:

Project leader: Dr Nigel Perkins **Phone:** 07 4638 4541 **Mobile:** 043 793 5376
Email: nigel@ausvet.com.au

Instructions

The questionnaire has been mailed to you along with a pre-paid envelope for return mail. Please complete the questionnaire and return to Nigel Perkins within 3 weeks of receival.

The questionnaire is designed in two parts.

Part A is made up of a number of questions in five (5) sections, and answers can be written in the available boxes on this questionnaire. All questions relate to the 12 month period ending on 30 June 2010.

Part B asks for information on performance of animals in your feedlot. Our preference is for participating feedlots to provide an electronic data file containing records from all animals that entered the feedlot during the 12 month period ending 30 June 2010. If it is not possible to provide an electronic data file, then there are additional questions that can be answered in written form in Part B of the questionnaire.

Note that all questions apply to the year ending 30 June 2010

Questionnaire – PART A

1. IDENTIFICATION AND CONTACTS

Date Completed: ______________________________

Feedlot name:____

Location (street address): ____

_______________________________________State:_________ Postcode:__________

Owner of feedlot:____

Manager of feedlot – name: ____

Postal address:____

_______________________________________State:__________Postcode:__________

Phone:_____________________________ Mobile:________________________________

Email:____

Contact person for questionnaire – name:____________________________________

Phone:_____________________________ Mobile:________________________________

Email:____

Consultant Veterinarian – name:____

Phone: _____________________________ Mobile: ______________________________

Email: ____

Veterinarian providing clinical services – name:________________________________

Phone: _____________________________ Mobile: ______________________________

Email: ____

Note that all questions apply to the year ending 30 June 2010

2. GENERAL INFORMATION

2.1 What was the maximum number of animals the feedlot could hold on feed at one time in the year ending 30 June 2010. Provide answer in Standard Cattle Units (1 SCU = 600 kg animal at time of turn off). See Appendix for details on estimation of SCU.

2.2 Estimate total number of cattle turned off for each of three categories of days on feed:

	Short-fed (<100d)	**Mid-fed (100-250d)**	**Long-fed (>250d)**
Number of cattle turned off in year ending 30 June 2010			

2.3 How many feeder pens were there on the feedlot (only count those pens used for full-time feeding of animals)

2.4 Estimate stocking density for feeder pens (m^2/SCU)

2.5 Largest feeder pen capacity (in SCU) and smallest feeder pen capacity (SCU)

largest pen capacity *smallest pen capacity*

2.6 Give an estimate of the percentage of incoming cattle in each of the three categories of origin class of cattle entering the feedlot (proportion of cattle in each of the following origin classes)

	Vendor direct	**Other property**	**Saleyard**	
% of annual feedlot intake for year ending 30 June 2010				must add to 100%

Vendor direct: cattle coming directly to feedlot from property where they were bred
Other property: cattle coming from any property other than the place where they were bred (including holding/backgrounding paddocks managed by feedlot operation or parent company).
Saleyard: cattle coming direct from saleyard to feedlot entry.

Note that all questions apply to the year ending 30 June 2010

2.7 Indicate percentage of cattle entering the feedlot that travelled more than 1000km in the journey ending with feedlot entry (where transport occurred within the 7 days prior to entering the feedlot).

2.8 Indicate percentage of cattle entering the feedlot that travelled for more than 12 hours in the journey ending with feedlot entry (where transport occurred within the 7 days prior to entering the feedlot).

