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# The Importance of Early Identification of At-risk Sows and Learnings From the Improving Pig Survivability Project

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# An integrated approach to improve whole herd pig survivability

<https://piglivability.org>

Jason Ross, Joel DeRouchey, Michael Tokach, Jason Woodworth, Kara Stewart, Nick Gabler, Anna Johnson, Aileen Keating, Daniel Linhares, Suzanne Millman, John Patience, Chris Rademacher, Stephan Schmitz-Esser, Lee Schulz, Kent Schwartz, Ken Stalder, Amanda Chipman, Kristin Olsen



National Swine Improvement Federation

November 30, 2018

*Survivability Conf Nov 5-6, 2025*

*Omaha, NE*



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Research and Extension

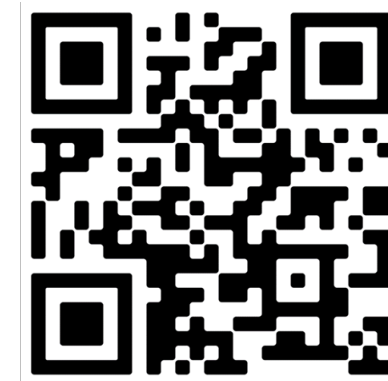


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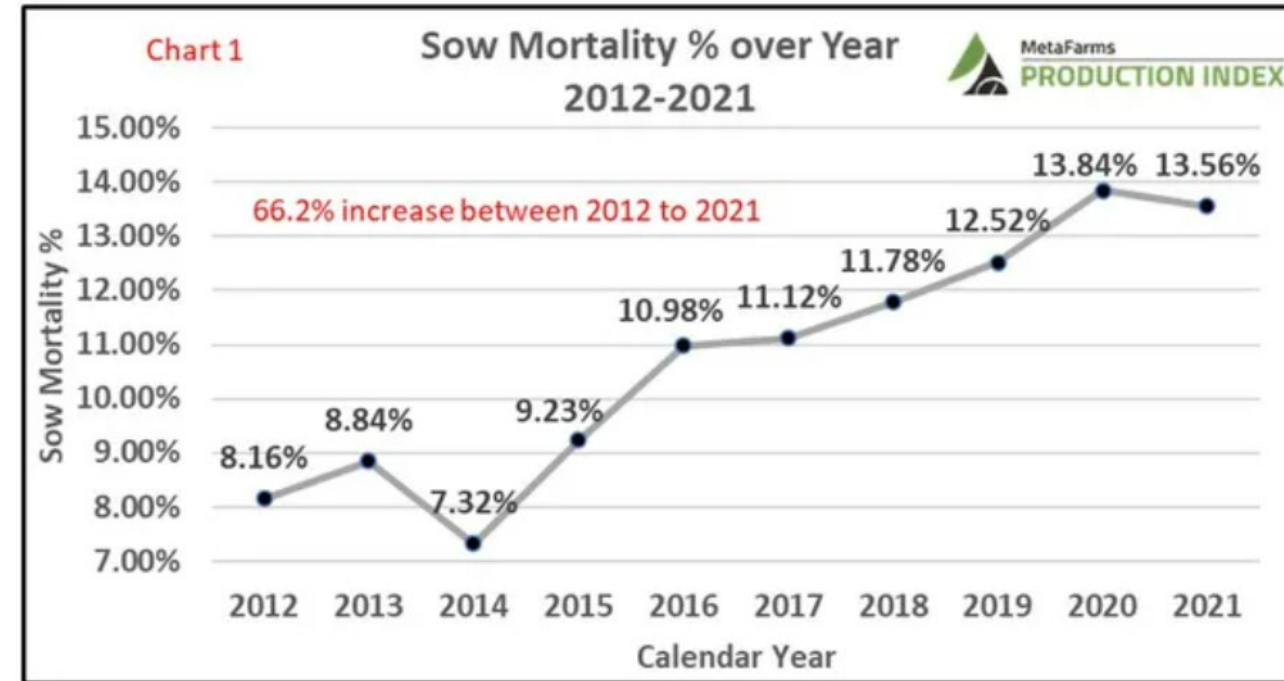
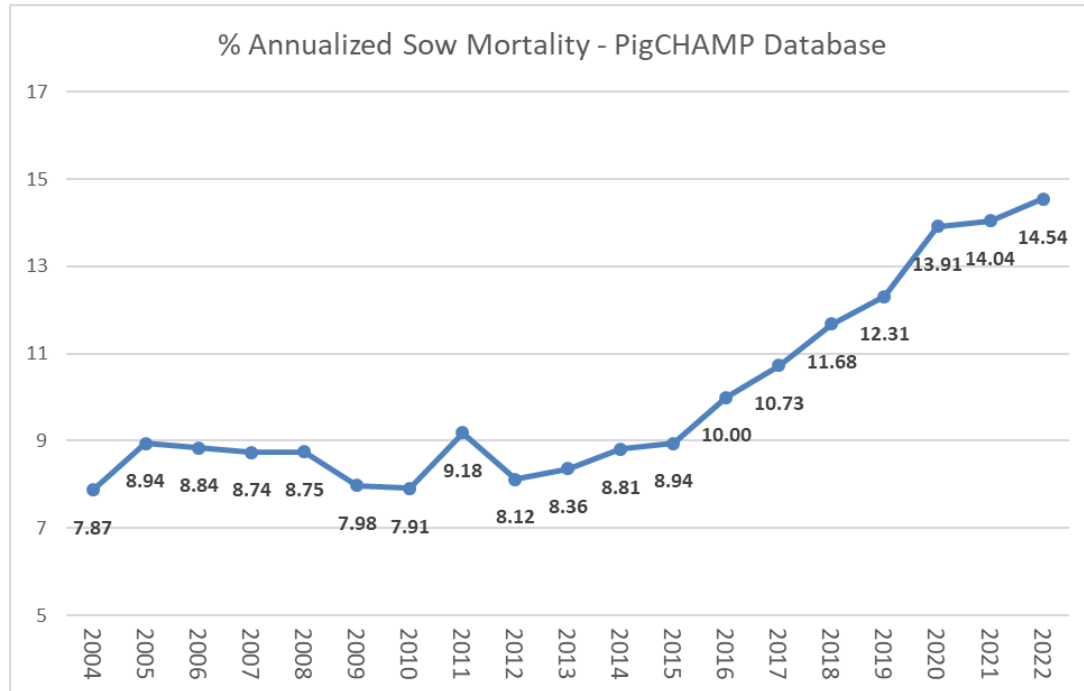
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[www.piglivability.org](http://www.piglivability.org)

# Recent Trends in Sow Mortality



PigCHAMP >  
Benchmarking

~ 350 farms  
~685,000 sows



# Causes of Mortality

- Lots of reasons
- But can be really put into 3 major categories
  - Lameness
  - Pelvic Organ Prolapse (POP)
  - Sudden Deaths (Unknown)
    - Everything that isn't lame or prolapsed

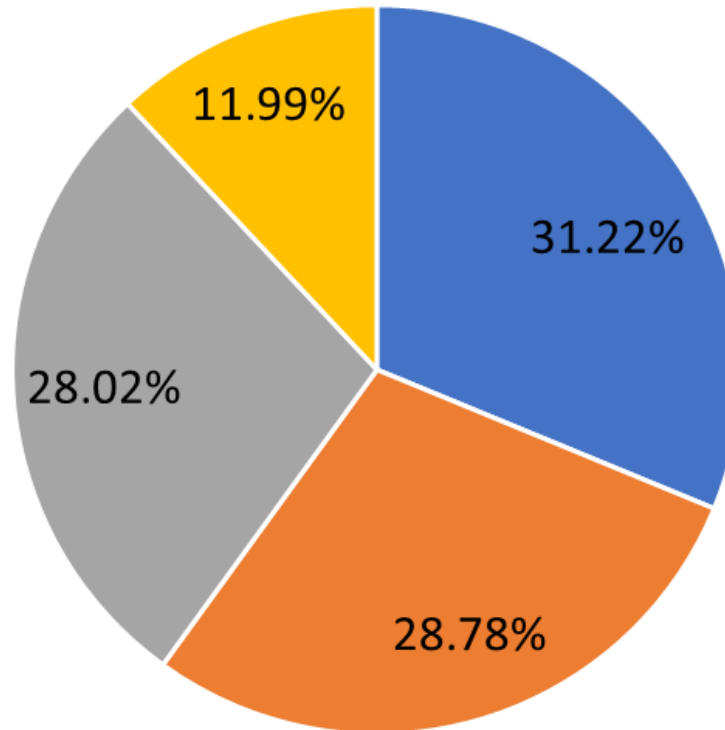
## Pelvic Organ Prolapse

- Vaginal
- Rectal
- Uterine
- Any combination of these

# Breakdown of causes of mortality

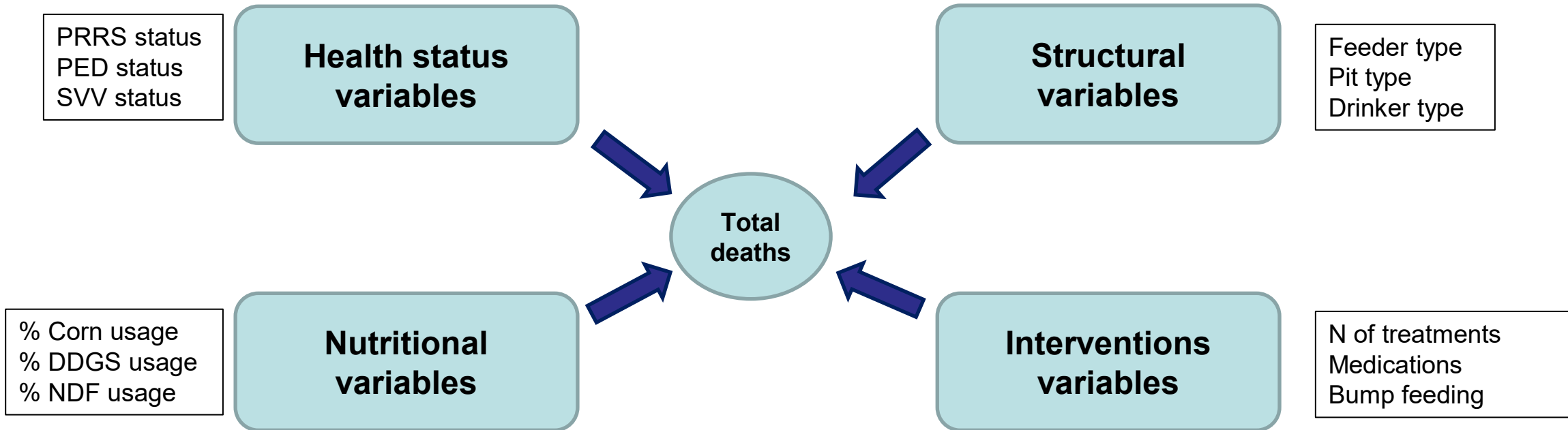
■ Sudden deaths   ■ Lame deaths   ■ Prolapses deaths   ■ Others

