Improving Sow Livability: *A Collaborative Approach*

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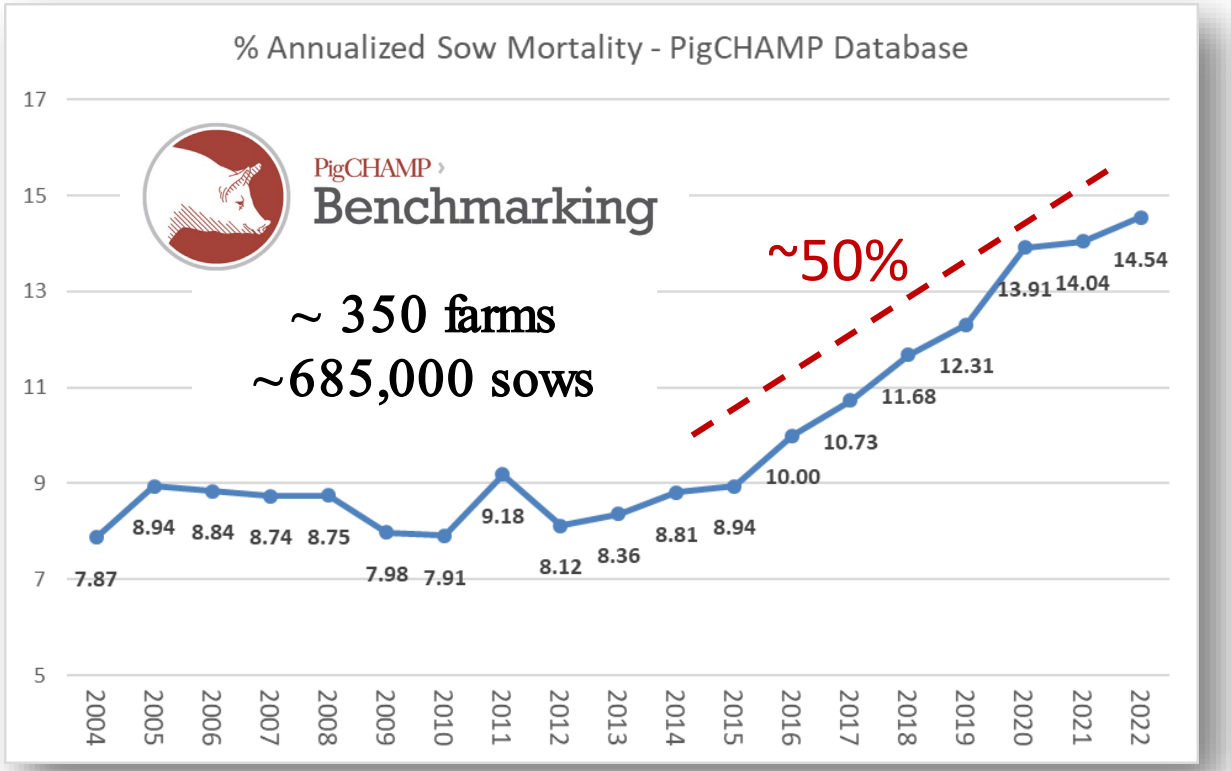
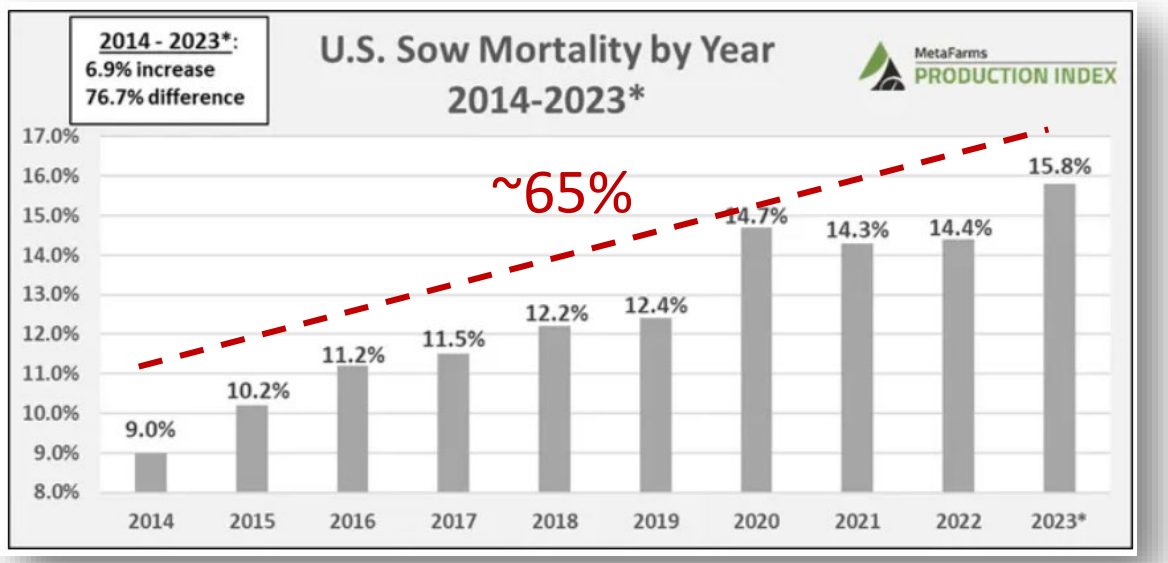
www.piglivability.org

Industry Challenges

- Recent Trends in U.S. Sow Mortality

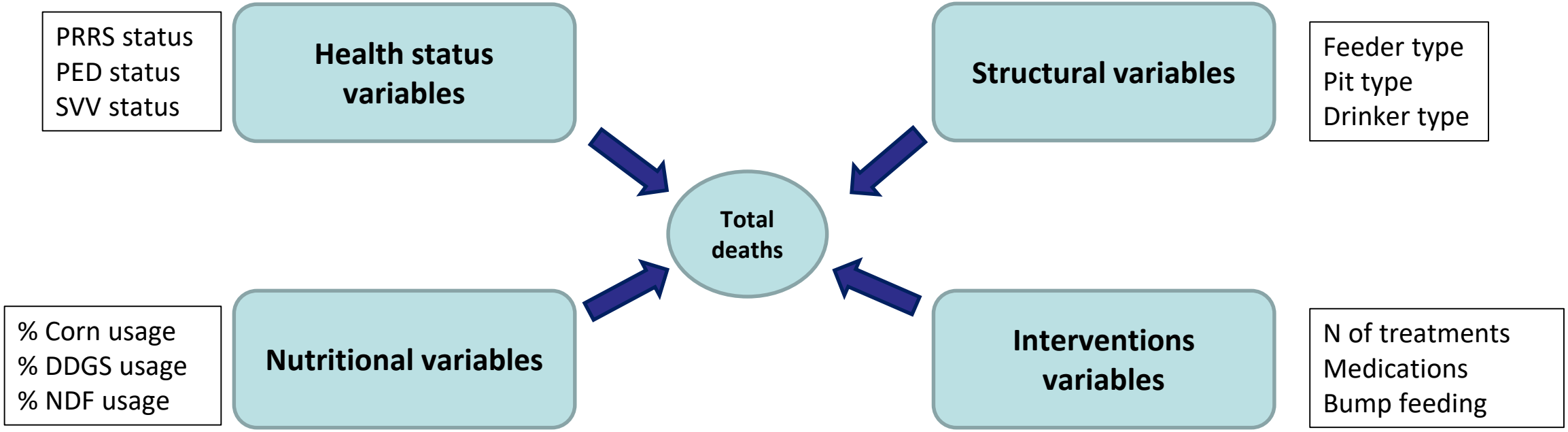
2023* Sow Removal by Reason	
Removal Reason	% of Total
Farrowing	5.5%
Gut	1.4%
Age/Parity	0.3%
Production	1.1%
Prolapse	22.6%
Structure/body Condition	23.5%
Other/Unknown	34.0%
General Health	11.6%





Source: https://www.nationalhogfarmer.com/livestock-management/u-s-sow-mortality-trends-continue-to-climb