2.9 Estimate the percentage of cattle that were horned when they arrive at the feedlot (visible horns present – includes animals that have been tipped but does not include animals that have been dehorned)

2.10 Estimate the percentage of all cattle entering the feedlot that were male

2.11 Of the male cattle at the time of arrival at the feedlot, what percentage were:

Entire male	
Castrated male - testicles removed	
Castrated male - testicles retained (burdizzo, short scrotum)	
	must add to 100%

2.12 Of the female cattle arriving at the feedlot, what percentage were:

Entire female	
Speyed female	
	must add to 100%

Note that all questions apply to the year ending 30 June 2010

2.13 Please indicate how animals were identified in your feedlot system

NLIS tag only *tick only*	**NLIS + Visual tag** *tick only*	**Other** *please write explanation*

2.14 Provide details on computer software you use to manage feedlot records:

Recording system	**Tick all that apply**
Software	
StockaID	
Feedlot 3000	
Possum Gully	
Feedlot Plus	
Outcross software	
Customised software	
Spreadsheet (eg Excel)	
Other - please explain	
Paper records	

Note that all questions apply to the year ending 30 June 2010

3. FEEDLOT ENTRY PROCEDURES

Terminology

- **Arrival at feedlot**: When cattle are unloaded from transportation to the feedlot premises.
- **Holding paddocks**: Cattle may be held in paddocks close to the feedlot either after arrival and before induction or after induction and before entry.
- **Induction**: Processing of cattle, tagging and application of any treatments.
- **Entry**: When cattle are moved into feedlot pens. Entry may occur immediately following induction or cattle may be inducted and then moved to holding paddocks for a period before entry.

3.1 Estimate the percentage of cattle that completed induction and entry into the feedlot less than 7 days after arrival at the feedlot premises.

3.2 For those cattle that completed induction and entry less than 7 days after arrival at the feedlot premises, estimate the number of days from arrival to induction **and** from induction to entry:

	Preferred (target)	Typical	Shortest	Longest
Days from arrival at feedlot to induction				
Days from induction to entry				

3.3 For those cattle that completed induction and entry greater than 7 days after arrival at the feedlot premises, estimate the number of days from arrival to induction **and** from induction to entry:

	Preferred (target)	Typical	Shortest	Longest
Days from arrival at feedlot to induction				
Days from induction to entry				

3.4 Estimate the percentage of incoming cattle for the year ending 30 June 2010 that were enrolled in an accredited cattle feedlot preparation program such as Landmark Maxistart or Elders Feeder Guard:

Note that all questions apply to the year ending 30 June 2010

3.5 Place a tick against any Feedlot Preparation Programs that were certifying cattle arriving at your feedlot in the year ending 30 June 2010:

Feedlot Ready Program	**Tick**
Elders Feeder Guard	
Hereford Feedlot Ready Program	
Landmark Maxistart Feedlot Ready Program	
Red Start Hereford Secure	
Other (please specify)	

3.6 Tick the boxes that best describes the aim of your feedlot with respect to respiratory disease vaccines

	Bovilis-MH	**Pestigard (BVD)**	**Rhinogard (IBR)**
Aim to have 100% of cattle vaccinated either before or after arrival for:			
Vaccination may be used at some times or in some lines of cattle			
None of the cattle entering the feedlot are vaccinated for:			

3.7 Of those arriving cattle in the year ending 30 June 2010 that were **not** enrolled in an accredited feedlot preparation program, estimate the percentage that received the following respiratory disease vaccinations either before or after they arrived at the feedlot:

Vaccinations	**Prior to arrival**	**After arrival & prior to entry**	**At entry**
Bovilis-MH			
Pestigard (BVD)			
Rhinogard (IBR)			

3.8 Estimate the percentage of **all** arriving cattle that were implanted with hormonal growth promotant (HGP) prior to arrival at the feedlot:

Note that all questions apply to the year ending 30 June 2010

3.9 Estimate the percentage of all cattle in the year ending 30 June 2010 that received the following treatments or procedures at feedlot entry **or** induction. Include comments where appropriate for those procedures that are applied only to some cattle:

Procedure	% of cattle	Comment if <100%	*example comments*
Anthelmintic			
worms			*only <2yr old*
fluke			*only southern cattle*
External parasites			
Lice			*only in winter*
Buffalo fly			*only in summer*
Ticks			*only if from tick area (QLD)*
HGP			
Antibiotic			
Vaccinations			
Clostridia			
Leptospirosis			
Botulism			*only if concerned*
Pestivirus			
Pinkeye			
Anthrax			*only if concerned*
3-day sickness			*only if concerned*
Tick fever			*only if concerned*
E. Coli			*only if concerned*
Salmonella			*only if concerned*

Note: Information about respiratory disease vaccination has already been provided in previous questions

Note that all questions apply to the year ending 30 June 2010

3.10 Of those cattle that had visible horns at arrival (see Question 2.9), estimate the percentage that were tipped (or re-tipped) on arrival or at induction.