- 240,000 sow U.S. system
- 2019-2021



Paiva, 2022

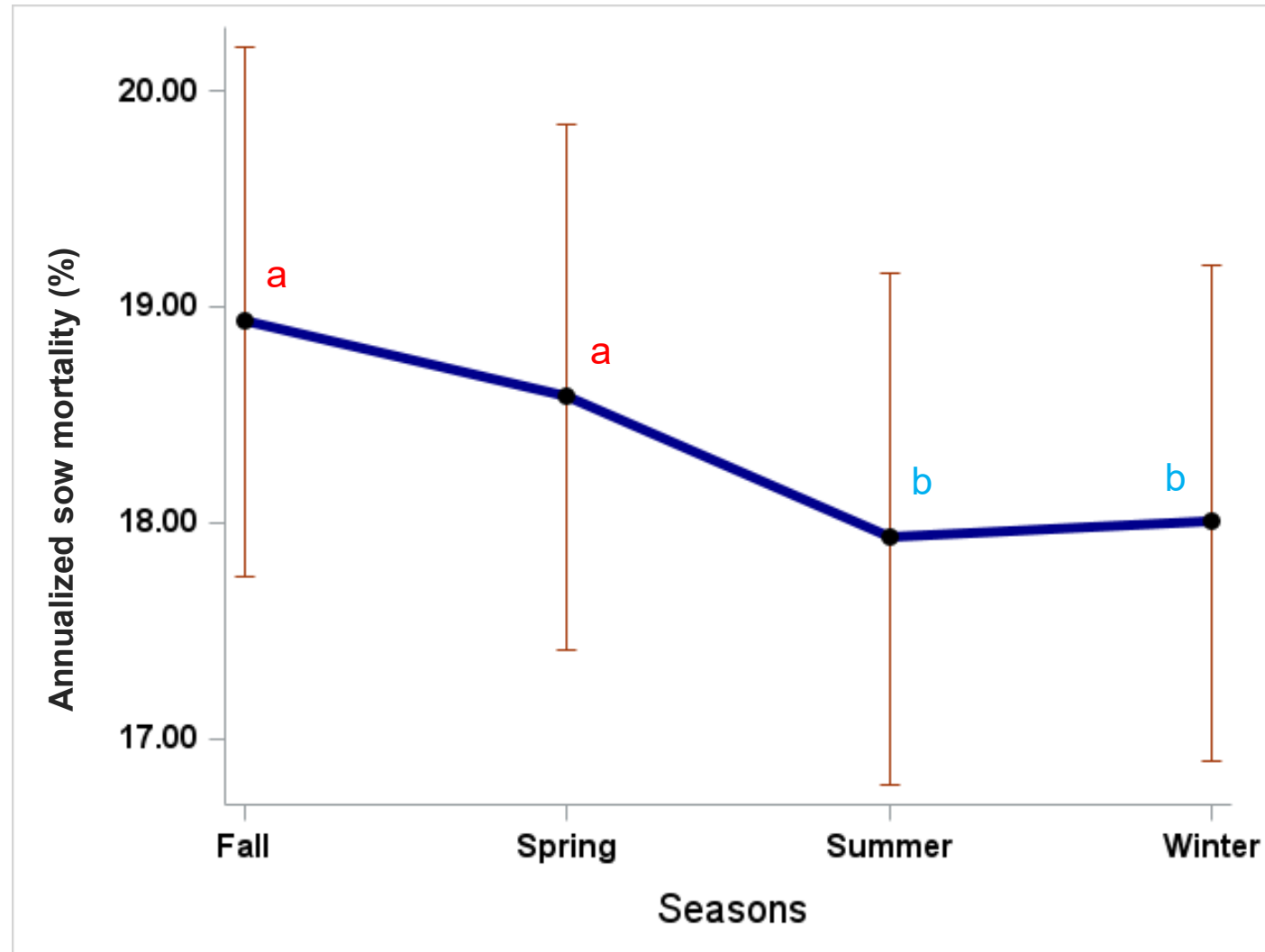
# Screening variables



- Generalized linear mixed regression statistical model
- Multivariable model – stepwise selection – Tukey pairwise comparisons