Sow Mortality: Risk Factors

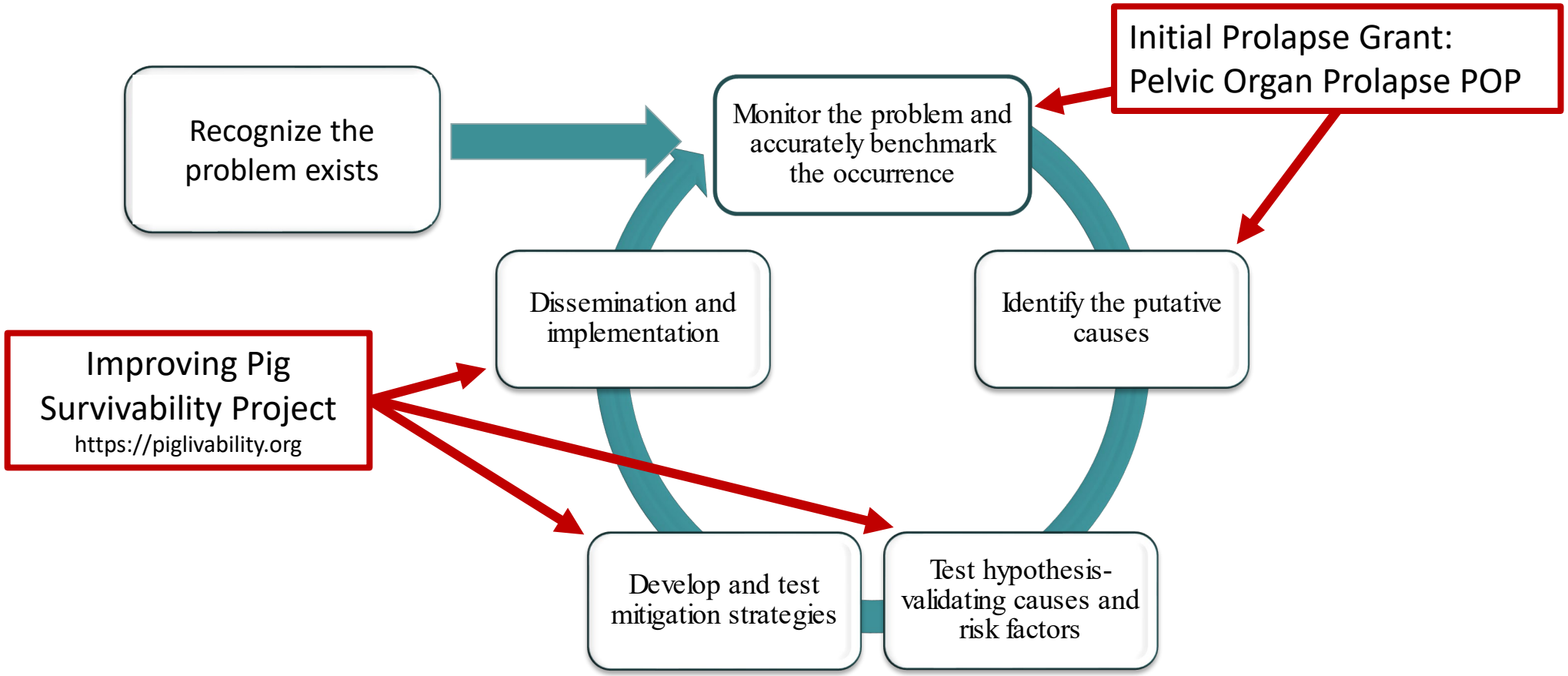


- Generalized linear mixed regression statistical model
- Multivariable model – stepwise selection – Tukey pairwise comparisons

Source: Paiva et. al 2023, doi: 10.1016/j.prevetmed.2023.105883

Pelvic Organ Prolapse in Sows:

Problem-Solving Cycle



Pelvic Organ Prolapse in Sows:
Objectives of the Initial Prolapse Project

- Identification of risk factors associated with Pelvic Organ Prolapse in the US sow herd.
  - Establish **network of industry** partners and Sow Farm Managers (target was **60-80 sow farms**).
  - Develop herd and individual **sow survey tool** and use it on farms.
  - Establish communication and **advisory network of producers**, allied industry, university faculty and staff.
  - Establish an **accessible repository of data**, samples and information.

This was a hypothesis-generating project.

It is expected to provide data used to justify pursuing future research studies that test specific hypotheses.

Photo credit: Courtesy of National Pork Board and the Pork Checkoff. Des Moines, IA USA.

Pelvic Organ Prolapse in Sows:

Participating Farms

About 385,000 sows

104 sow farms

15 U.S. states

52 weeks of mortality data
62 site visits

Larger production systems:
85 farms
Independent:
19 farms

Sow inventory
Ranging from 614 to 10,606

	Average bred sow inventory
Average	3,713
Minimum	614
Maximum	10,606
STDV	2,000
Total	386,166

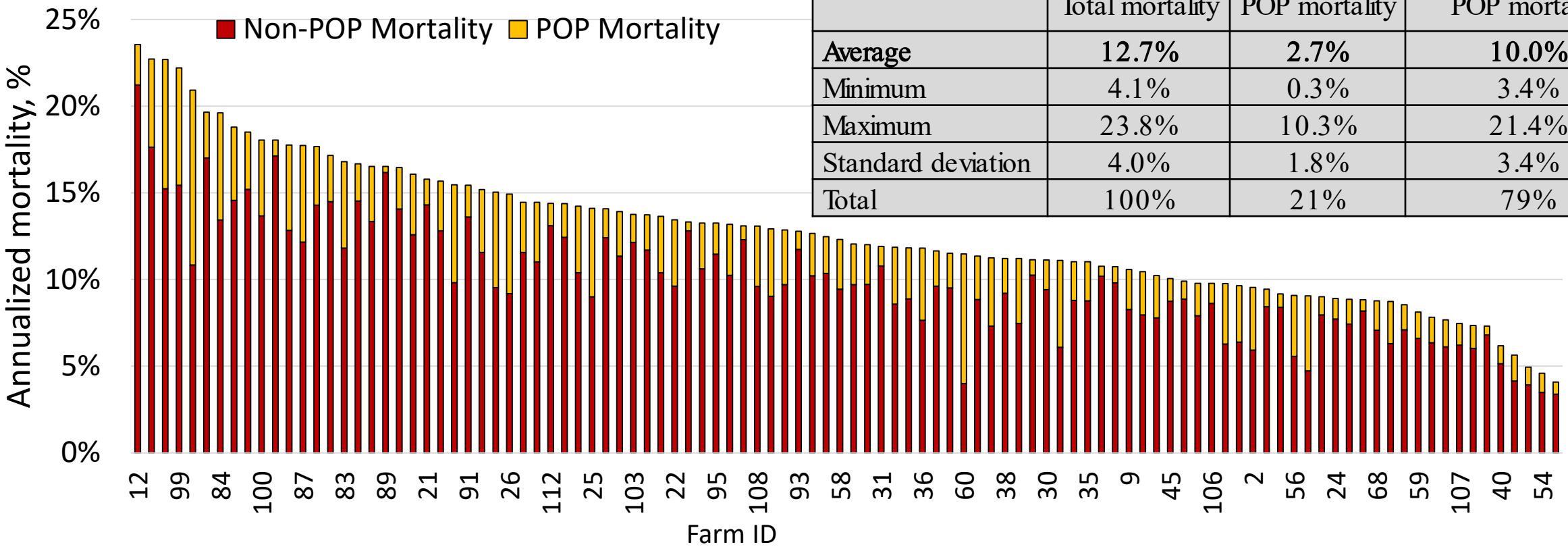
Gourley Brothers

PitchCo Inc.