3.11 Indicate the percentage of all intact females that were checked to determine pregnancy status either on arrival or at induction.

3.12 Indicate if you have used mass medication with either antibiotic or prostaglandin in the year ending 30 June 2010

Mass medication	**At Induction (Yes/No)**	**During feeding (Yes/No)**	**If Yes, please provide explanation**
Antibiotic			
Prostaglandin to females only			

Note that all questions apply to the year ending 30 June 2010

4. *MANAGEMENT OF FEEDLOT RATIONS*

4.1 Provide information on how your feedlot managed starter and finisher ration

Question	Short fed (<100d)	Mid fed (100-250d)	Long fed (>250d)
% of grain in starter ration			
% grain in finishing ration			
Number of days from first day of starter ration to first day of finisher ration			
Number of diet changes (steps) between first day of starter ration and first day of finishing ration			

4.2 Indicate the major sources of roughage used in the rations in each of the starter and finisher rations (Tick one or more boxes to indicate which types of roughage account for most of the fibre in ration)

Roughage	Starter ration	Finishing ration	
hay			
straw			
silage			
cotton seed hulls			
other			*add details*

4.3 Indicate by ticking which grains were used in rations in the year ending 30 June 2010 (Tick all that apply).

Grains	Starter ration	Finishing ration	
wheat			
barley			
sorghum			
corn			
other			*add details*

Note that all questions apply to the year ending 30 June 2010

5. MAJOR FEEDLOT DISEASES

5.1 Rate the effects of the following diseases in your particular feedlot for the year ending 30 June 2010. Please provide a rating for each disease and category of days on feed by entering a number (from 0 to 5) in each field in the table below. The rating should be based on the overall economic effect of that disease in your feedlot for that year.

For those conditions rated 3 or above, please circle the most important specific diseases from the list in brackets in that row that contributed to the score.

Rating scale

no importance	little importance	slight importance	important	very important	most important
0	1	2	3	4	5

Disease or condition arranged by body system	Category of days on feed Short-fed (<100d)	Mid-fed (100-250d)	Long-fed (>250d)
Eye (pink eye, trauma, other)			
Gastrointestinal system (bloat, diarrhoea, rectal prolapse, other)			
Nervous system (polioencephalomalacia, middle ear infection)			
Musculoskeletal (MS) - feet, limbs, back			
Foot problems (laminitis, foot abscess, injury, foot rot, white line disease, hoof cracks, conformation ...)			
MS conditions not involving the foot (fractures, other injuries, arthritis, swollen limbs,..)			
Respiratory disease (BRD)			
Skin (lice, warts, ringworm, other)			
Reproductive (penis/prepuce, prolapse of vagina, heifer calving, ...)			
Conditions that are hard to class by body system			
Feed disorders (grain overload)			
Heat stress			
Non-eaters			
Sudden death or downer cattle			
Add any other conditions that were important in the year ending June 2010			

Note that all questions apply to the year ending 30 June 2010

5.2 Estimate the average treatment cost per pull and any loss in value in animals at exit if they were pulled at any time while on feed. Provide these estimates for Bovine Respiratory Disease and for the 3 other diseases that had the most impact in your feedlot in the year ending 30 June 2010.
Note that our interest is in estimating costs of treatments administered to sick animals pulled from the feedlot and is not related to costs for any treatments applied at induction.

Marginal cost estimation	Respiratory Disease	other:	other:	other:
Average cost of all drugs/treatments administered to each animal while in the sick pen (cost per pull)				
Estimate of reduction in value of animal at exit for each animal that has been treated ($ per animal)				

5.3 Estimate the total number of pulls for the entire feedlot for the year ending 30 June 2010. A pull means one animal entering the hospital pen for treatment.