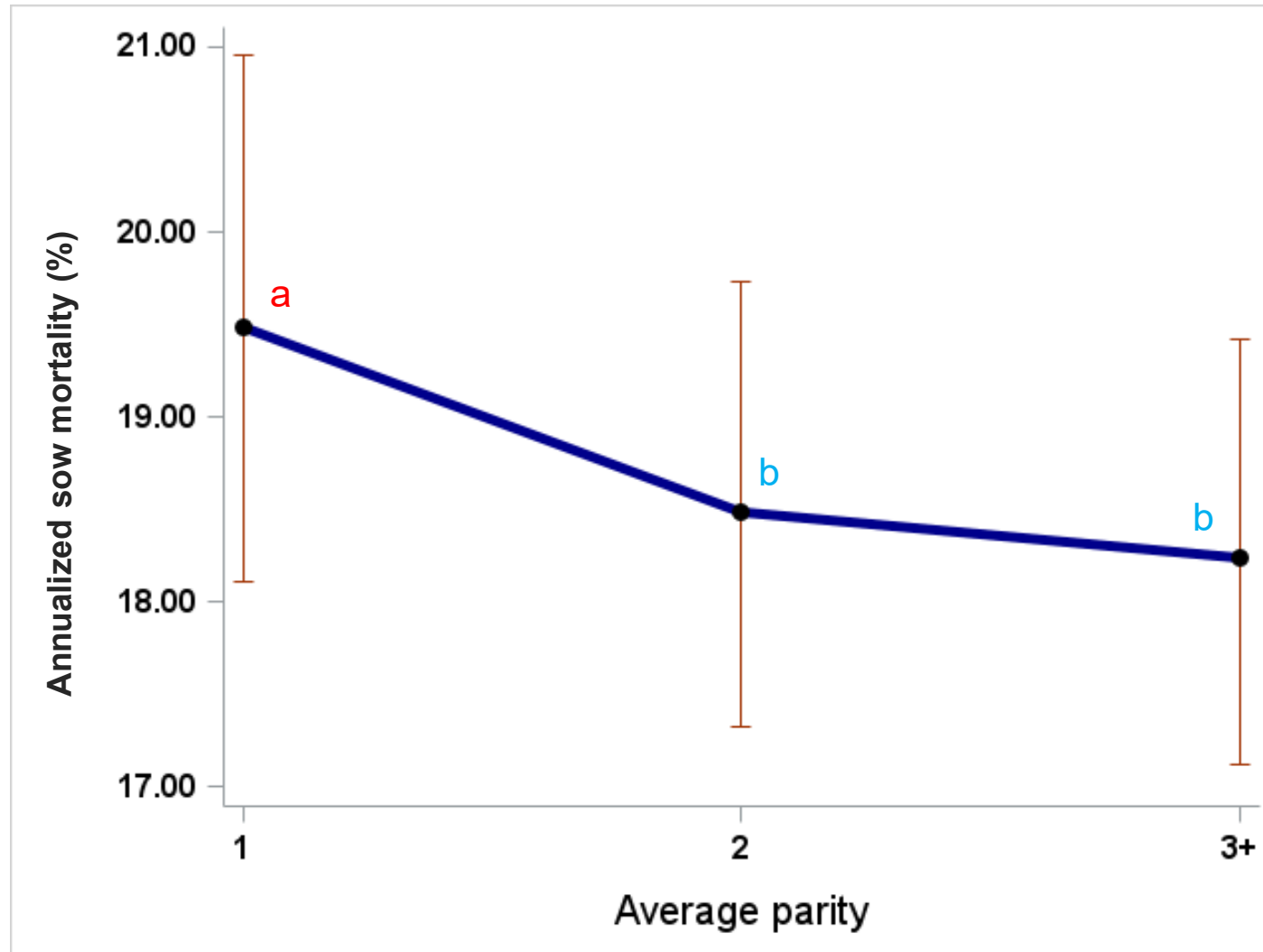
Paiva, 2022

# Fall and Spring with higher mortality



\* Difference in letters represents statistical difference within lines

# Higher mortality (1.0%) in gilts

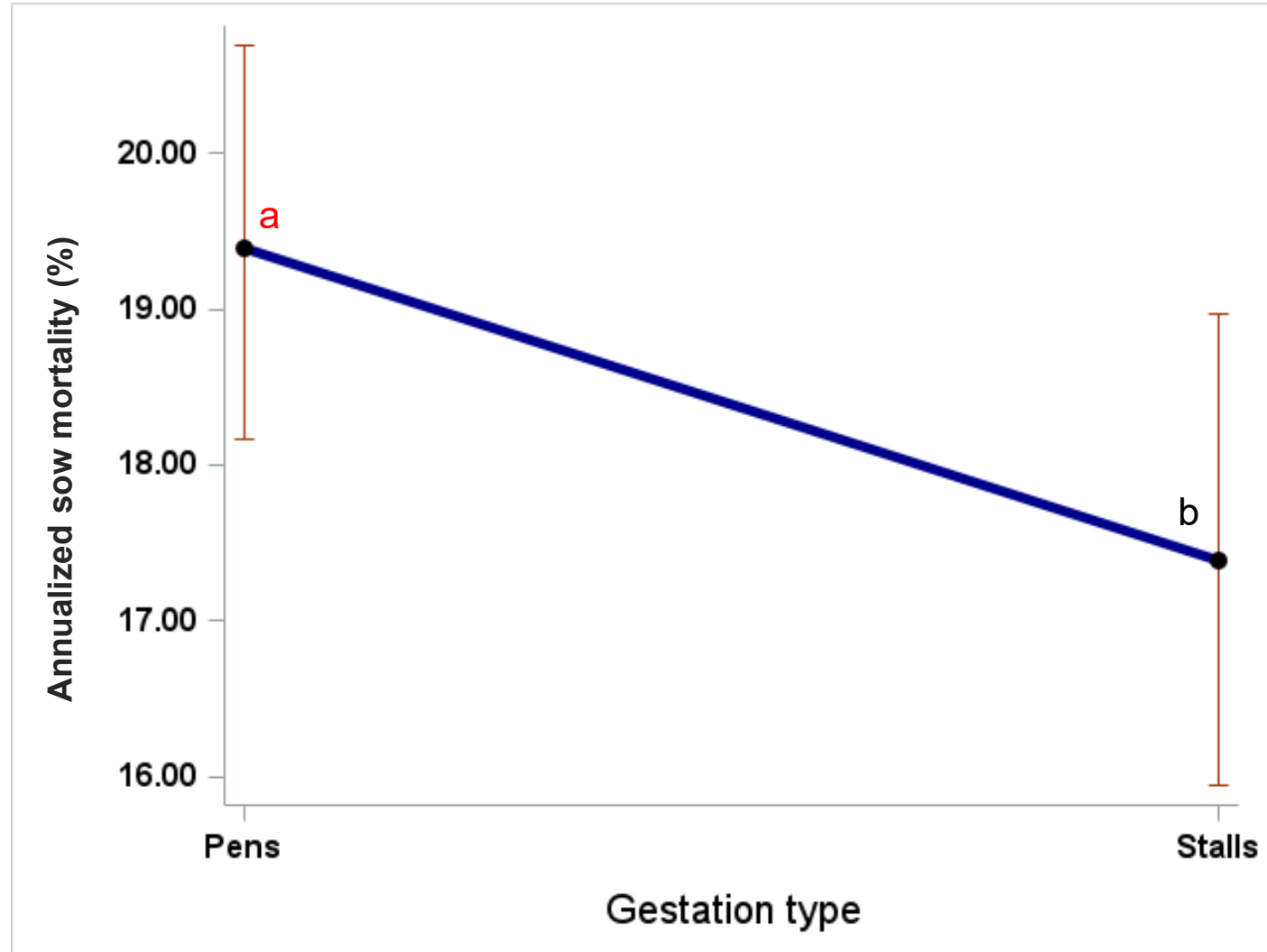


P 0.0257

\* Difference in letters represents statistical difference within lines



# Higher mortality (1.5%) in open pen gestation

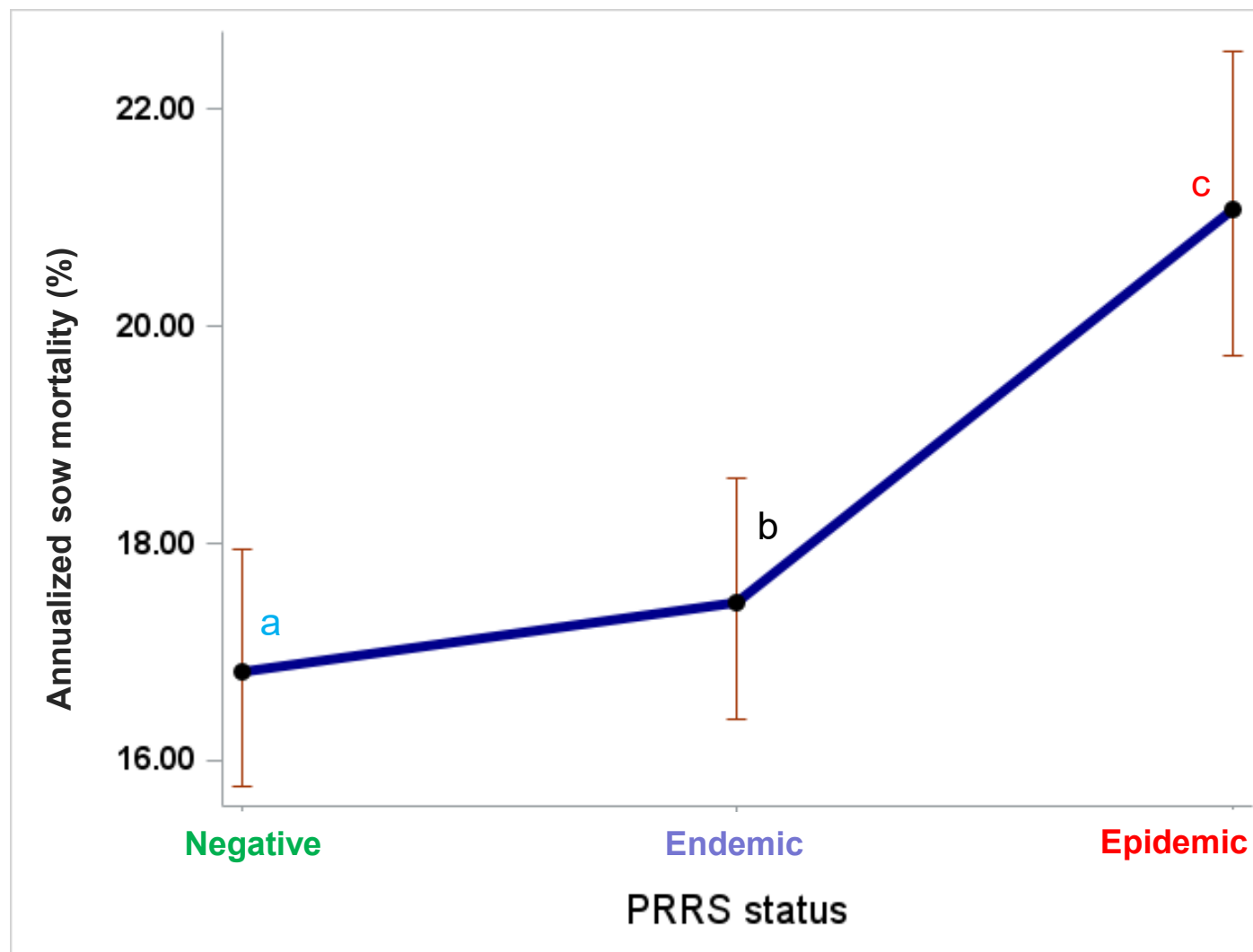


\* Difference in letters represents statistical difference within lines



P < 0.0170

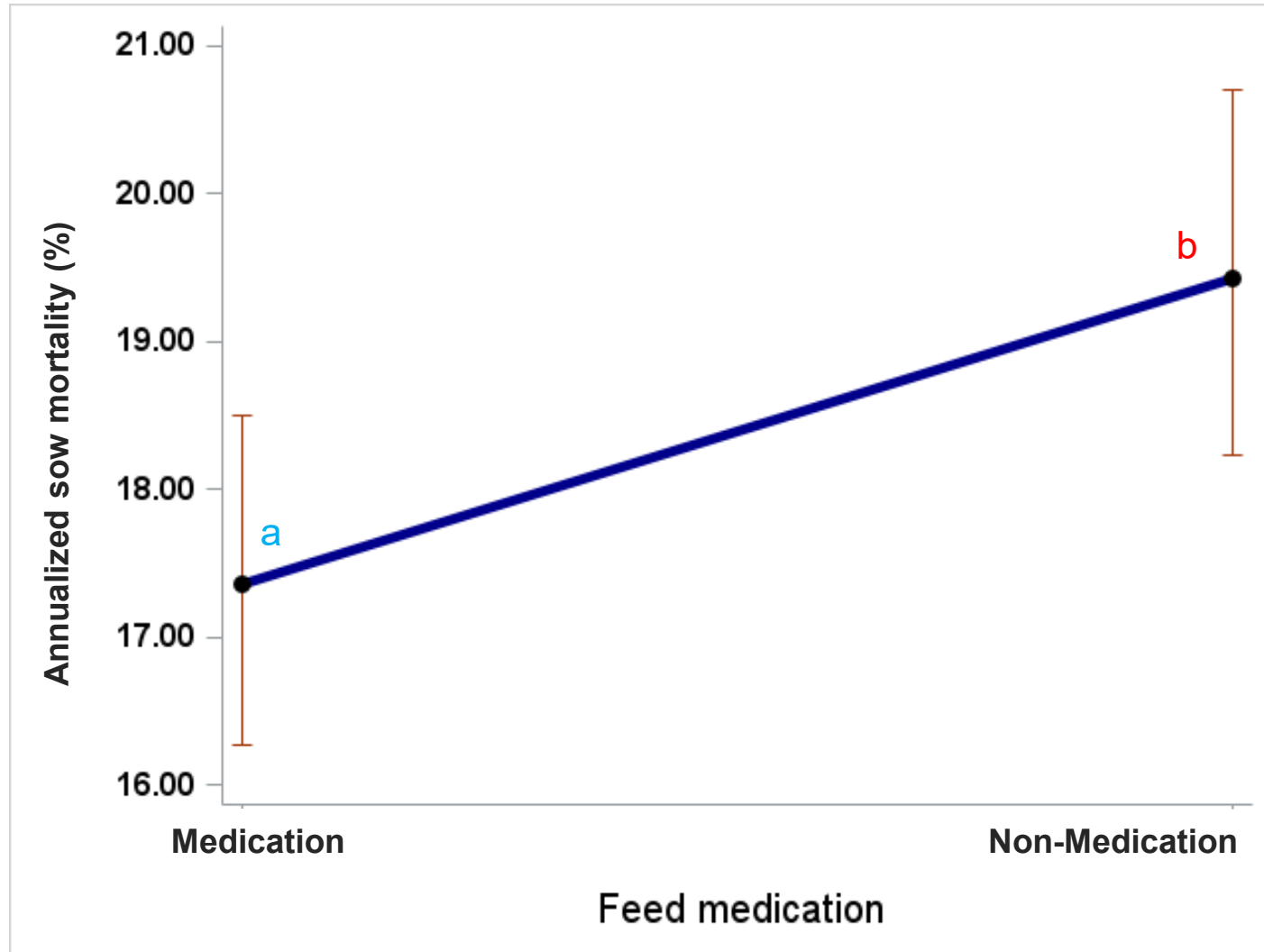
# Higher mortality for PRRS endemic and epidemic