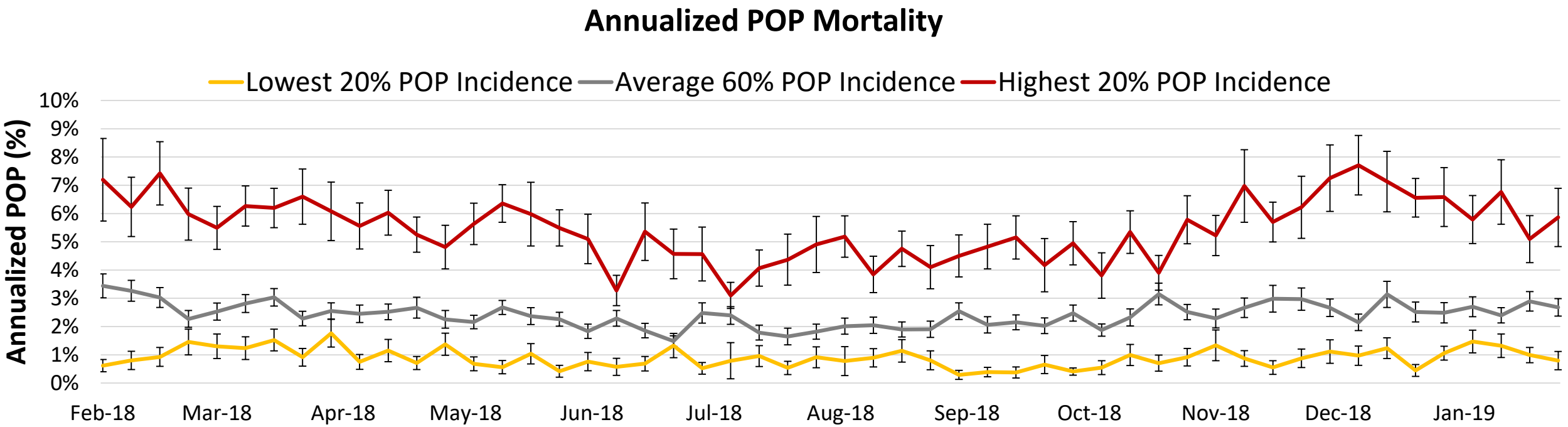
POP Project: Avg Mortality for 104 Farms

Cumulative Annualized Total Mortality

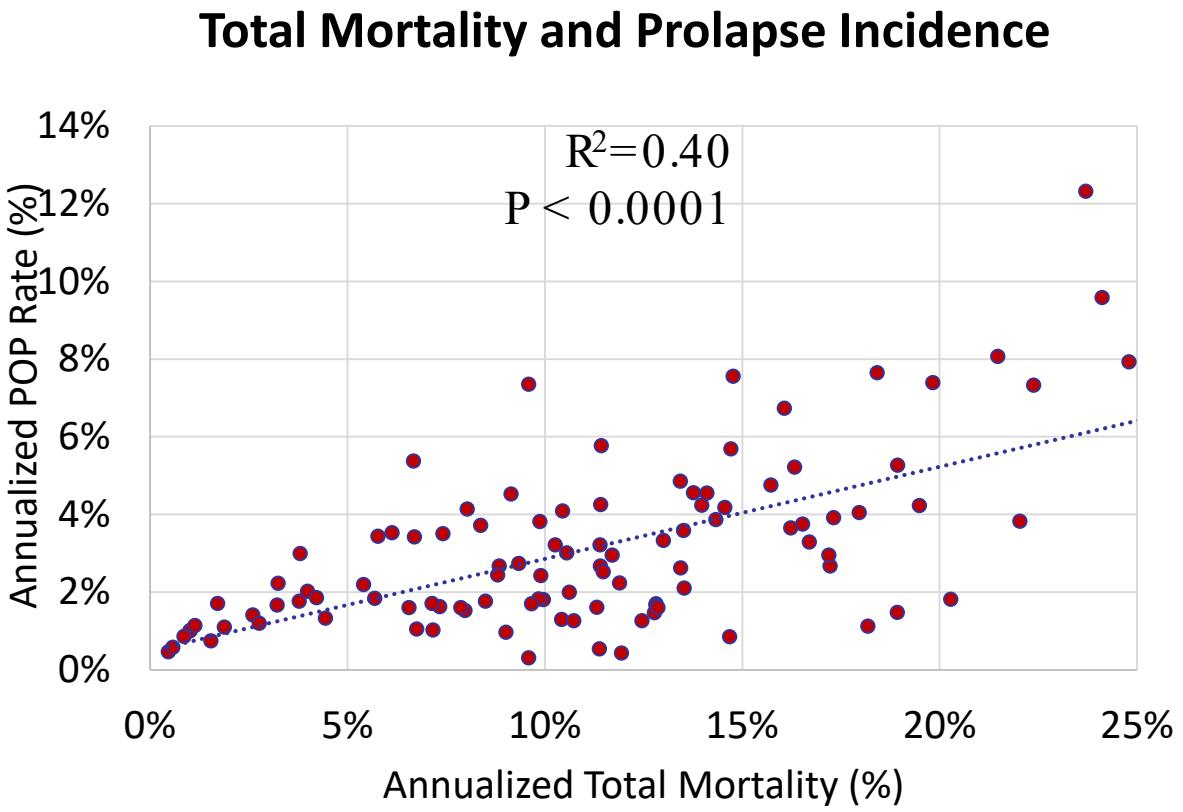
	Annualized Total mortality	Annualized POP mortality	Annualized non-POP mortality
Average	**12.7%**	**2.7%**	**10.0%**
Minimum	4.1%	0.3%	3.4%
Maximum	23.8%	10.3%	21.4%
Standard deviation	4.0%	1.8%	3.4%
Total	100%	21%	79%

