Epidemiology of Porcine Myocarditis Syndrome

Use of production data to demonstrate progression of disease

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History

- First cases of Porcine Myocarditis Syndrome diagnosed in samples submitted to Regional Veterinary Laboratory on 13 June 2003 from the parity 2 farrowing unit of a large commercial piggery in NSW (Site 1).
- It was then diagnosed in the parity 3+ sows on the same property, on 7 July 2003.
- Diagnosis in the gilt unit on that property occurred on 21 July.
- First cases were diagnosed on the 2nd property on 29 July.

History (cont)

- Disease appears to be have been confined to 2 sites run by the same company, and no further cases have been reported since end of 2004

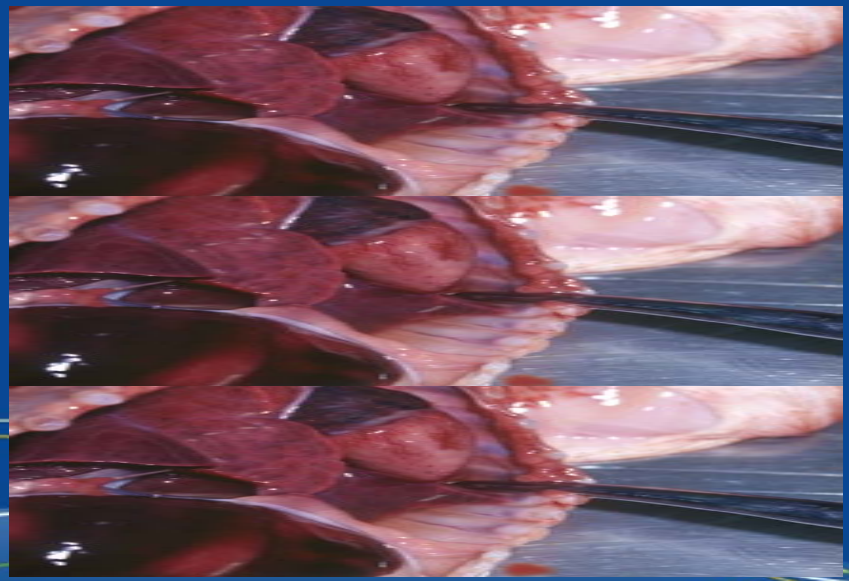
Clinical picture

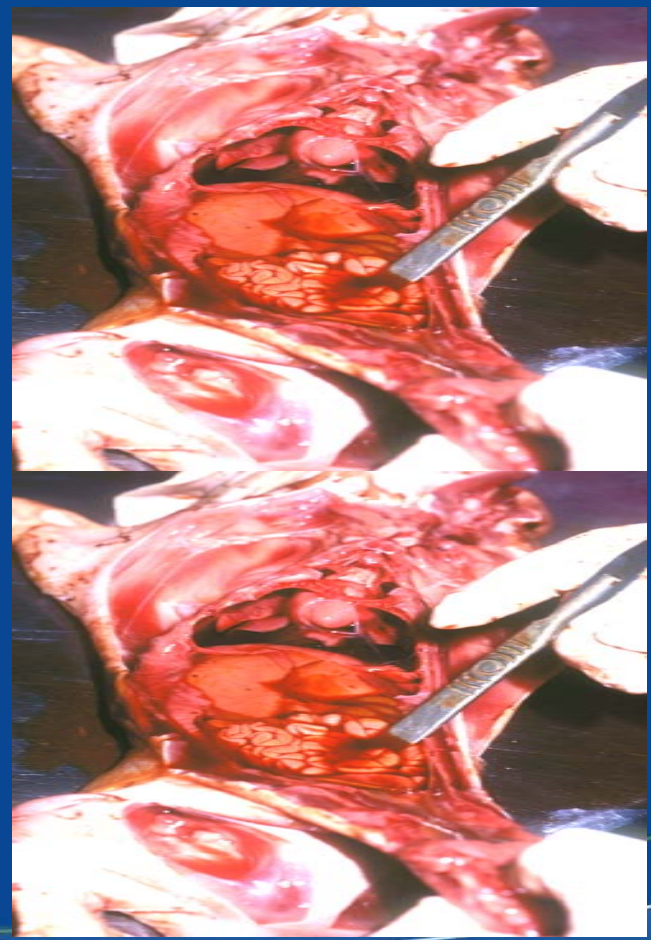
- Increase in prenatal deaths with “Good pigs” found dead
- Increase in stillbirths– “Jelly pigs”
- Gross indications of cardiac failure with subcutaneous oedema