\* Difference in letters represents statistical difference within lines

P < 0.001

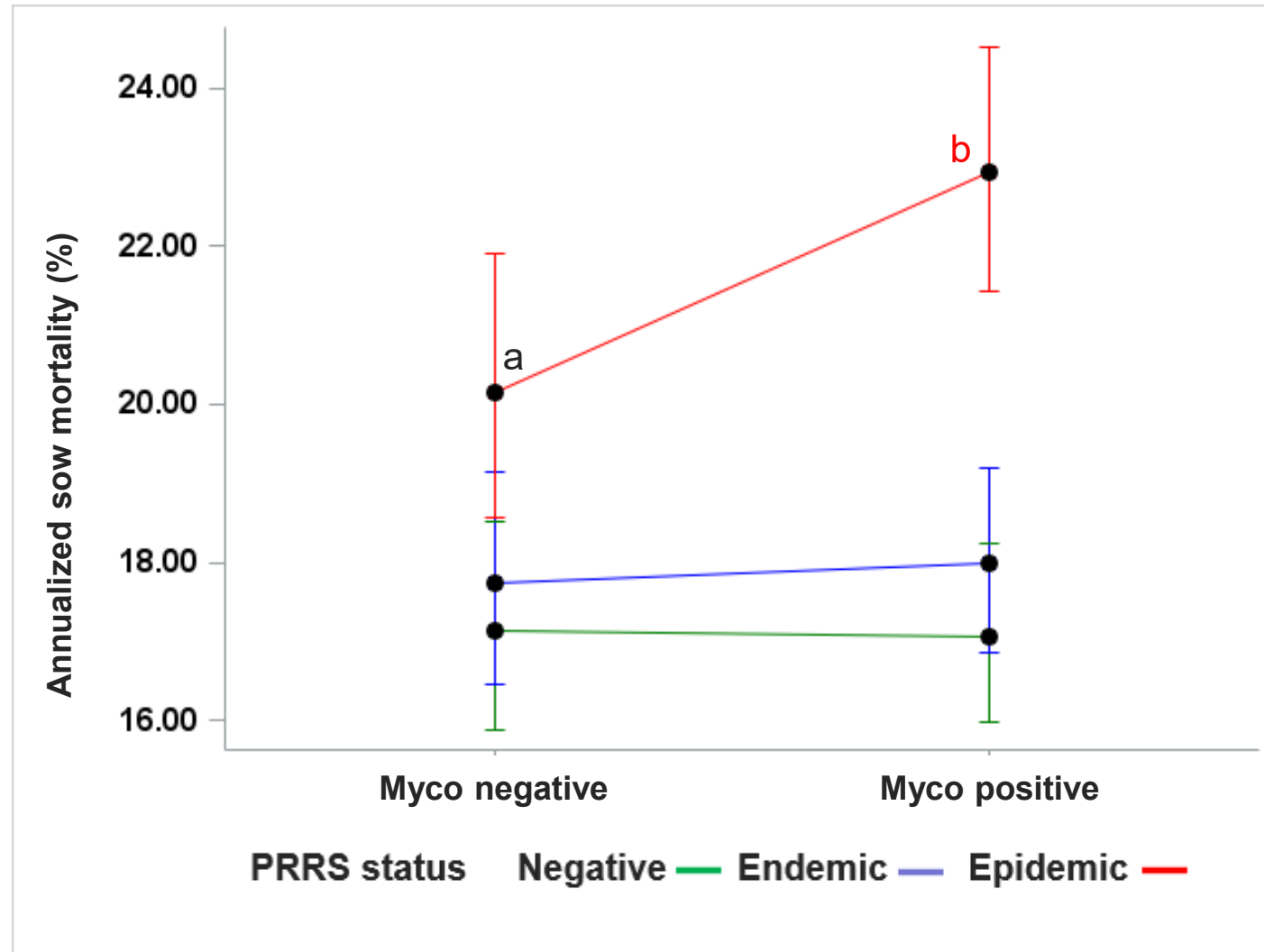
# No medication feed associated with higher mortality



\* Difference in letters represents statistical difference within lines

$P < 0.001$

# PRRS and *M.hyopneumoniae* interaction

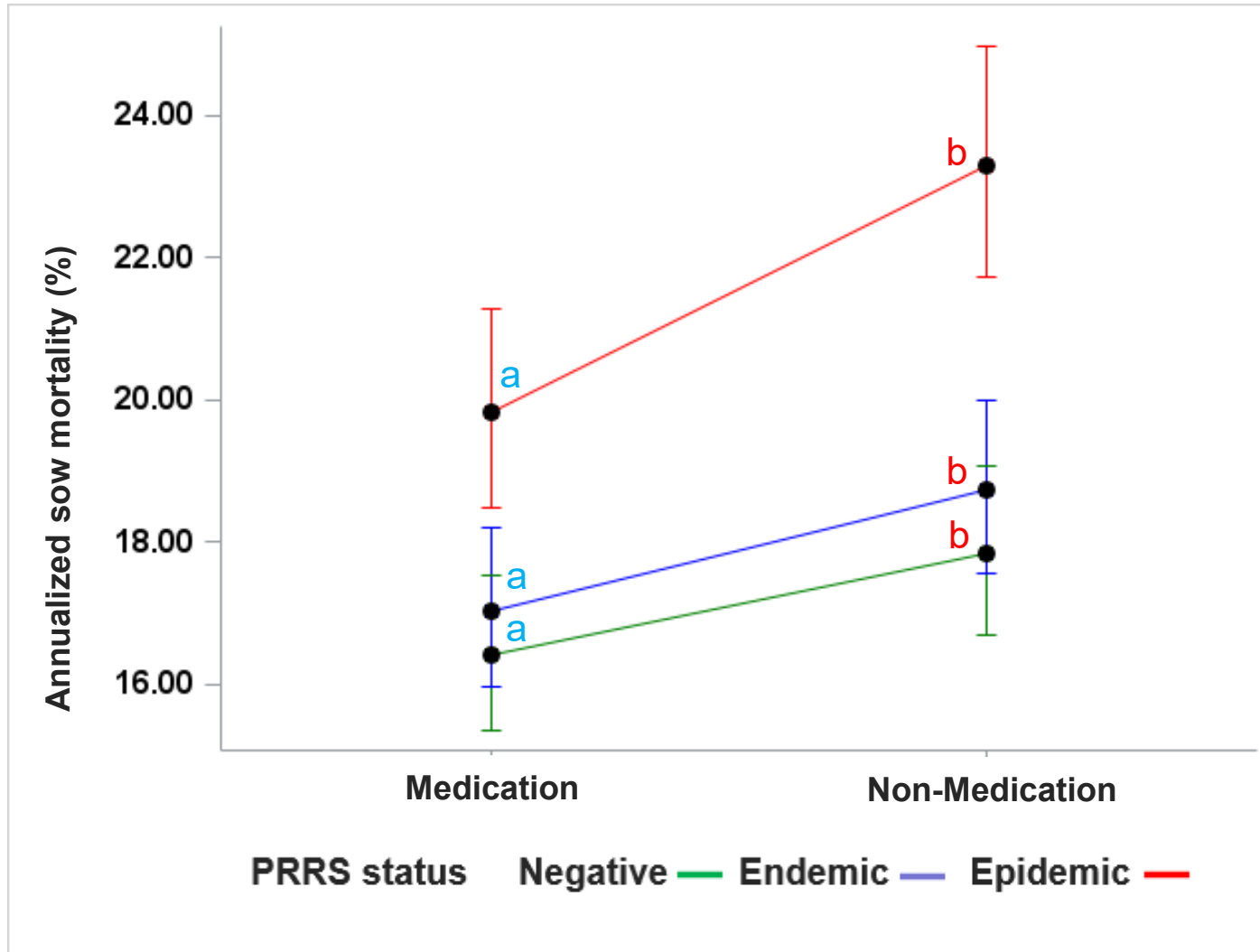


Farms that are positive for *M.hyopneumoniae* have much higher sow mortality during PRRS outbreak

P < 0.001

\* Difference in letters represents statistical difference within lines

# PRRS and feed medication interaction



Feed medication reduced sow mortality in all cases, but impact was even larger during PRRS outbreak.