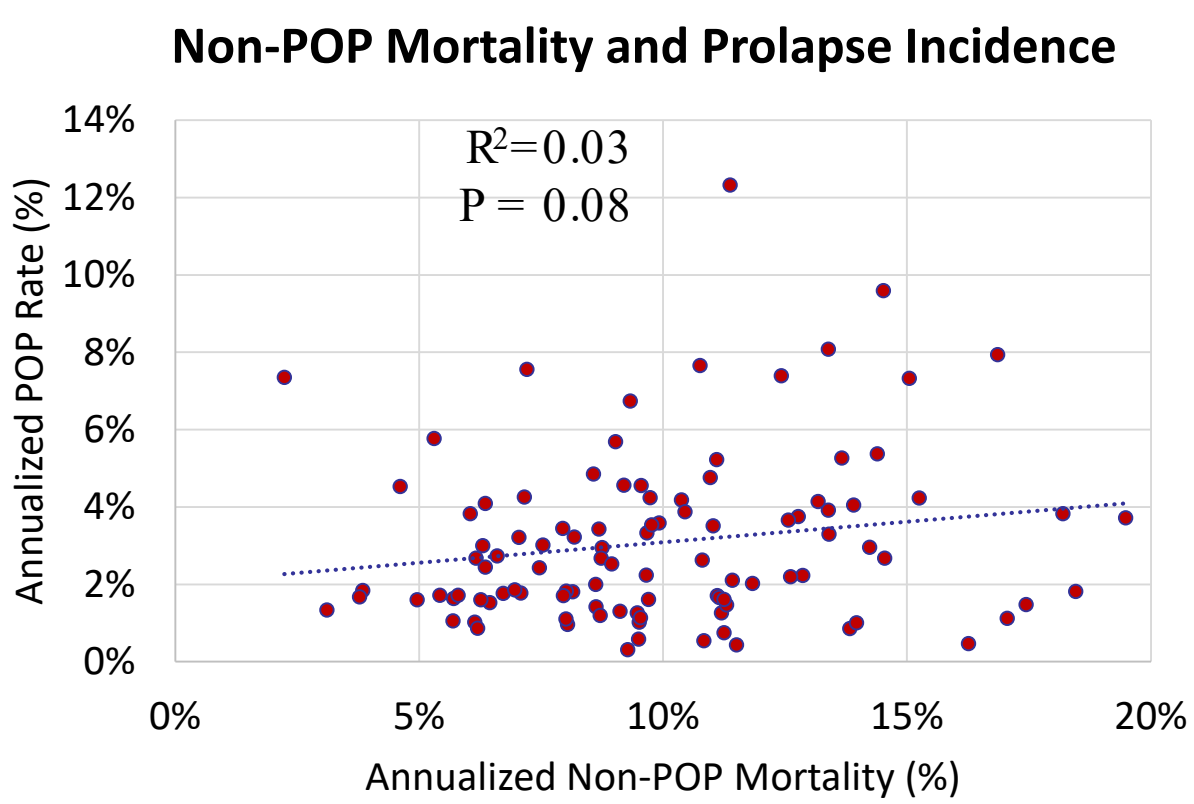


POP Project: Variation Across Farms



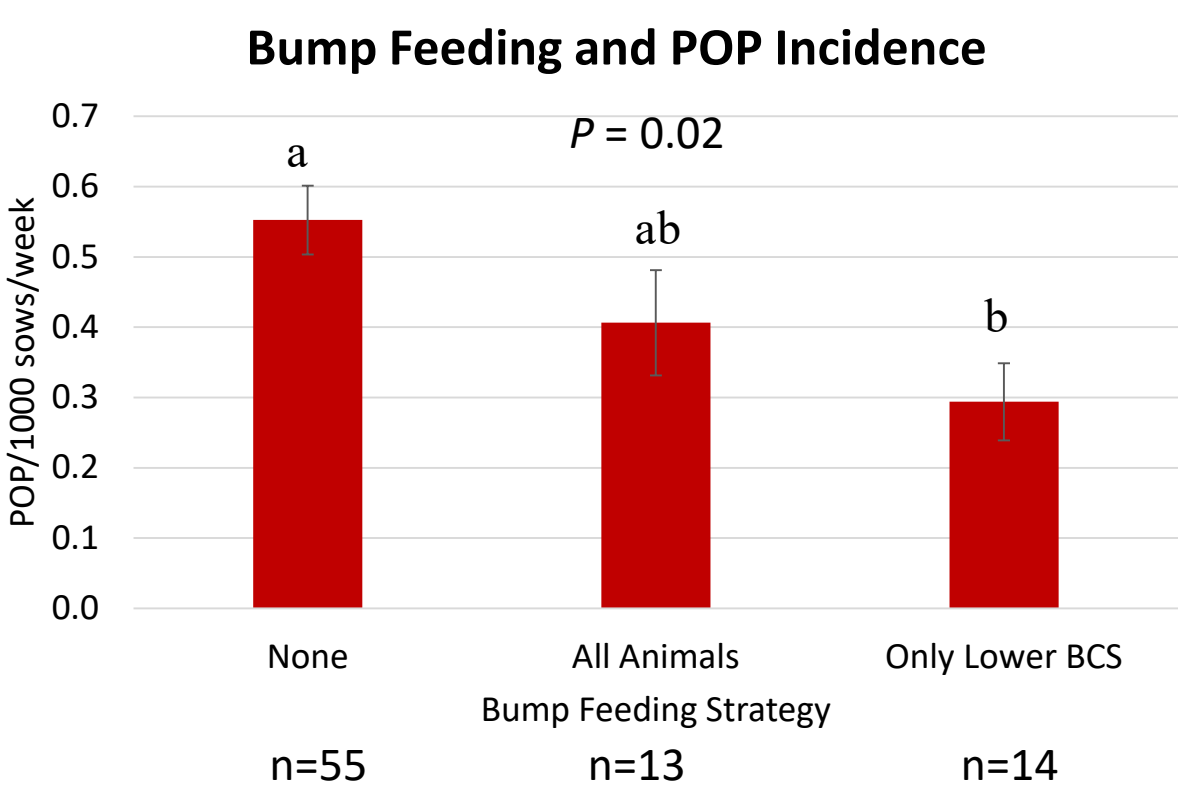
POP Project: Relationship POP and Mortality

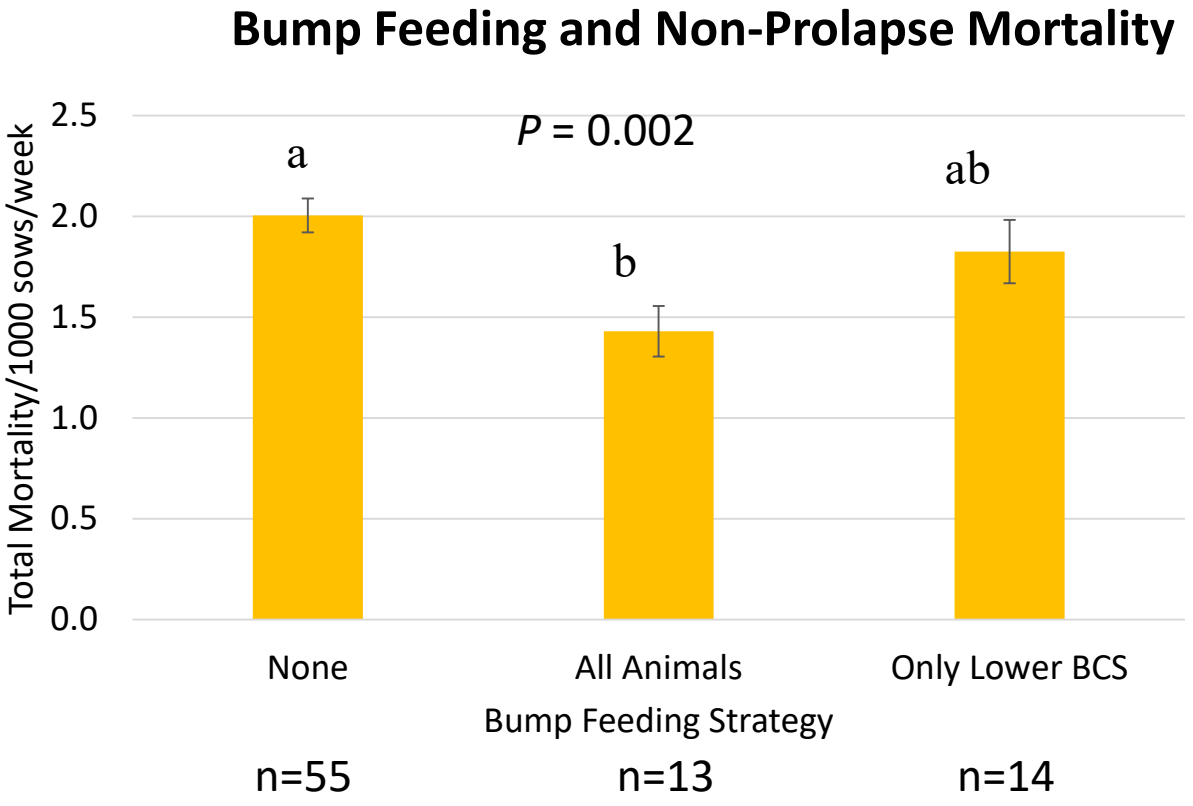




POP Project: Bump Feeding Strategy

A 0.1 change in POP/1000 sows/week is roughly 0.5% change in annualized mortality





POP Project: Individual Animal Measures

Production System		Farm Name		POPID Number	
Date		ISU collector initials		Days of gestation	

	Sow ID	Tail Length (cm)	Distance from anus/ vagina (cm)	Perineal Region Score	Standing or laying down for perineal score	BCS	Comments
1							
2							
3							
4							
5							
6							

Scope of the project

On-site visits completed on:

- 62 of the 104 farms
- Over 5000 sows individually measured
- 11 of the 15 states
- 4 people collecting data on visits

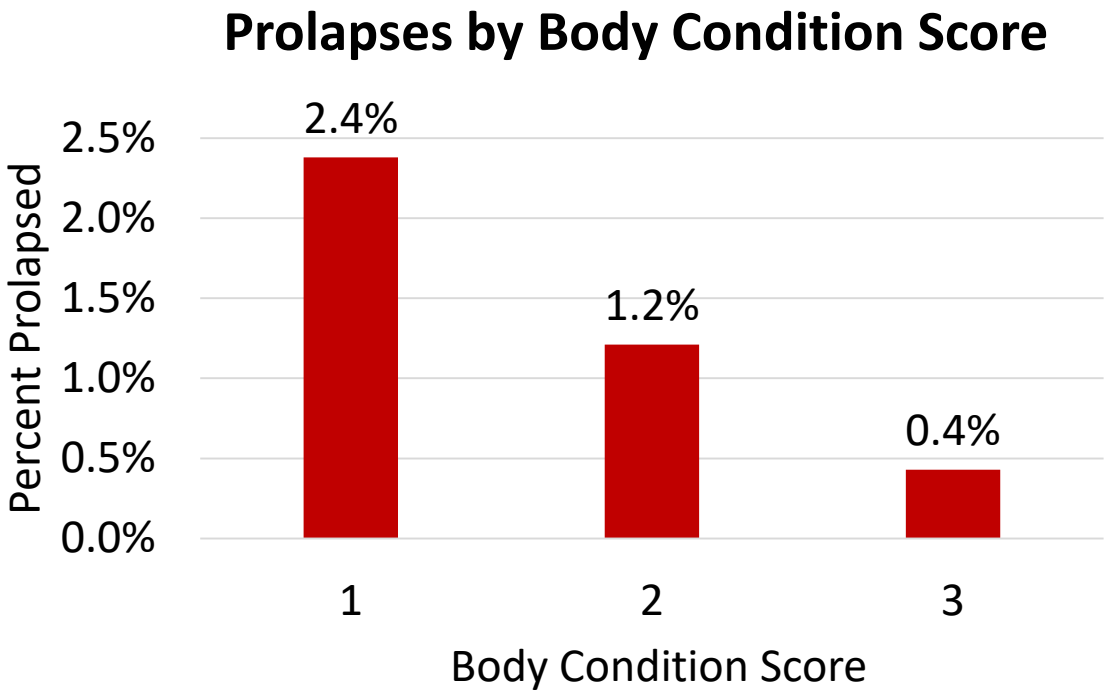
POP Project: BCS in Late Gestation

Body Condition Score in Late Gestation as an Indicator of POP Risk

	Total scored animals	Animals prolapsed	Percent prolapsed
BCS 1 – Thin	884	21	2.4%
BCS 2 – Ideal	3378	41	1.2%
BCS 3 - Heavy	691	3	0.4%
Total	4953	65	1.3%