Porcine Myocarditis: Barbara Moloney, ACVSc Science Week, June 2005

Gross Pathology

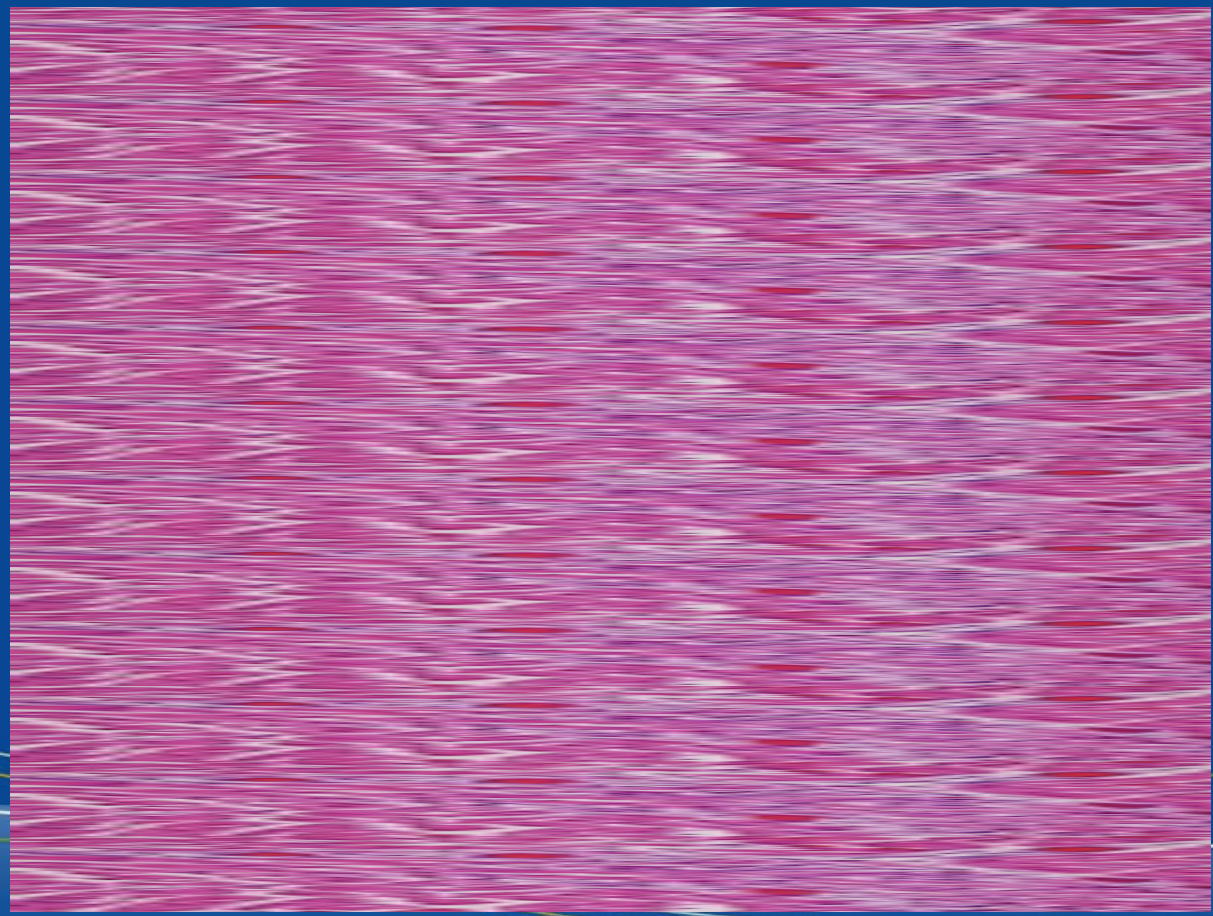
- Post mortem examination showed excess pleural/peritoneal fluid and pallor of myocardium.





Microscopic Pathology

- Varying degrees of non suppurative myocarditis



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Other evidence for infectious cause

- Elevated IgG levels in affected stillborn pigs
- Viral particles seen under EM in affected tissues

Diseases ruled out

- Exotic (tested at Australian Animal Health Laboratory, Geelong)
  - Foot and Mouth Disease
  - Porcine Respiratory and Reproductive Syndrome
  - Vesicular Stomatitis
  - Aujesky's Disease
  - Classical Swine Fever
  - Nipah Virus and Hendra Virus
- Endemic/other (tested at EMAI)
  - Encephalomyocarditis
  - Menangle virus