P 0.0194

\* Difference in letters represents statistical difference within lines

# A practical approach to early intervention to reduce sow mortality

Chris J. Rademacher\*, Justin T. Brown, Locke A. Karriker, Megan R. Nickel, Gabi E. Doughan, Meredith B. Petersen, Swaminathan Jayaraman, Gustavo S. Silva, Daniel C. L. Linhares

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# Sow Mortality- Project Objectives

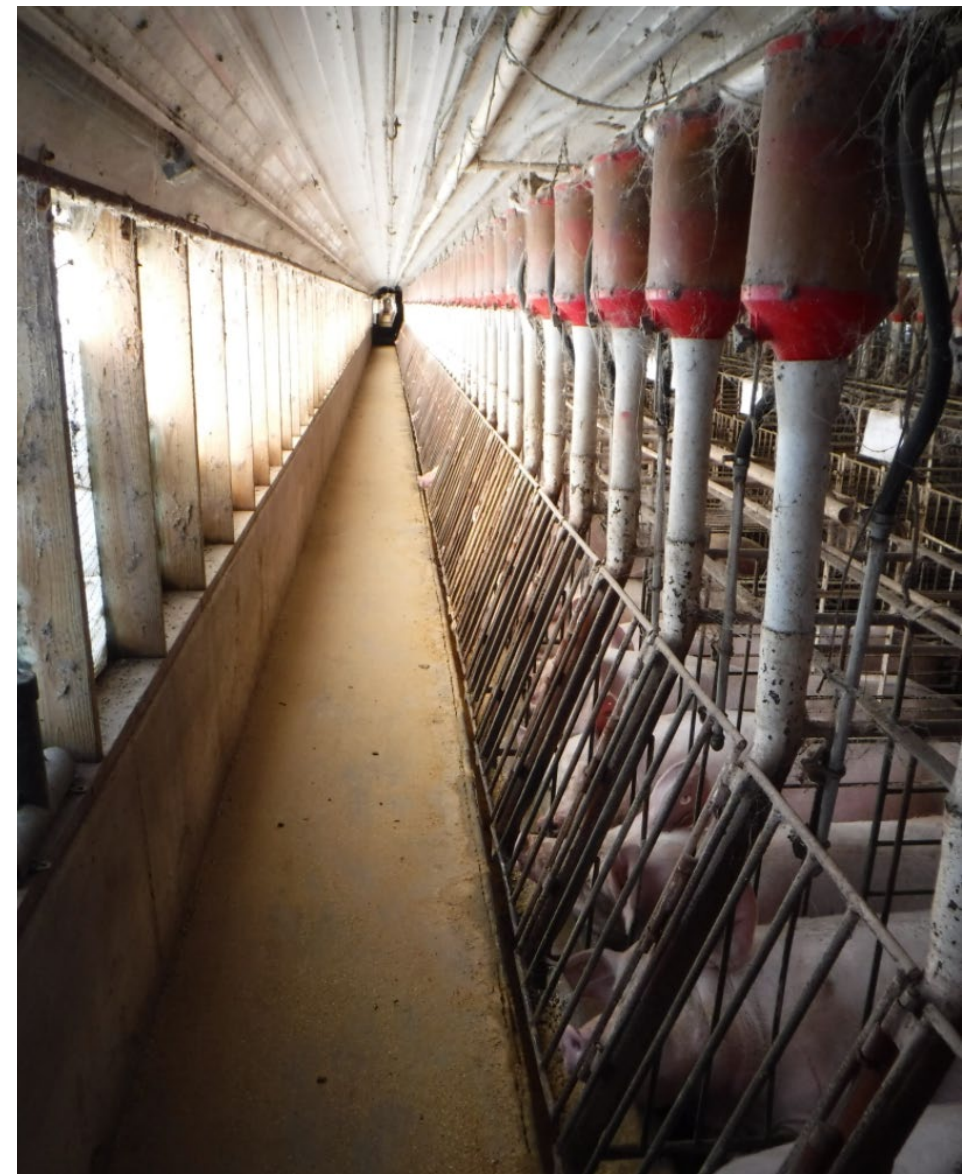
- **Primary Objectives:**

- Can we see a reduction in sow mortality by increased emphasis on identifying and treating “at-risk” sows.
- What is the time requirement to do this on a daily basis?
  - ROI calculation on the additional labor cost
- Can this protocol be transferred to farm staff and continue to maintain the mortality reduction?



# Farm Background

- 4000 head sow farm in Iowa
- 3 breeding and gestation buildings
  - Stall breeding and gestation
  - **No evaluation done in farrowing**
- PRRS and Mhp Positive
- Mash feed in drop boxes
  - **Fed once per day in AM**
- 17% current sow mortality
- Training done June 2021





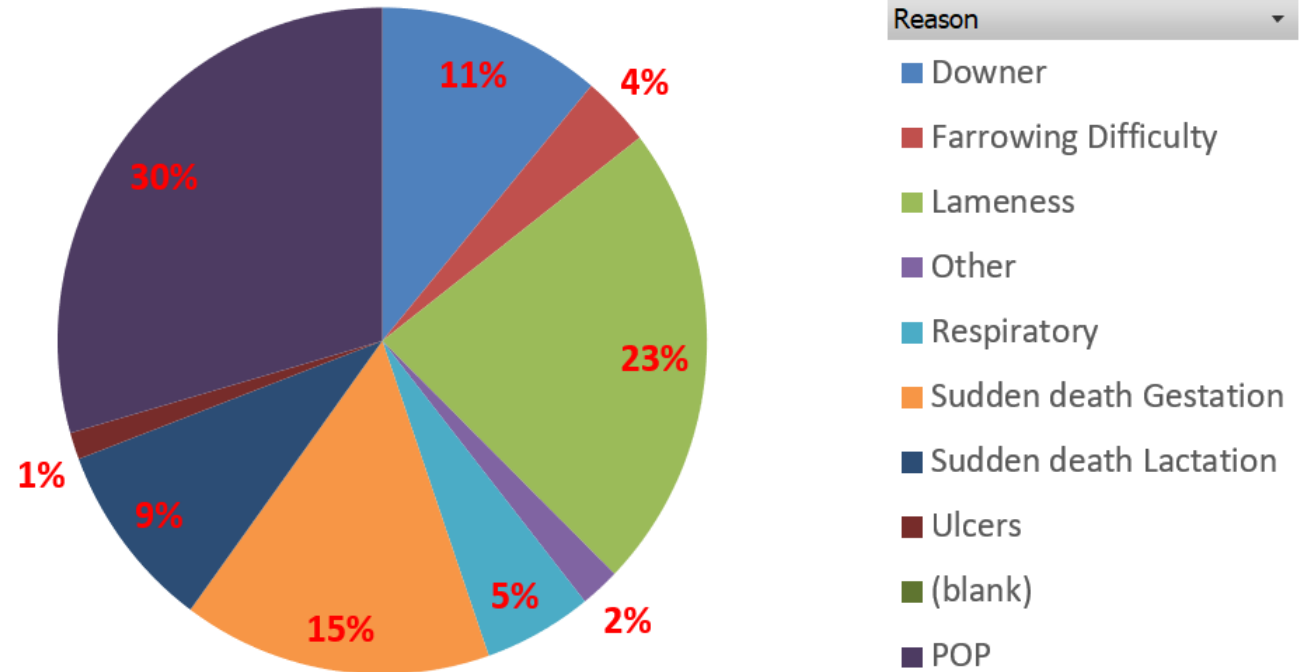
# Farm Background

- **Sow Mortality Reasons**

- January – June 2021
- Pelvic Organ Prolapses – 30%
- Lameness and Downers - 34%
- Sudden Deaths – 24%

Count of Reason

Mortality by Reason 2021



# Identification and Training

- 1 ISU Vet + 1 Gestation Barn Staff
  - Training period - 2 weeks
- Walked B&G barns as sows were being fed.
  - 1 in front and 1 behind
- Any females not eating or up at the feeder were flagged by hanging card.
  - Come back later to assess and treat
- **Goal** – Finish identifying at-risk sows before they lay down post-eating.
  - 30 minutes per barn/room





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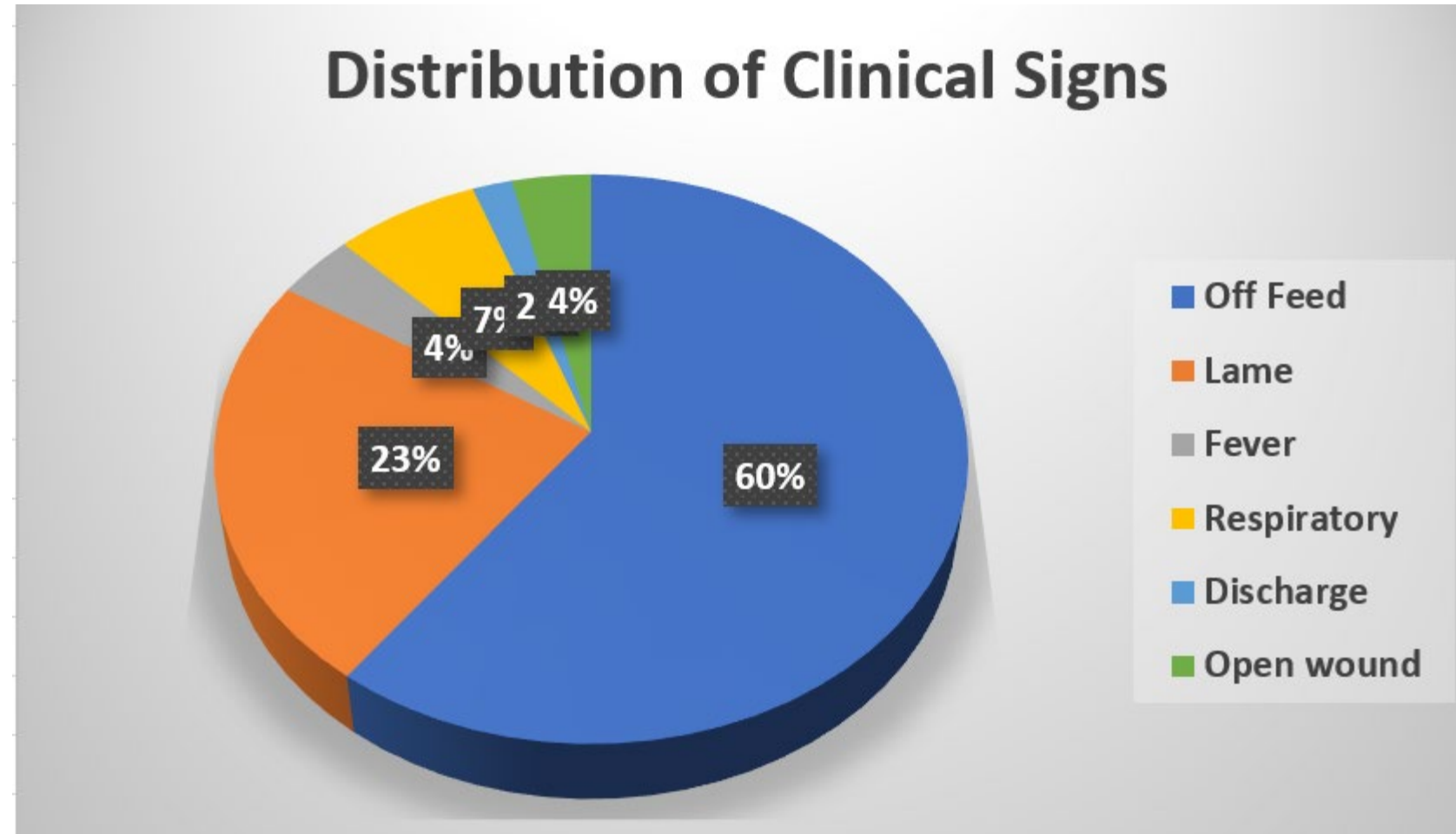
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# Clinical Signs – 2 week evaluation