Palpation of hip bones to determine body condition

SMEC SWINE MEDICINE EDUCATION CENTER



POP Project: Perineal Score evaluation

Score 1: Presumed ***"little to no" risk of prolapse.*** Has none of the following: Protrusion, vulva swelling and/or swelling of the perineal region.

Score 2: Presumed ***"moderate" risk of prolapse.*** Has evidence of some but not all of the following: Protrusion, moderate vulva swelling and/or swelling of the perineal region.

Score 3: Presumed ***"high" risk of prolapse.*** Has all of the following: Protrusion, moderate to severe vulva swelling, swelling of the perineal region and the possible beginning of a prolapse.

POP Project: Perineal Score in Late Gestation

Score 1: Presumed ***"little to no" risk of prolapse.*** Has none of the following: Protrusion, vulva swelling and/or swelling of the perineal region.

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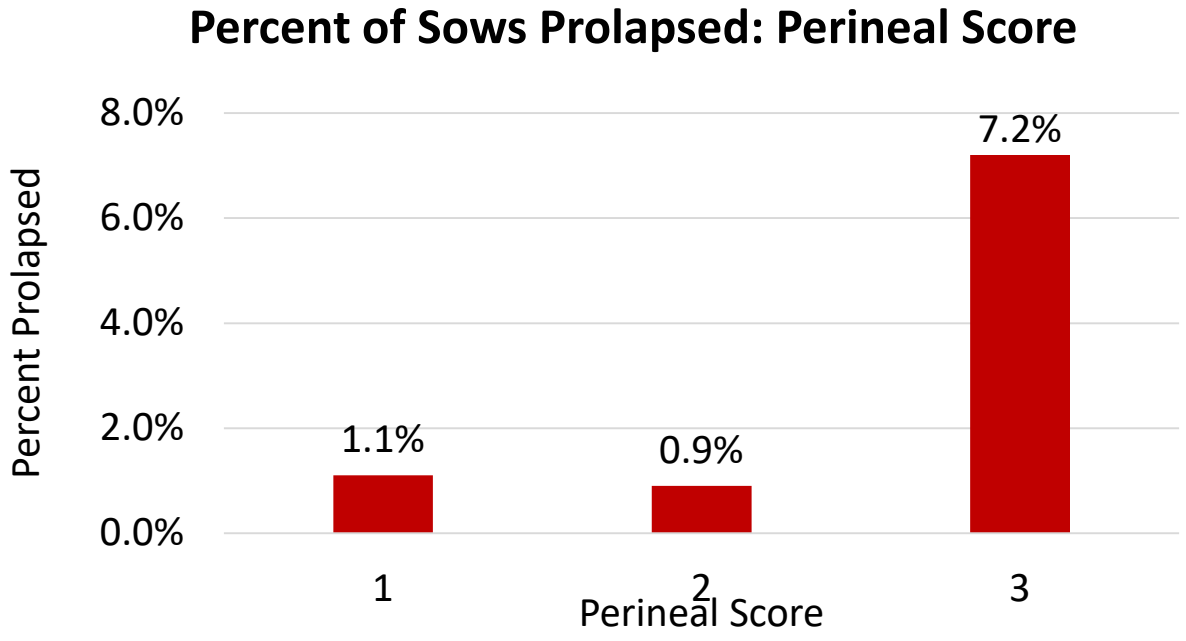
Score 3: Presumed ***"high" risk of prolapse.*** Has all of the following: Protrusion, moderate to severe vulva swelling, swelling of the perineal region and the possible beginning of a prolapse.

	Total scored animals	Animals prolapsed	Percent prolapsed
Score 1	1310	15	1.1%
Score 2	1361	12	0.9%
Score 3	235	17	7.2%
Total	2906	44	1.5%



Factors that ***don't seem to have a relationship*** with prolapse incidence according to this dataset

Factors that could have a relationship with prolapse incidence, but ***there was only moderate evidence***

Factors that seem to have a relationship with prolapse incidence and therefore ***need further investigation*** to identify causation

Herd size, induction protocol, sleeving protocol, tail length, hygiene, particle size

Geographical region, sow housing, laxatives, mycotoxins, health status and disease outbreaks, nutrition, genetics, antibiotic usage

Water quality, body condition, bump feeding strategy, perineal score

An integrated approach to improve whole herd pig survivability

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Jason Woodworth

Laura Greiner

IMPROVING PIG SURVIVABILITY

A multidisciplinary team from Kansas State University, Purdue University, and Iowa State University

POP Project: BMD during late gestation

- Objective: To determine if treatment with BMD® (bacitracin methylene disalicylate) for 2 weeks pre-farrow would reduce the prevalence of POP in late gestation sows.
- BMD is a narrow spectrum antibiotic used in sows for control of clostridial enteritis caused by *Clostridium perfringens* in suckling piglets.

Experimental design

Gestation week 14 sows allocated into treated (BMD) or non-treated (CON) groups

- Treatments assigned based on rows of gestation crates
- Sows received BMD for 2 weeks pre-farrow
- Conducted at 2 sow farms in same production system

Sows were assigned a perineal score before moving into farrowing

- Scorer was “blinded” to treatments
- Scored at one time point during gestation week 15
- Moved into farrowing at start of gestation week 16

Farm A: BMD in water

CON (n = 522)