5.4 Estimate the total number of pull-days for the entire feedlot for the year ending 30 June 2010. One pull-day means one animal spending one day in the hospital pen. If one animal spends 5 days in the hospital pen, it has accumulated 5 pull-days. *Enter NR=not recorded if you do not record pull days*

5.5 Estimate the total cost of drugs/treatments administered to all animals while in the hospital pen for the year ending 30 June 2010.
Note that our interest is in estimating costs of treatments administered to sick animals pulled from the feedlot and is not related to costs for any treatments applied at induction.

Note that all questions apply to the year ending 30 June 2010

Questionnaire – PART B

6. FEEDLOT PERFORMANCE: (inductions, animals on feed, ADG, pulls and deaths)

6.1 Is it possible to obtain an electronic data file to the project team covering animal performance in the feedlot during the 12 month period ending 30 June 2010?
A project team member will assist in identifying data needs and preparing for extraction of data

YES ☐ NO ☐

Explanation

The project team would prefer to receive electronic data files from participating feedlots that cover records for **cattle entering the feedlot between 1 July 2009 and 30 June 2010** and that covers three areas:

- a file containing one row per lot with data on lot characteristics and average performance for each lot for those cattle entering the feedlot between 1 July 2009 and 30 June 2010 (data file may extend into 2011 to ensure close out for all lots entering to 30 June 2010).
- a file containing data on hospital pulls for the 24 month period 1 July 2009 to 30 June 2011
- a file containing data on deaths for the 24 month period 1 July 2009 to 30 June 2011
    - the longer period for pulls and deaths is to ensure that these files cover as many of the same lots as possible from the performance file.

Details on what data the project team is interested in and how data may be prepared are provided in Appendix 2 to this questionnaire. A member of the project team will be very happy to work with you to help define data needs and how best to get data to the project team.

If you answered **YES**, please return the questionnaire using the pre-paid envelope supplied. A member of the project team will contact you to discuss the electronic data requirements and assist in preparation of files. There is no need to complete questions 6.2, 6.3 or 6.4 – since this information will be provided in the electronic data files.

If you answered **NO** to Question 6.1, please complete the remainder of the questionnaire (questions 6.2, 6.3 and 6.4) using your records for the year ending 30 June 2010. Please provide actual estimates based on records where possible to assist the project in determining accurate industry level estimates of performance.

Complete separate tables for each of the three categories of days-on-feed. Leave blank if your feedlot had no animals in a particular category for the year

Provide estimates of all outcomes for each month of the year ending 30 June 2010

For animals on feed, estimate EITHER the mean number of cattle on feed in a given month (for that category of DOF) OR provide numbers at the start and end of each month (no need to do both).

Daily weight gain (kg/hd/day) provided for those animals that exited the feedlot in that month

6.2 FOR SHORT-FED ANIMALS ONLY (<100 days on feed), month by month estimates of mean cattle numbers on feed (OR number at start and end of month), inductions, daily wgt gain for animals exiting in that month, and pulls (total pulls only) and deaths (for bovine respiratory disease – BRD, and all other conditions combined)

Month	mean # cattle on feed	# cattle on feed at start	# cattle on feed at end	# inductions during month	Daily wgt gain kg/hd/day	# BRD pulls	# BRD deaths	# Other pulls	# Other deaths
July 2009									
August 2009									
Sept 2009									
Oct 2009									
Nov 2009									
Dec 2009									
Jan 2010									
Feb 2010									
March 2010									
April 2010									
May 2010									
June 2010									

6.3 FOR MID-FED ANIMALS ONLY (100-250 days on feed), provide month by month estimates of mean cattle numbers on feed (OR number at start and end of month), inductions, daily wgt gain for animals exiting in that month, and pulls (total pulls only) and deaths (for bovine respiratory disease – BRD, and all other conditions combined)