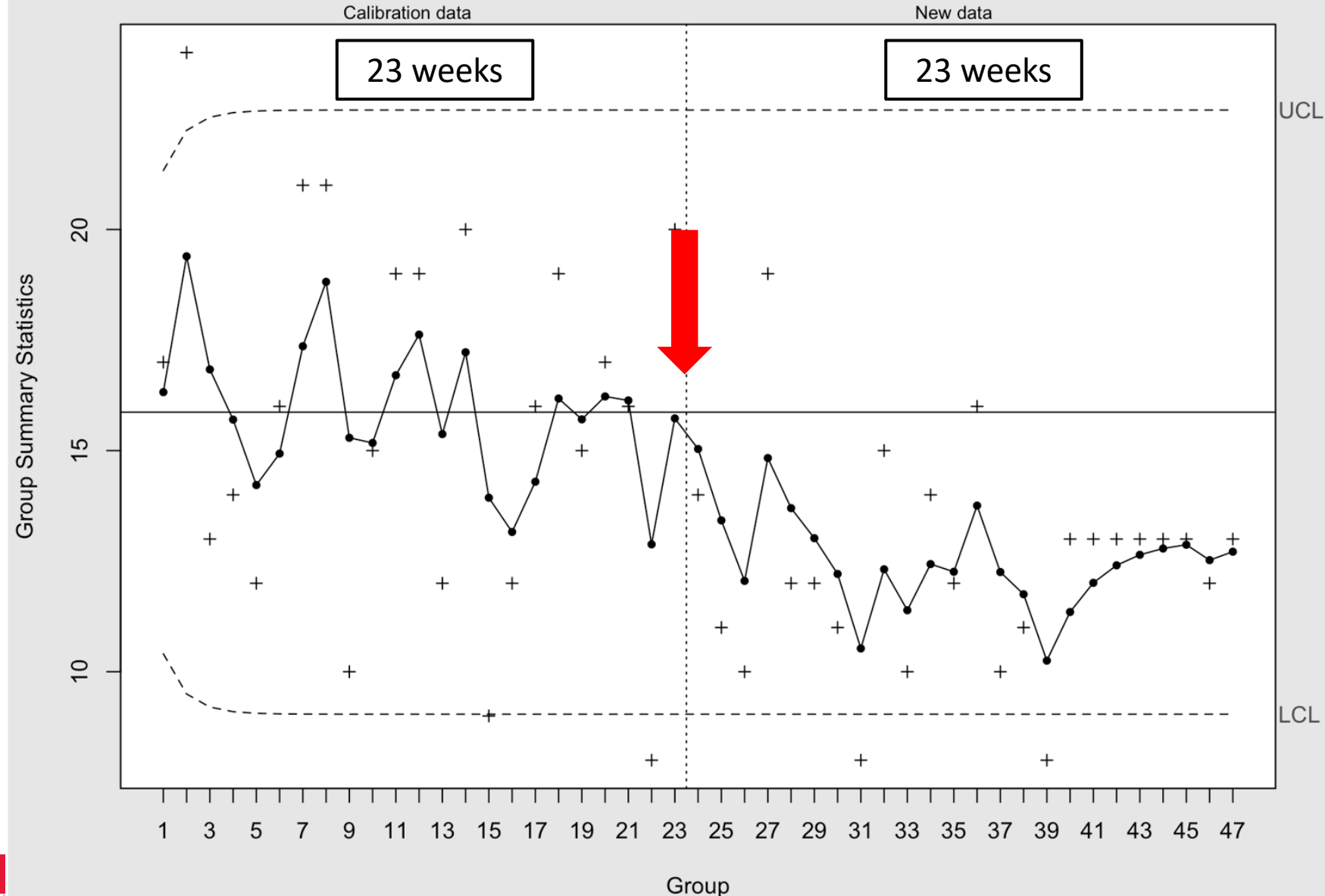
- Off-feed was primary sign
- 30% had 2 symptoms
  - Most common is off-feed + lame



# Evaluation of Training

- Weekly sow deaths per week
  - 4.25% reduction in annualized sow mortality
    - 16.75% to 12.5%
- Chi-squared test for proportions (before and after training)
  - $p=0.007$

Sow deaths/week EWMA SPC



Number of groups = 47  
Center = 15.86957  
StdDev = 4.553514

Smoothing parameter = 0.4  
Control limits at 3\*sigma  
No. of points beyond limits = 0

# What is 4.25% worth?

- ISU Economic Opportunity Model
  - Opportunity cost of losing pregnant females
  - Additional cull sow income
  - Fewer replacement females
- **\$50 USD per sow**
  - 4800 sows = \$240,000 USD per year
  - 4800 sows @ 25 PSY = 120,000 wean pigs/year
- **\$2.00 USD per weaned pig savings – Dec 2021**

<https://www.extension.iastate.edu/agdm/livestock/html/b1-79.html>

The screenshot shows a webpage from Iowa State University's Extension and Outreach department. The page title is "Assessing Economic Opportunity of Improving Mortality Rate in Breed-to-Wean Swine Production". The content discusses the challenges of high death loss in sow farms and the benefits of the Pig Computerized Health and Management Program (PigCHAMP). It mentions that in 2021, the upper 10 percentile of herds for sow mortality had an average death rate of 21.30%, while the lower 10 percentile had a death rate of 7.30%. The page also includes a PDF icon, a search bar, and navigation links for "SOURCES" and "OUTLOOK".

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Search

<https://www.extension.iastate.edu/agdm/livestock/html/b1-79.html>

Written September, 2021  
File 01-76

**Assessing Economic Opportunity of Improving Mortality Rate in Breed-to-Wean Swine Production**

One of the challenges facing many sow farms is high death loss. The Pig Computerized Health and Management Program, or PigCHAMP, is a database that includes information from nearly 300 farms. PigCHAMP's website provides publicly accessible benchmark summaries which have shown an increase in sow mortality rate from 8.12% in 2012 to 14.86% in 2021.<sup>1</sup> In 2021, the upper 10 percentile of herds for sow mortality had an average death rate of 21.30%. On the other hand, the lower 10 percentile for sow mortality had a death rate of 7.30%. These values clearly illustrate the extremes that can be seen on individual farms for sow mortality and the potential to improve.

Improving sow mortality, and pre-wean mortality which is a secondary focus of this analysis, results in greater efficiency and producing more pigs, which can increase potential profits. In most, if not all cases, there will be some cost associated with reducing mortality rate, so producers need to weigh the costs against the potential economic benefits. Individual farms may have different methods to reduce mortality and the costs will also vary. For example, costs could include additional labor, health and management interventions, or facility improvements depending on the causes of mortality. This analysis focuses on the benefit of improving mortality on an individual operation. By knowing the benefit, one can back into indifference points to guide decision-making and help identify an optimal level of mortality for an operation at a particular point in time.

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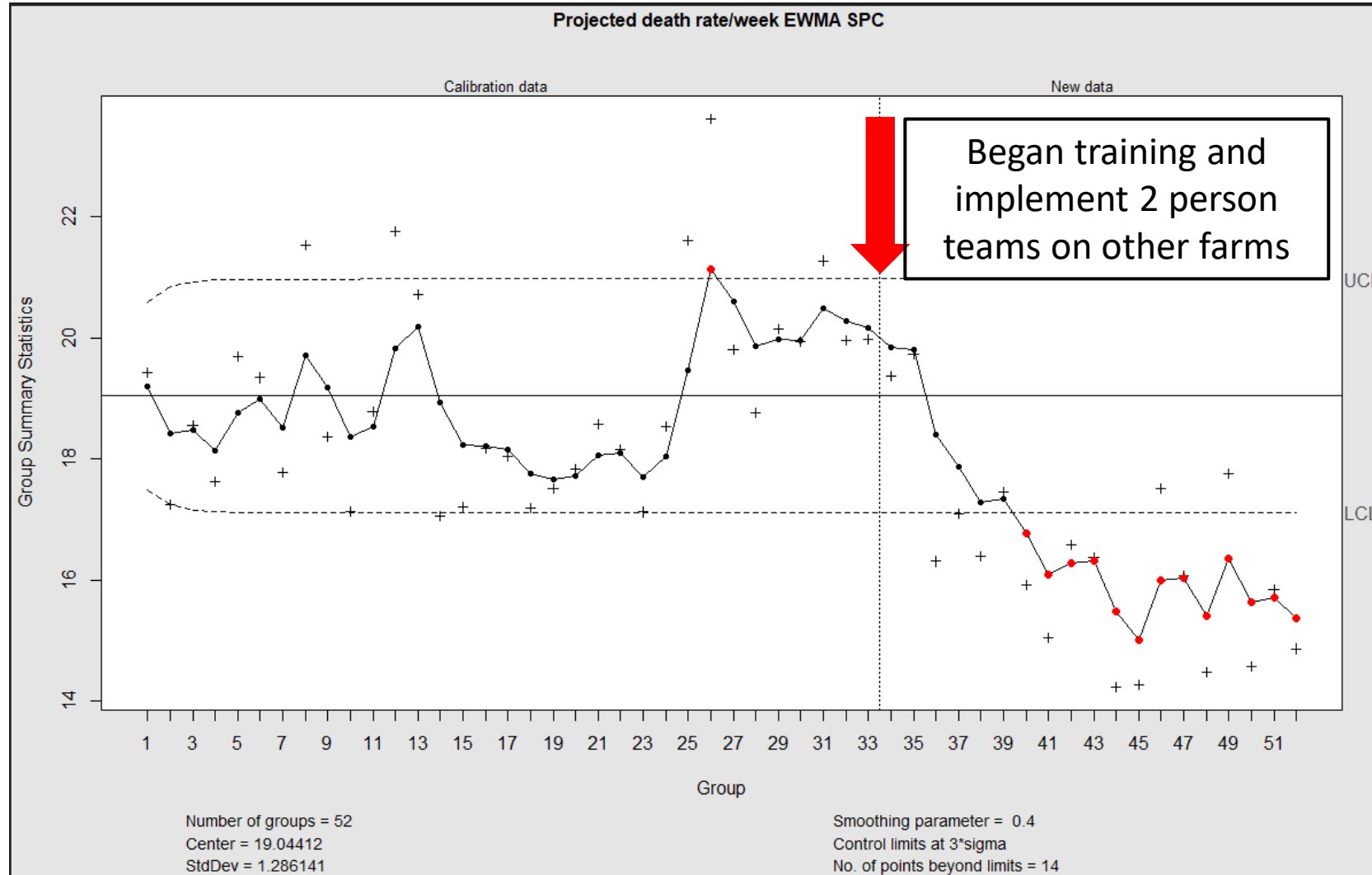
**IMPROVING PIG OPPORTUNITY**