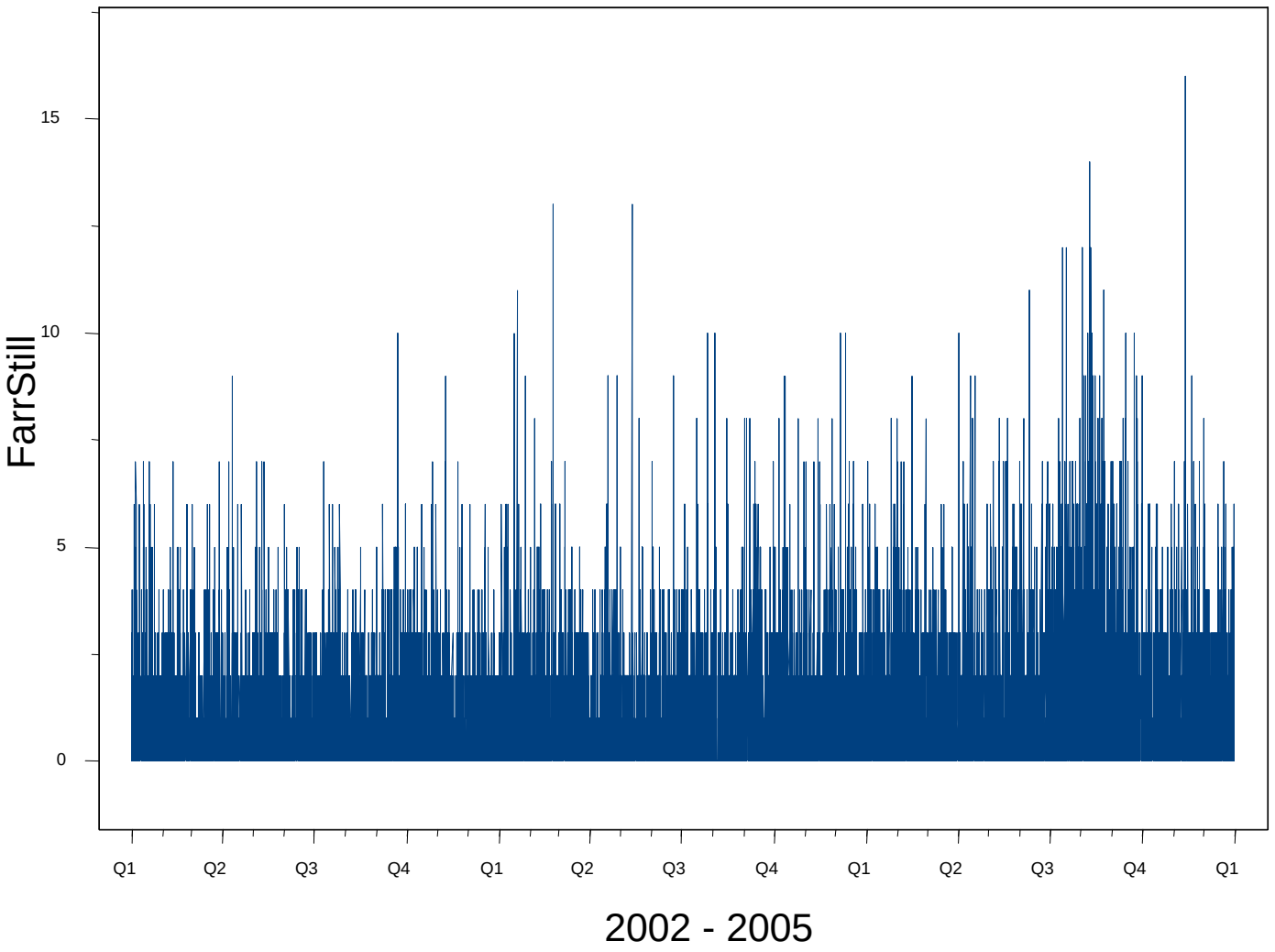
Other non-infectious causes considered

- Vitamin E or selenium deficiency
- Salinomycin toxicity (dietary supplement)
- Autogenous Glasser's disease vaccine

Case definition – problematic!

- Variations in the degree to which a litter was affected
- No specific diagnostic test – aetiology not determined
- Very large number of farrowings prevented detailed enumeration of cases.
- Use of production data: - raw data for number of stillbirths:
  - Large amount of background noise – difficult to see epidemic with any precision

Number of stillbirths in each litter over time: Nucleus Breeding Unit



Large amount of data from farrowing records

- Over 3 year period:

Count of farrowings by Farm and Year				
FarmCode	**2002**	**2003**	**2004**	**Totals**
Site 1	14,092	13,726	13,859	41,677
Site 2	52,804	51,384	55,286	159,474
Totals	66,896	65,110	69,145	201,151

Data fields available

Field	Source	Contents
FarmCode	Farrowing Table	Farm of farrowing:
FarrDate	Farrowing Table	Date of farrowing (dd/mm/yy)
MateSow	Farrowing Table	Sow farrowed
FarrParity	Farrowing Table	Sow parity
FarrBarn	Farrowing Table	Barn (Breeding unit within farm)
FarrRoom	Farrowing Table	Room
FarrPen	Farrowing Table	Pen
FarrAlive	Farrowing Table	Born alive
FarrStill	Farrowing Table	Stillborn
FarrMummy	Farrowing Table	Mummified
WEANNUM*	Weaning Table	Weaned
DEATHNUM*	Death Table	Died

*Numbers weaned and died were considered unsuitable for analysis due to variable degrees of cross-fostering of piglets. Piglets are not individually identified before weaning.