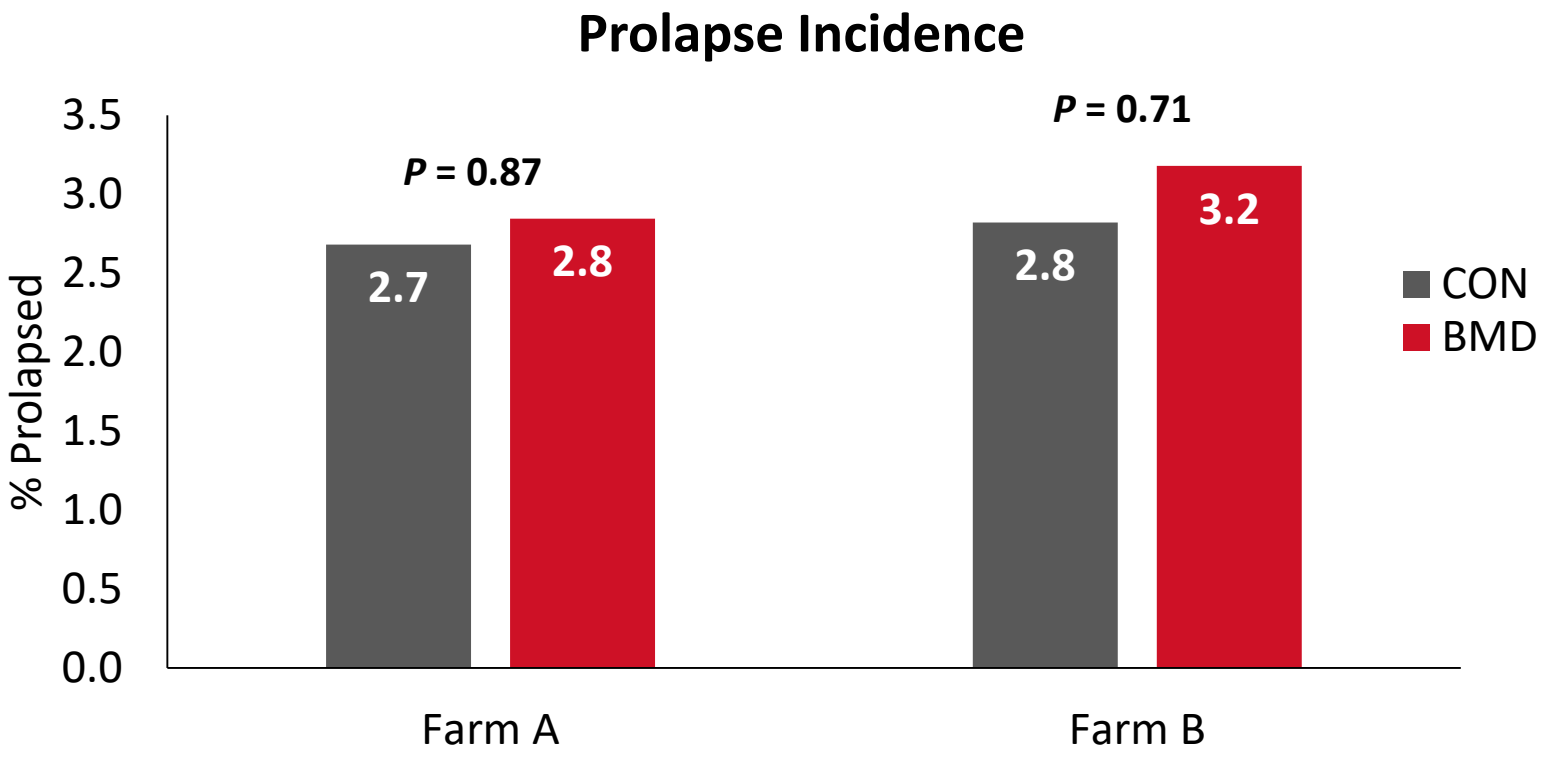
BMD (n = 492)

Farm B: BMD in feed

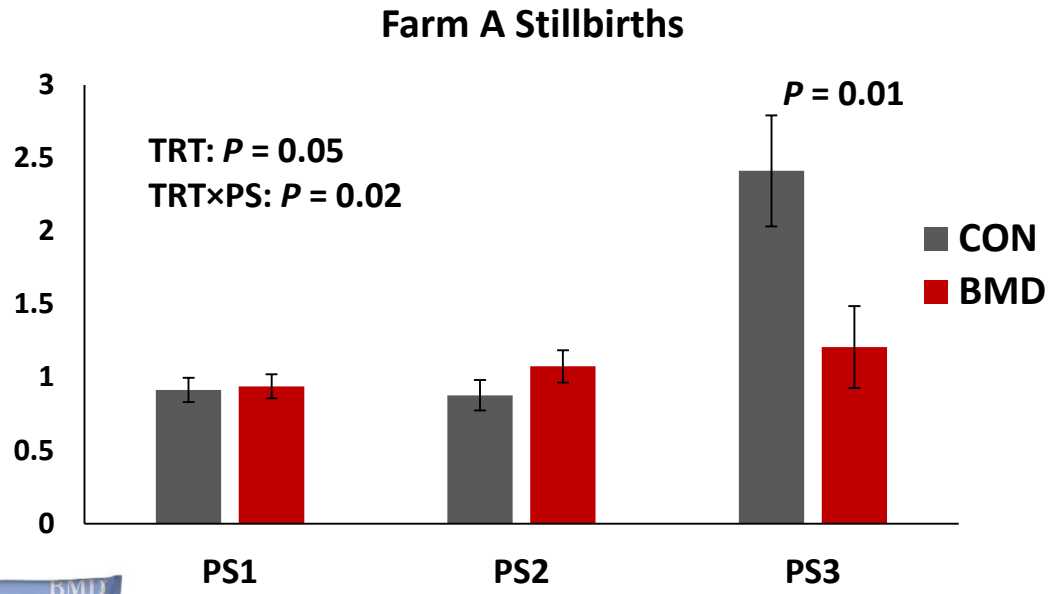
CON (n = 709)

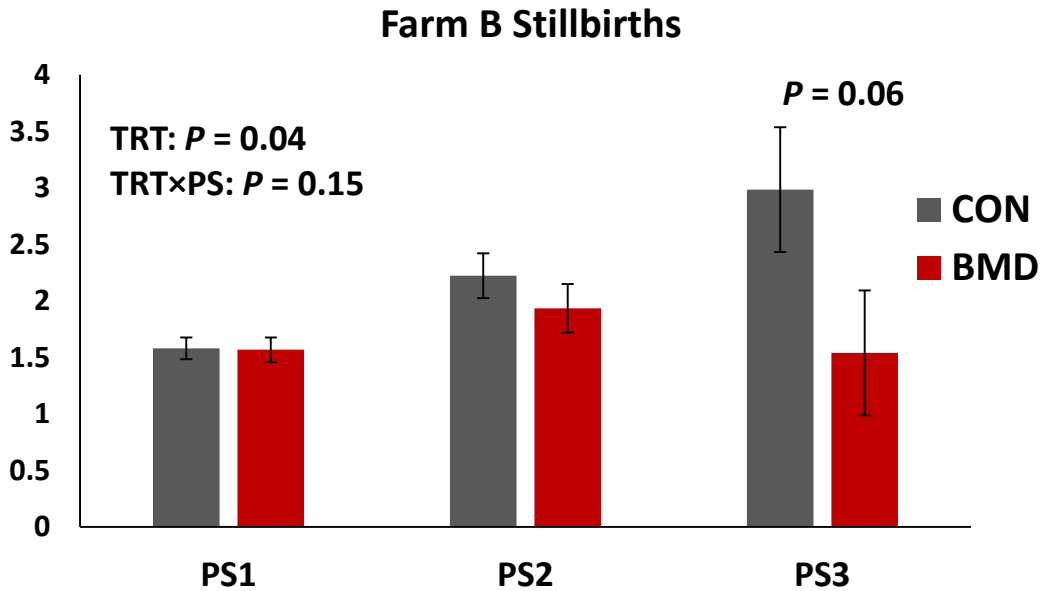
BMD (n = 566)

BMD treatment did not affect prolapse incidence at either farm



A decrease in number of stillborn piglets was observed in BMD treated sows compared to control at both farms





POP Project: Genetic Contribution

Topigs Norsvin Collaboration

- Initiated a study in 2020 to investigate a potential genetic component for uterine prolapse
- Data = 16,000+ records collected from a US farm between 2012 and 2020
- Data used to estimate the heritability of vaginal / uterine prolapse