# Time Series

- Time commitment = average 2 hours per day for at-risk identification for 2 people.
  - Identification of at-risk females can be done while walking the barn, sweeping feed into trough and doing barn checks
  - Vary based on herd size and number barns/rooms
- 1 hour per day for follow up treatment for 1 person to do the actual treatments (minimize treatment variation)
- **Additional 0.5 FTE**
  - **\$250,000 return for \$35,000 investment → 7:1 return!**

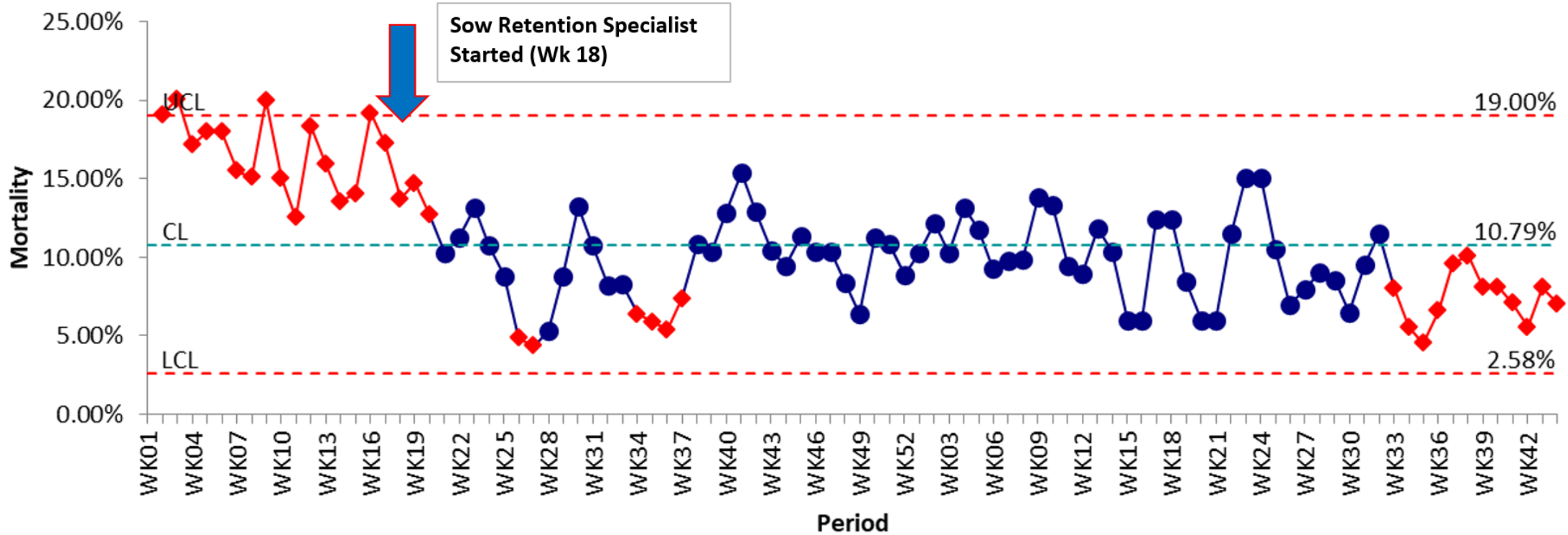


# System wide implementation (n=40 farms)



# What about other systems?

## Sow Mortality (w/o Prolapses) % - X Chart Wk01 FY23 - Wk44 FY24



# What about sudden deaths?

- Good dead sow suddenly dead
  - Easy to distinguish “lame” and “proplases (POP)”
- Farms don’t do necropsy routinely
- Many get called “sudden deaths”
- Want to try and learn what are the root causes of these?

# Necropsy Project

- Two large sow farm (7,000 head sows)
  - Spring and Fall
  - One farm with a history of acute deaths and discharges
  - Necropsy room to post sows
  - Only posted sudden deaths sows
    - Not lame or prolapse sows

# Recording Form

Sow Necropsy Form									
Sow ID									
Date									
Farm									
Parity									
BCS (1-3)									
Stage	Breeding (Wean-30 day Gestation)	Gestation (30-90 day gestation)	Pre-Farrow (90-115 day)	Farrowing	Open	Cull			
Mortality Category	Sudden death	Sick Sow	Lame Sow	Prolapse	Euthanized	Other			
Days since last treatment									
Treatment For	Off-Feed	Lameness	Respiratory	Abortion	Discharge	Fever	Mastitis	Retained	Sick
Last Treatment	None	LA-200 (OTC)	Naxcel	Baytril	Linco	Tylan	Flunixin		
Skin Lesions Present	Normal	Abscesses	Flank lesions	Snout lesions	Open Wounds	Vesicles	Erosions	Pale	Purple extremities
Front Leg Lesions	Normal	Dewclaw lesion	Open wound	Joint swelling	Cracked hoof	Cartilage/OCD lesion	Deep pad cracks	Coronary Band	Long Toes
Rear Leg Lesions	Normal	Dewclaw lesion	Open wound	Joint swelling	Cracked hoof	Cartilage/OCD lesion	Deep pad cracks	Coronary Band	Long Toes
Lymph Nodes	Normal	Enlarged Inguinal	Enlarged Mediastinal	Enlarged Other					
Lungs	Normal	Adhesions	Consolidation 1-25%	Consolidation 25-50%	Consolidation >50%	Profuse Edema	Interstitial Pneumonia	Hemorrhage	
Heart	Normal	Pericarditis or Adhesions	Excess Pericardial fluid	Myocardial Hemorrhage	Enlarged	Vegetative Endocarditis			
Abdominal Fluid	Normal	Excess clear fluid	Excess Blood Tinged Fluid	Fibrin present	Clotted blood present	Feces	Peritonitis		
Diaphragm	Normal	Hemorrhage	Tear						
Liver	Normal	Scarring	Enlarged and Congested	Torsion	Pale	Mottled	Fibrin	Friable	
Spleen	Normal	Torsion	Enlargement	Fibrin	Ruptured				
Bladder	Normal	Pus	Cysts and sediment	Blood present	Thickened	Hemorrhages	Reddened	Enlarged	
Kidneys	Normal	Cystic	Petichial hemorrhages	Infarcts	Congested	Pus			
Stomach	Normal	Full feed	Empty	Full of Blood (Acute Ulcer)	Digested Blood	Rupture			
Pars Esophagea	Normal	Grade 1 Ulcer	Grade 2 Ulcer	Grade 3 Ulcer					
Small Intestine	Normal	Torsion/Intussusception	Blood in lumen	Thickened	Melena				
Large Intestine	Normal	Soft feces	Firm Feces	Frank Blood in Feces	Melena				
Prolapse	Normal	Vaginal	Rectal	Uterine	Both				
Uterine Content	Normal	Retained Pigs	Blood in lumen	Pus present	Inflamed lumen	Torsion			
Mammary Glands	Normal	Edema							
Diagnostics Submitted	Yes								
Preliminary Diagnosis									
Notes									

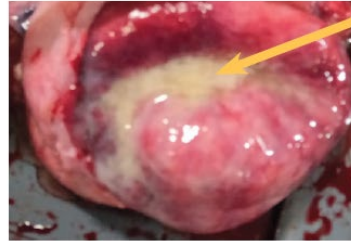


# Sow Necropsy Manual

## Bladder (Vejiga)



Thickened  
(Engrosado)

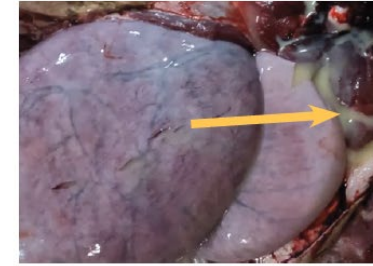


Pus



Bladder (Vejiga) 26

## Uterus (Útero)



Pus Present  
(Presencia de pus)