Case Definition

- Using the definition proposed by McOrist *et al* (2004) of an affected litter having 4 or more stillborn piglets, the number cases are shown in table 2.

Table 2: Count of "cases" by Farm and Year

FarmCode	2002	2003	2004	Totals
Site 1	363	1,139	543	2,045
Site 2	1,391	2,332	2,281	6,004
Totals	1,754	3,471	2,824	8,049

Two approaches to data analysis

- The progression of disease can be demonstrated by:
  1. Calculation of cumulative incidence using previous case definition, or
  2. Use of stillbirths as a proportion of total born

1. Cumulative Incidence

- Cumulative incidence can be calculated:

$$CumulativeIncidence = \frac{NumberOfCases}{NumberOfFarrowings}$$

And reported as cases per 100 farrowings, averaged over a moving 10-weekly period

2. Stillbirths as a proportion of litter size

- Proportion of stillbirths calculated as:

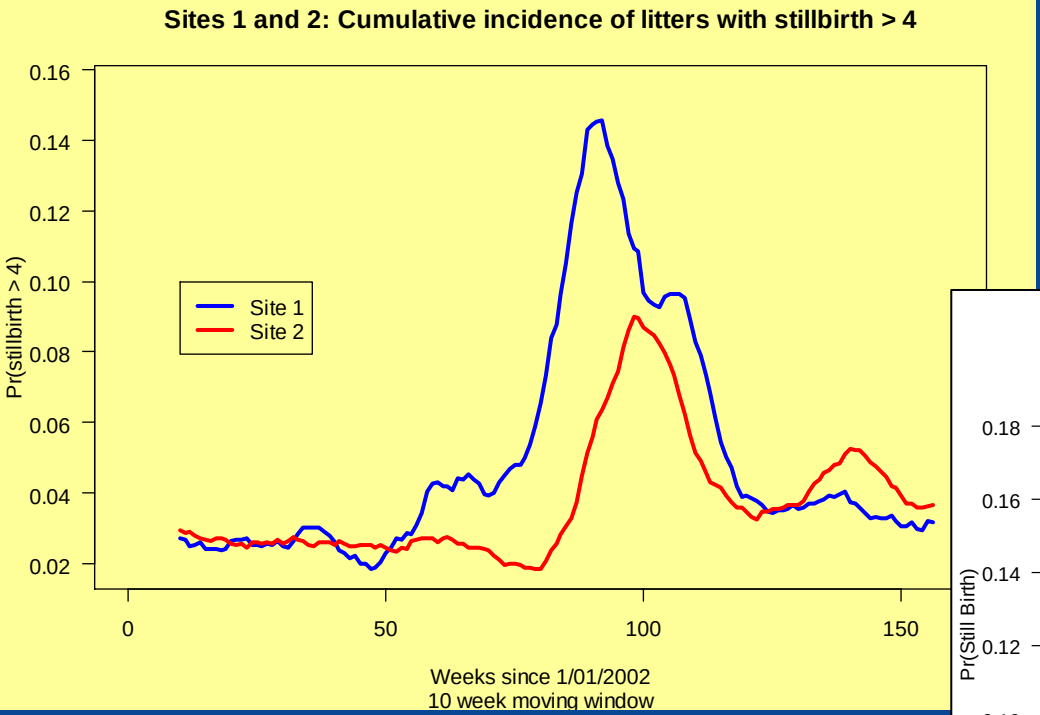
$$P(Stillborn) = \frac{TotalStillborn}{(TotalStillborn + TotalBornalive)}$$