Sow Feeding Strategies: Pre-farrow feeding

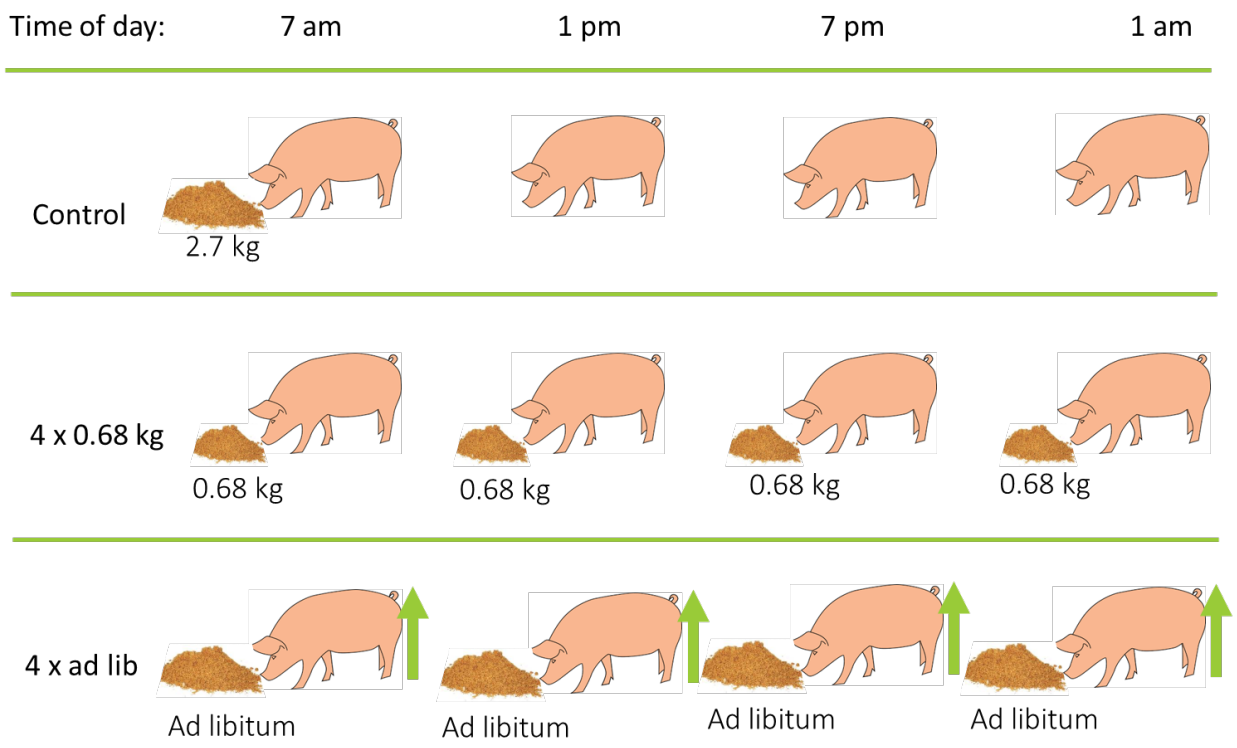
Effect of **timing and amount of feed** prior to farrowing on sow and litter performance

Kiah Gourley, Analicia Swanson, Rafe Royall, Joel DeRouchey, Steve Dritz, Mike Tokach, Robert Goodband, Chad Hastad, and Jason Woodworth

2020 Transl. Anim. Sci. 4:1-13

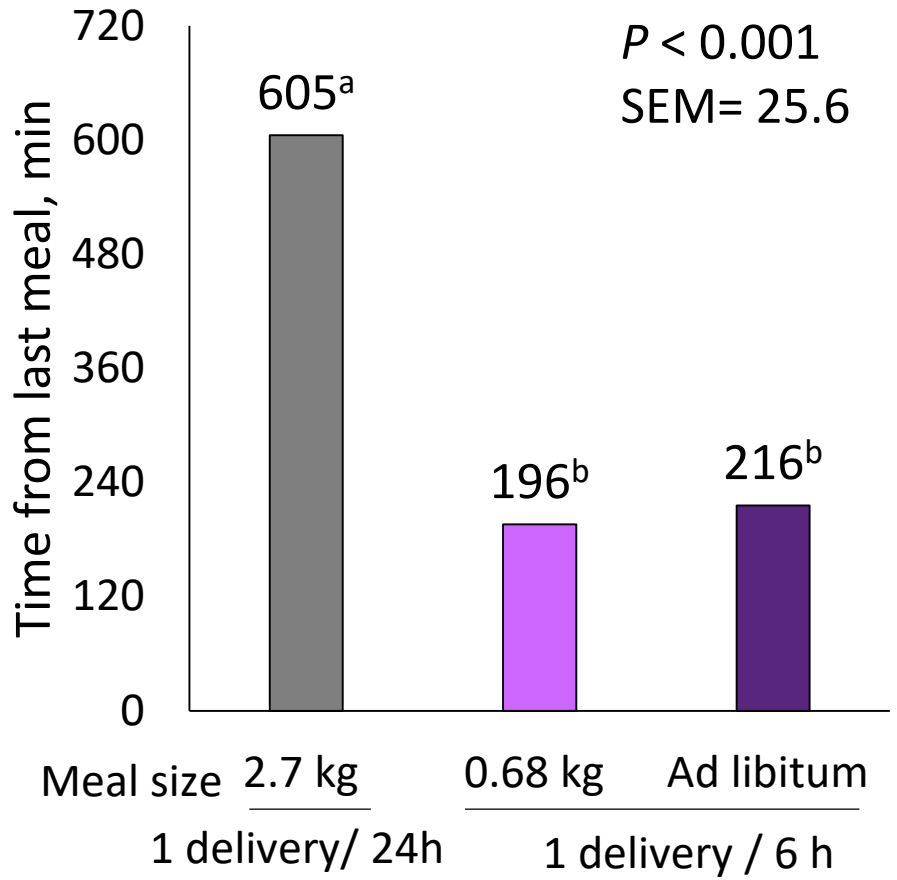
Pre-farrow feeding: Materials and Methods

- 727 mixed parity sows (mean = 3.8)
- Sow feed intake from entry to farrowing house to parturition & lactation feed intake (310 sows)
- Sows were monitored 24 h/d during farrowing
- Farrowing duration:
  - Time from 1st to last pig born
- Treatments:
  - Control: once a day
  - 4 Times per day
  - Ad-libitum (encourage intake 4 times)