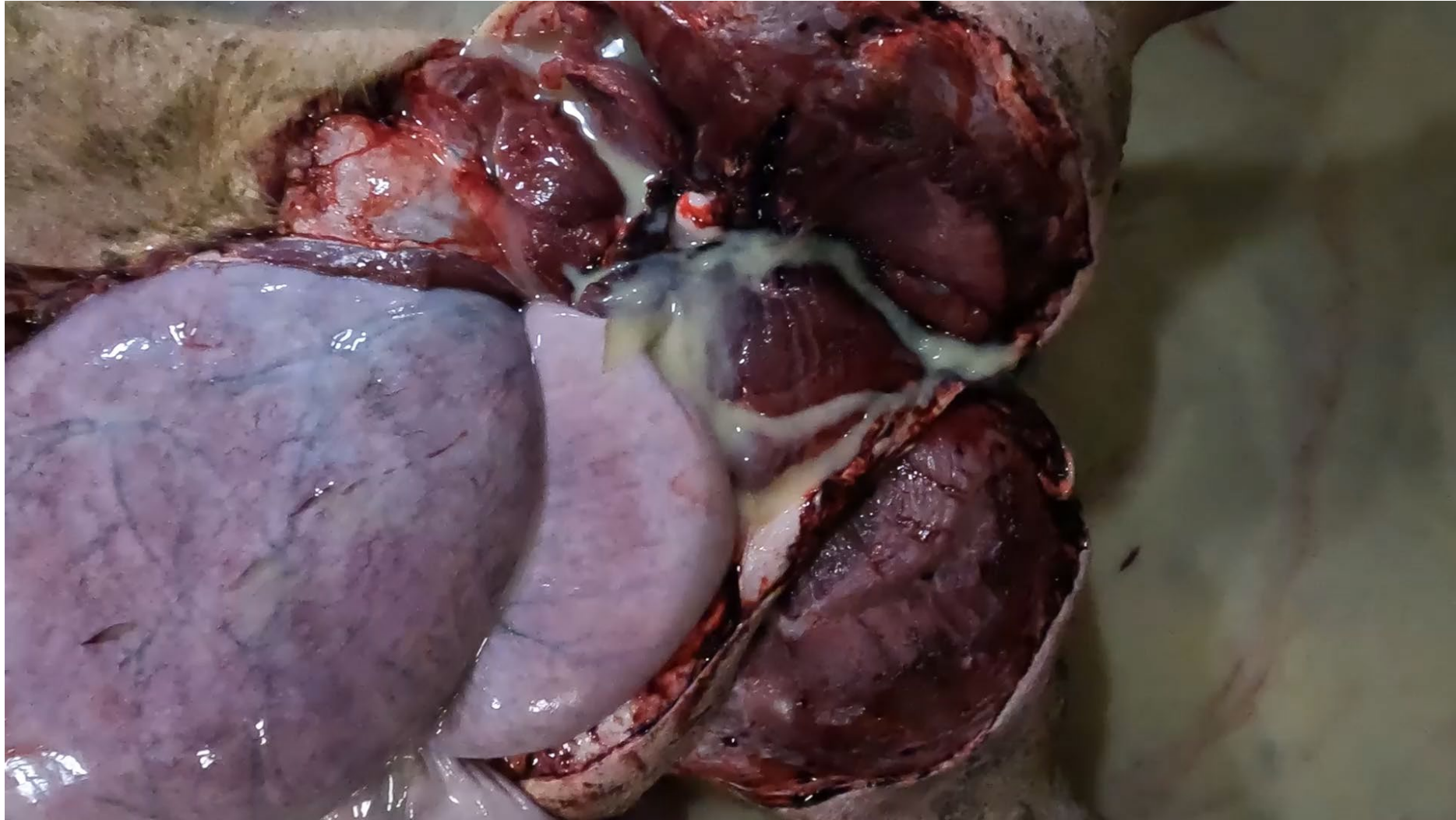
Uterus (Útero) 43

# Uterus with pyometra and retained pigs (resorbed)

pyometra = pus in the uterus



# Pyometra (pus in the uterus)

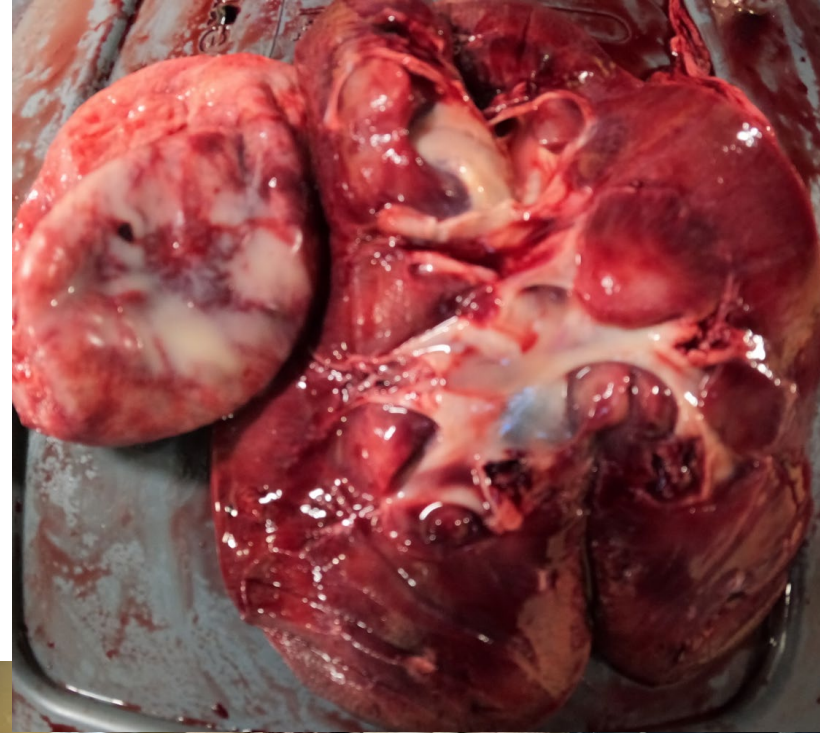
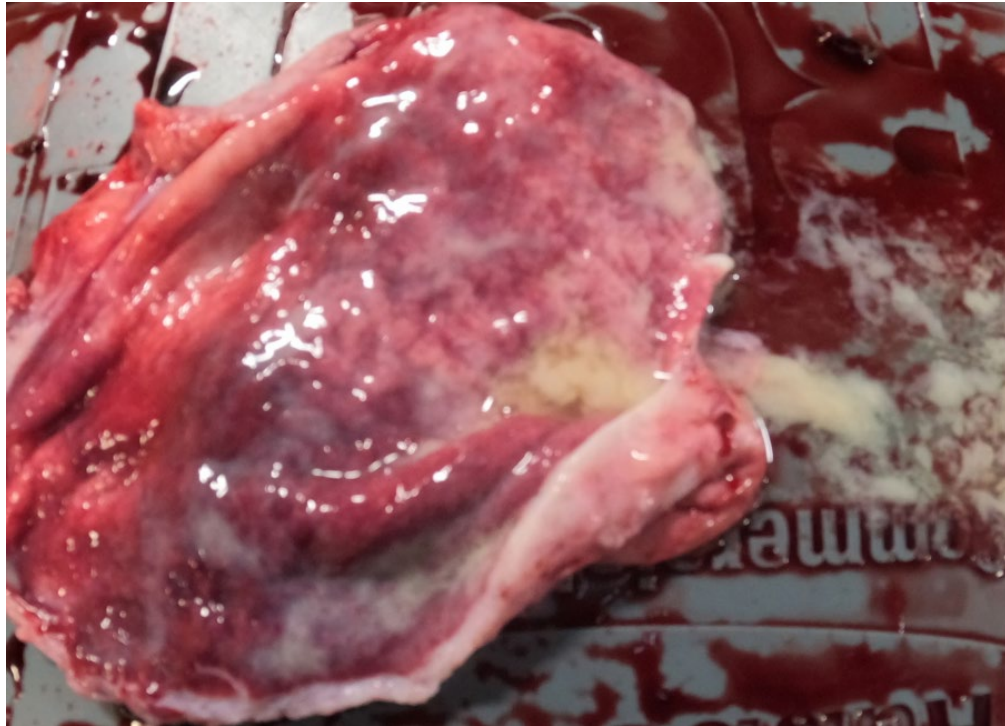




# Cystitis

# Nephritis

# Pyelonephritis



# Peritonitis



# Next steps

- So why so many retained pigs??
  - Almost always see more than one.
  - Seen in aborted sows as well.
  - Problem with farrowing assistance?
  - Problem with energy or calcium availability?
  - Do we need to feed sows differently to prepare them for farrowing (i.e. transition diets)
  - Can we identify them post-farrow with ultrasound?

# Summary

- In U.S. we have not prioritized early detection and individual sow treatments, particularly in breeding and gestation
  - Lack of appetite → Fantastic early indicator in once per day fed animals
    - By the time we treat them, it may be too late
- Easily implementable
  - Just flag off-feed sows while feeding and sweeping in AM
  - Come back and treat later when appropriate.
- More research and necropsies needed to further study sudden deaths
  - Looking into root causes of retained pigs and mitigation options.

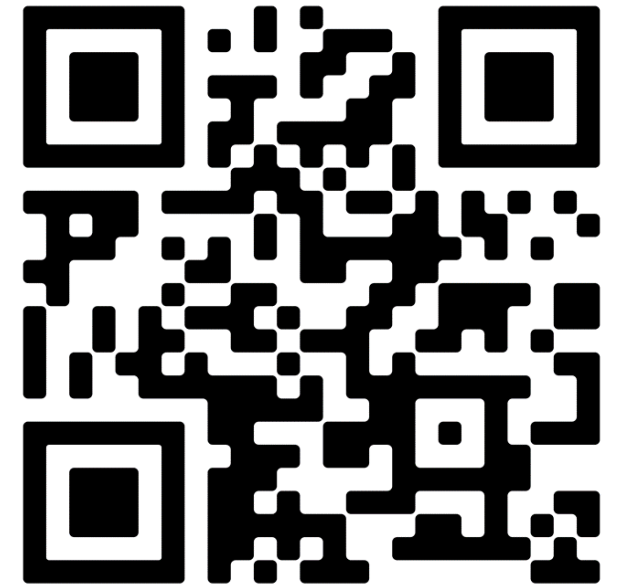
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# Questions??

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