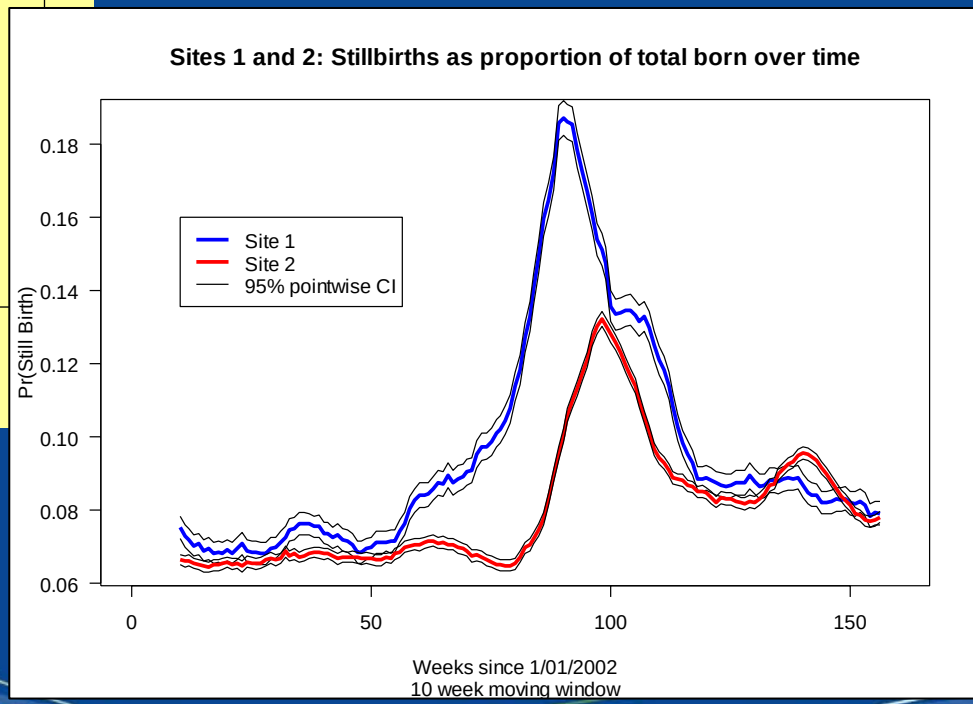
And averaged for each moving 10-weekly period,

95% pointwise confidence limits calculated as:

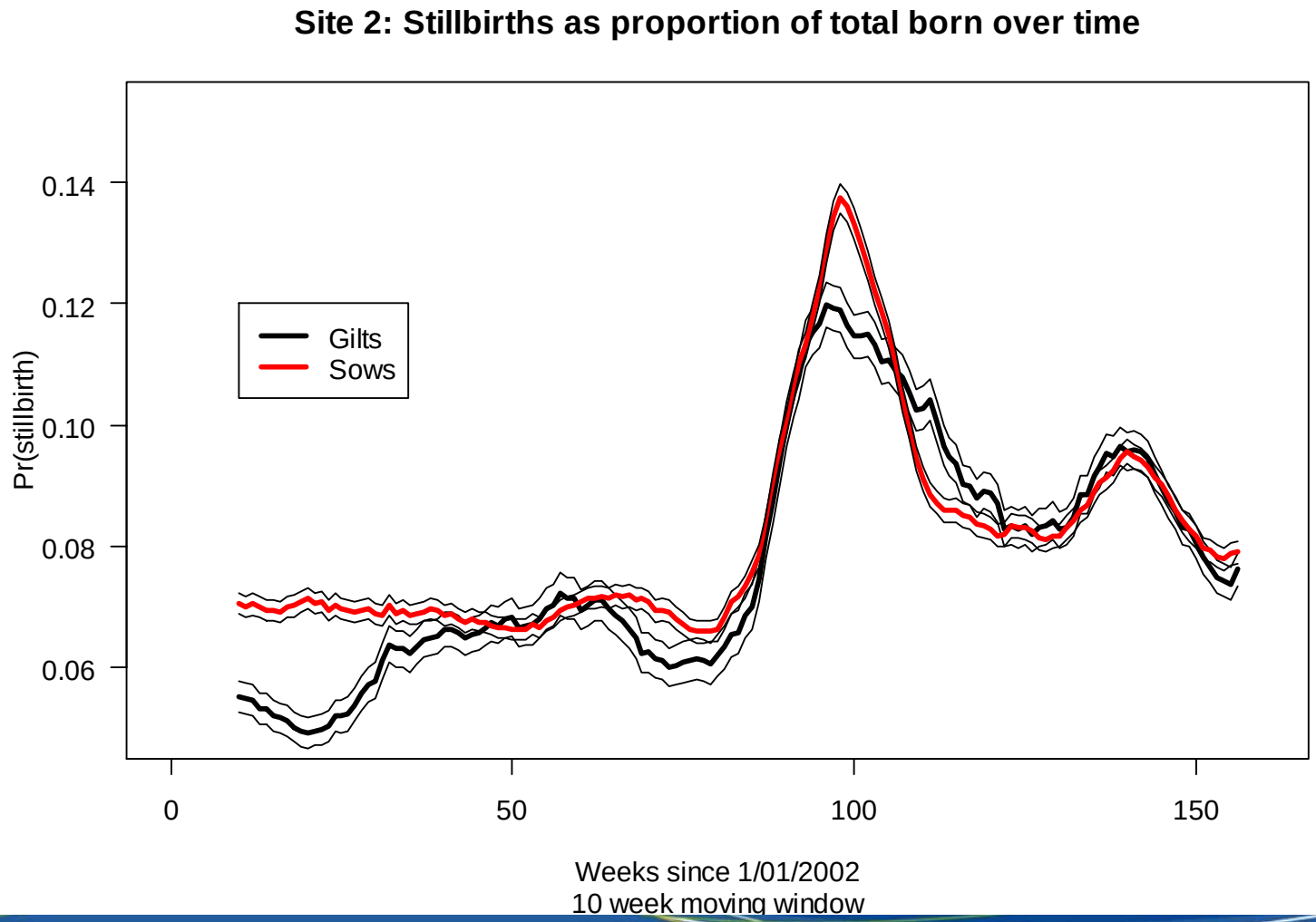
$P(\text{stillborn})_i$ +/- 2*sqrt($P(\text{stillborn})_i$*(1-$P(\text{stillborn})_i$)/TotalBornalive_i