Month	mean # cattle on feed	# cattle on feed at start	# cattle on feed at end	# inductions during month	Daily wgt gain kg/hd/day	# BRD pulls	# BRD deaths	# Other pulls	# Other deaths
July 2009									
August 2009									
Sept 2009									
Oct 2009									
Nov 2009									
Dec 2009									
Jan 2010									
Feb 2010									
March 2010									
April 2010									
May 2010									
June 2010									

6.4 FOR LONG-FED ANIMALS ONLY (>250 days on feed), provide month by month estimates of mean cattle numbers on feed (OR number at start and end of month), inductions, daily wgt gain for animals exiting in that month, and pulls (total pulls only) and deaths (for bovine respiratory disease – BRD, and all other conditions combined)

Month	mean # cattle on feed	# cattle on feed at start	# cattle on feed at end	# inductions during month	Daily wgt gain kg/hd/day	# BRD pulls	# BRD deaths	# Other pulls	# Other deaths
July 2009									
August 2009									
Sept 2009									
Oct 2009									
Nov 2009									
Dec 2009									
Jan 2010									
Feb 2010									
March 2010									
April 2010									
May 2010									
June 2010									

Estimation of SCUs

A Standard Cattle Unit is defined as an animal of 600kg liveweight, at the time of exit (turnoff) from the feedlot.

Expressing stocking capacity of a feedlot in SCUs provides a standardised measure of weight turned off from the facility as opposed to an estimate based on numbers of head. The use of a standardised measure ensures that data from different feedlots can be combined and compared.

The method recommended by DPI&F for estimating the number of SCUs in a feedlot at a given point in time is based on the average liveweights of different groups of cattle in the feedlot.

Table : Conversion factors for different liveweights to estimate SCU

Liveweight at exit kg	Conversion factor (F) SCUs per head
750	1.18
700	1.12
650	1.06
600	**1.00**
550	0.94
500	0.87
450	0.81
400	0.74
350	0.67

For example:

Assume the feedlot contains 300 head of trade cattle with an average liveweight of 400kg and 500 head of Jap Ox with an average liveweight of 550kg.

The SCU is estimated as:

300*0.74 + 500*0.94 = 692 SCUs

Data requirements for electronic data file on animal performance

- The project team is particularly interested in three files:
    - **Performance data** to cover all cattle that entered the feedlot between 1 July 2009 and 30 June 2010, recognising that the data file may extend into 2011 to cover close out for all these lots.
    - **Hospital pulls** for the 24 month period from 1 July 2009 to 30 June 2011
    - **Deaths** for the 24 month period from 1 July 2009 to 30 June 2011
        - the longer period for pulls and deaths is to ensure data on pulls and deaths cover the full period on feed for those lots entering the feedlot between 1 July 2009 and 30 June 2010. If cattle are fed for shorter periods then this window may be shortened.
- Data may be provided as a delimited file or ASCII format or other format as discussed with project team members.
- Data may be provided by email attachment or on CD-ROM, DVD or USB drive
- All data will be treated as confidential
    - Data will be de-identified. Feedlot and vendor will be identified by code only.
    - Data will be stored in a secure location and will not be disseminated.
    - Data will only be used for the purposes of analyses completed as part of this project.
    - The only information released will be in the form of aggregated or summary data.
- The following information identifies variables of interest.

Performance data	Comment
Lot number	
Count of animals entering feedlot in each lot	
Death loss	Count- deaths per lot
Sex	heifers, steers, mixed
Category of DOF (target)	<100, 100-250, >250
Entry date (or week of entry - 1 to 52)	
Date of close out	
Average induction weight for lot	
Average days on feed for the lot	
Average exit weight for the lot	

Hospital pulls	Comment
Animal ID	NLIS, Visual tag, other
Lot number	
Date pulled	
Reason for pull	
Diagnosis	
Treat protocol	

Deaths	Comment
Animal ID	NLIS, Visual tag, other
Lot number	
Date died	
Reason for death	