Results – Both Sites

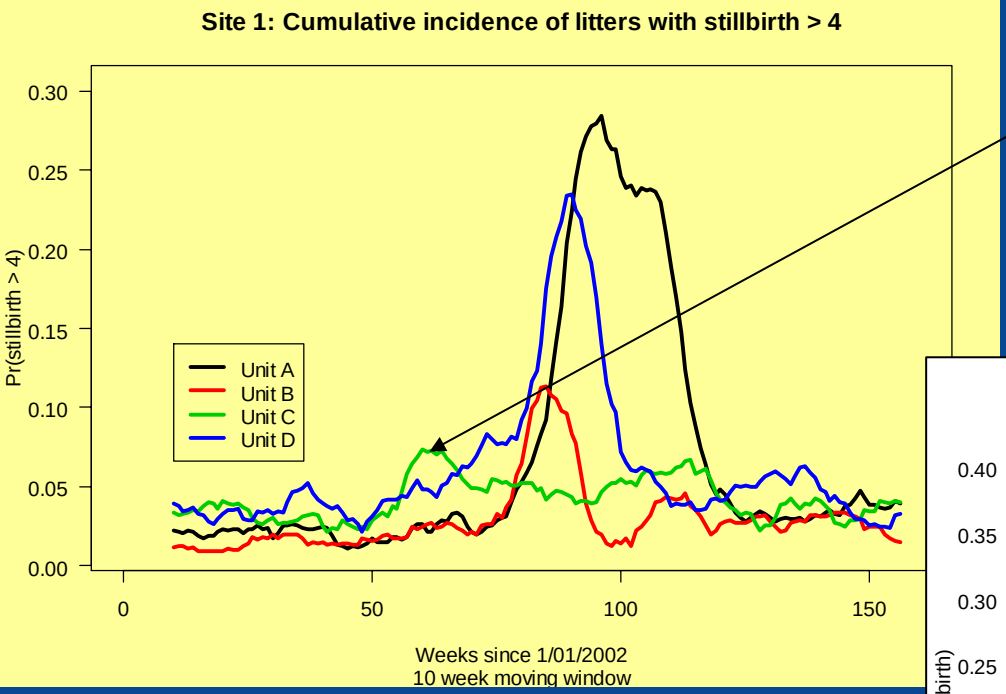




Gilts vs Sows

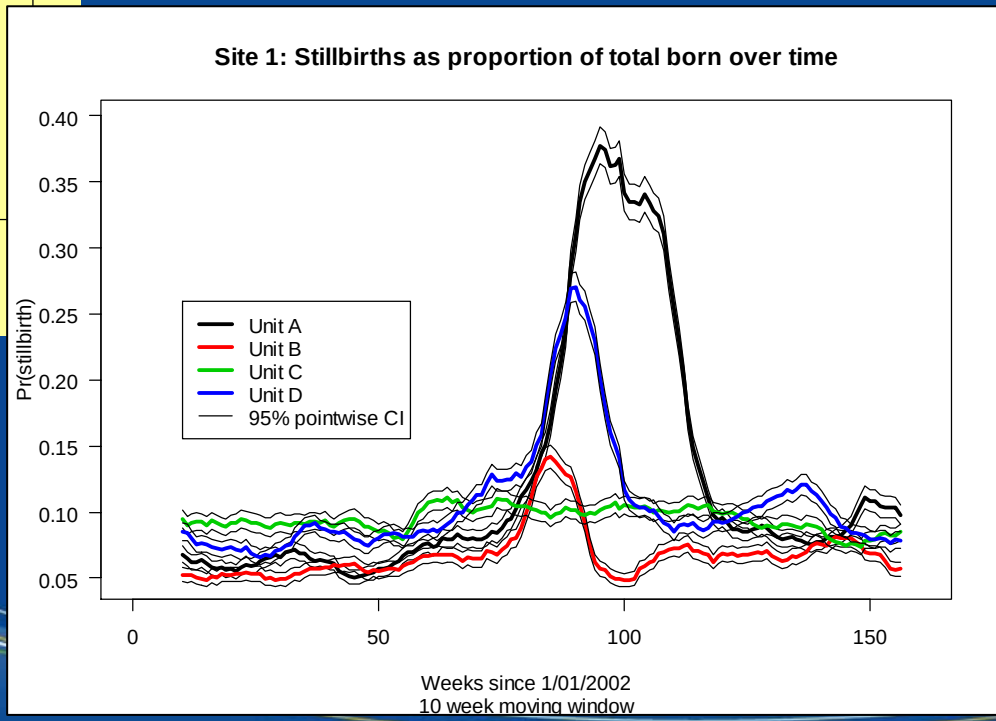


Results: Site 1

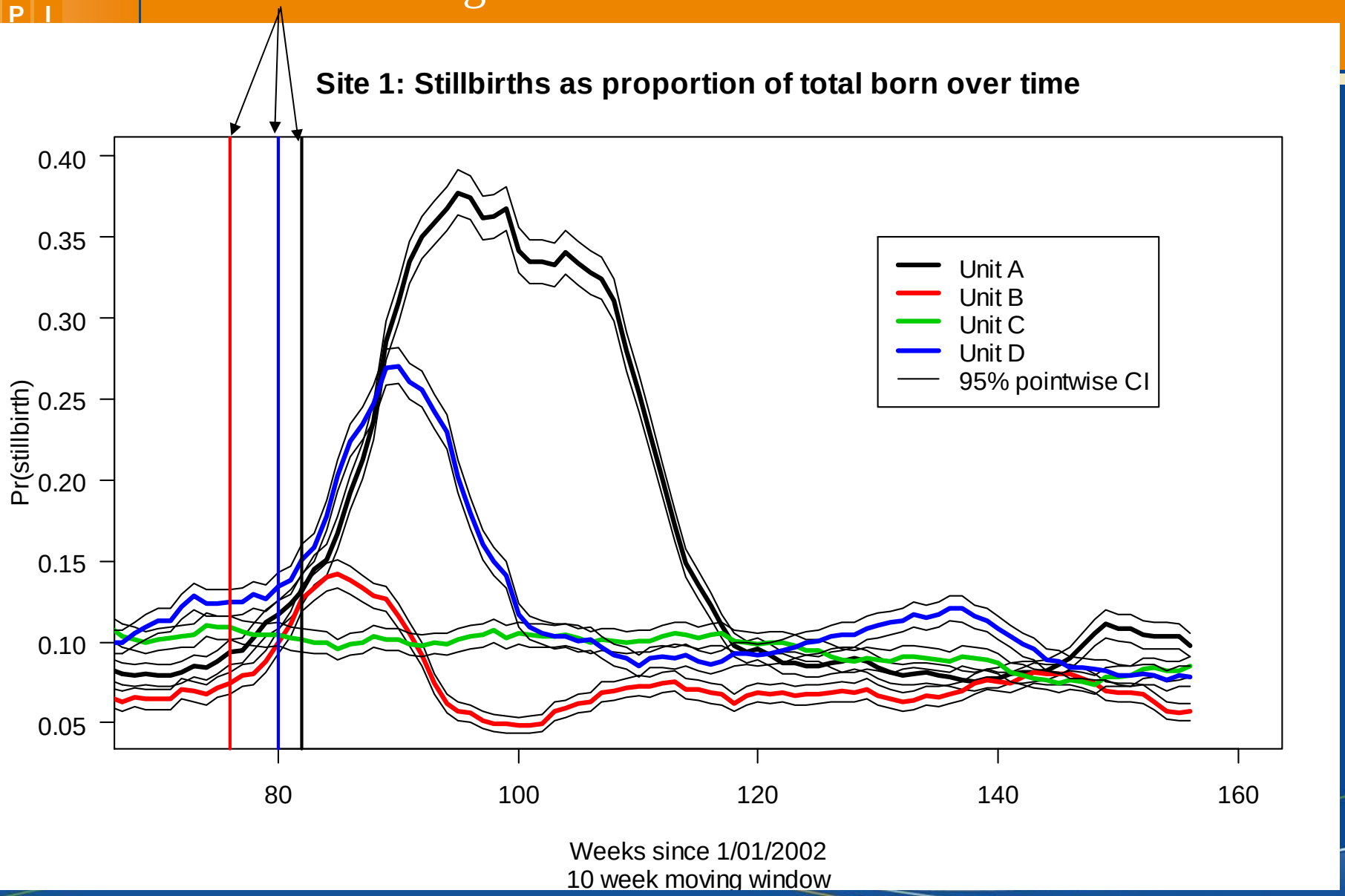


Possible first occurrence of disease in Unit C early 2003 (not reported clinically)

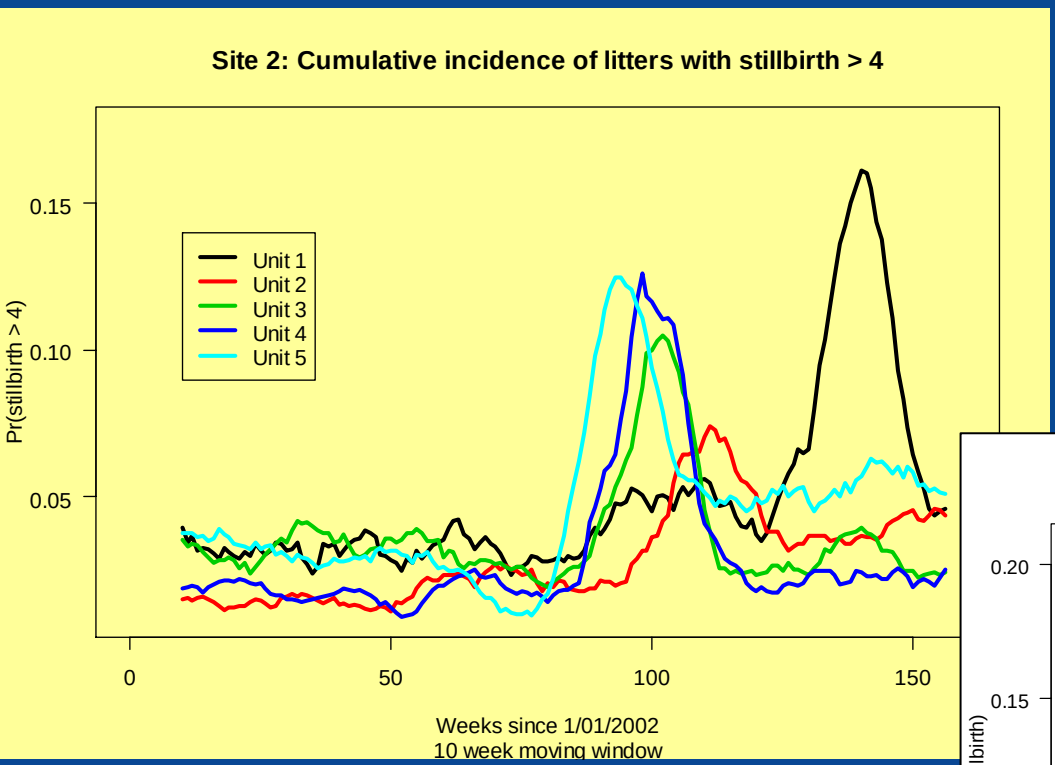
Disease first observed in Unit B mid June 2003

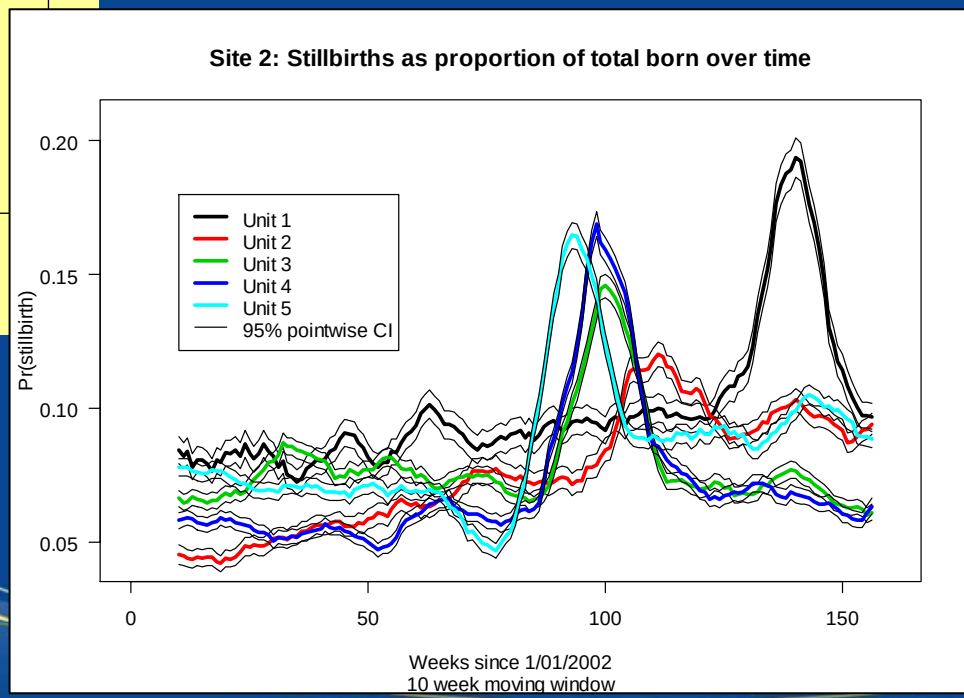


Times of Diagnosis



Results: Site 2





Conclusions

- Work is still being done trying to identify the cause(s) of this syndrome
- Disease appears to have resolved at both sites
- No reports of this disease occurring at other sites
  - how would it be detected if it was?
- Analysis of data from some other companies shows no evidence of stillbirth peaks as occurred in case piggeries

Acknowledgements

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