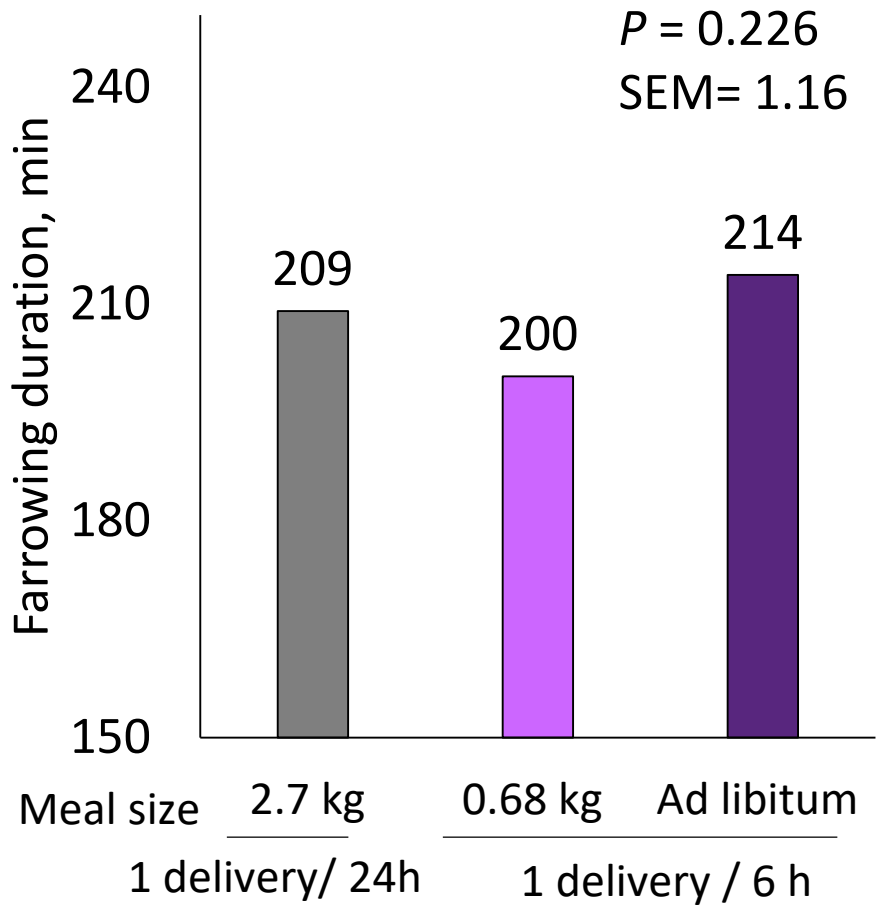


Pre-farrow feeding: Farrowing Duration

Time from last meal to farrowing

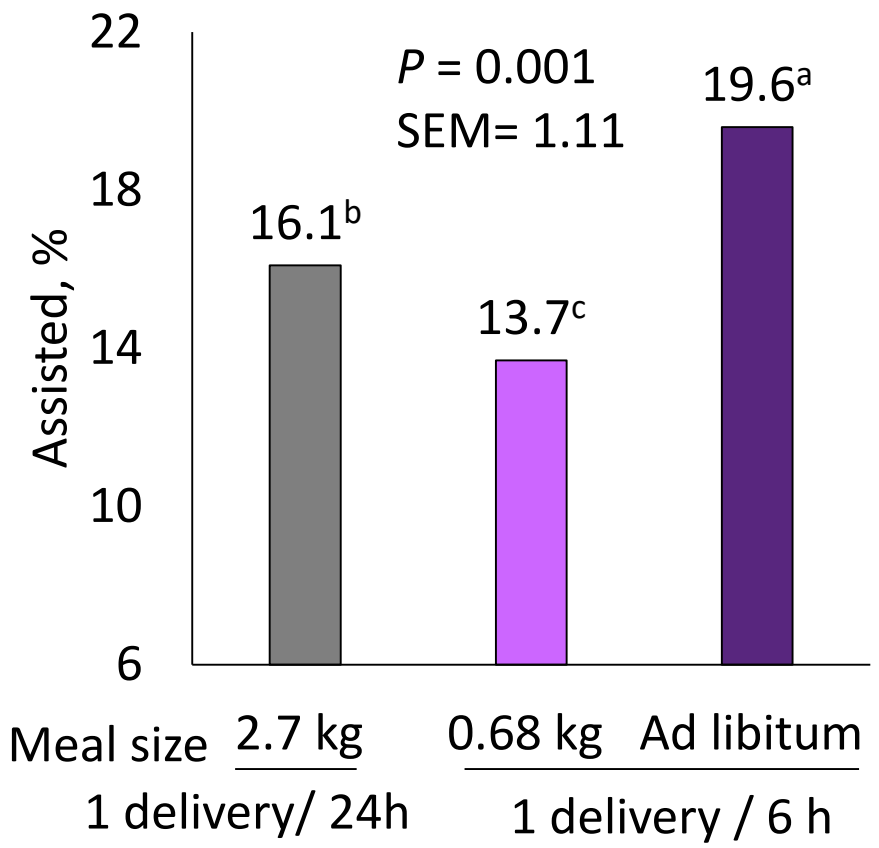


Farrowing duration

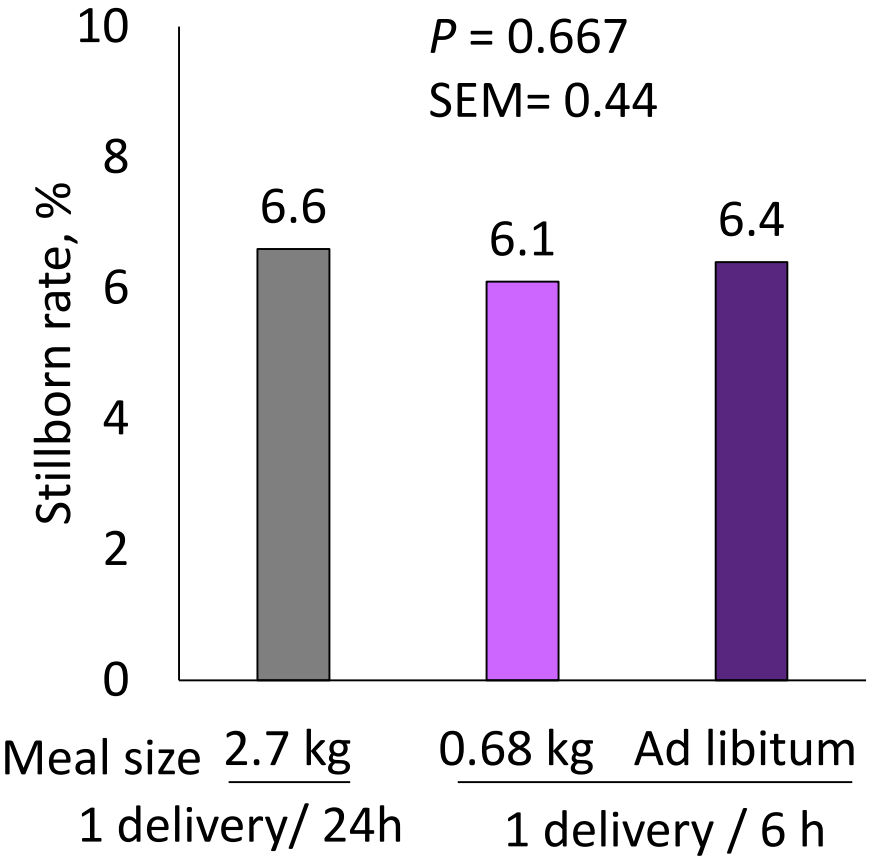


Pre-farrow feeding: Farrowing Assistance

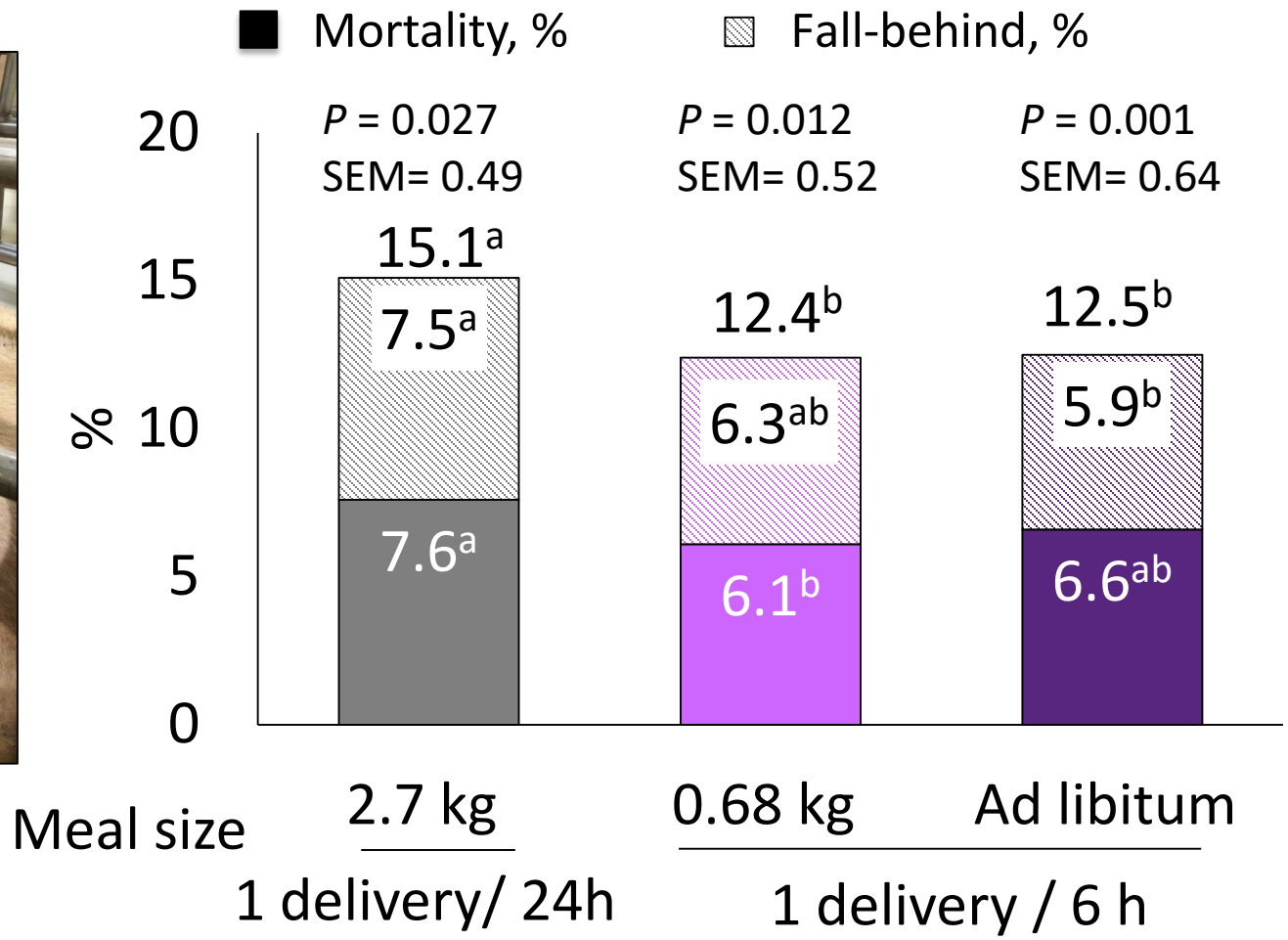
Farrowing assistance



Stillborn rate



Pre-farrow feeding: Piglet Outcome



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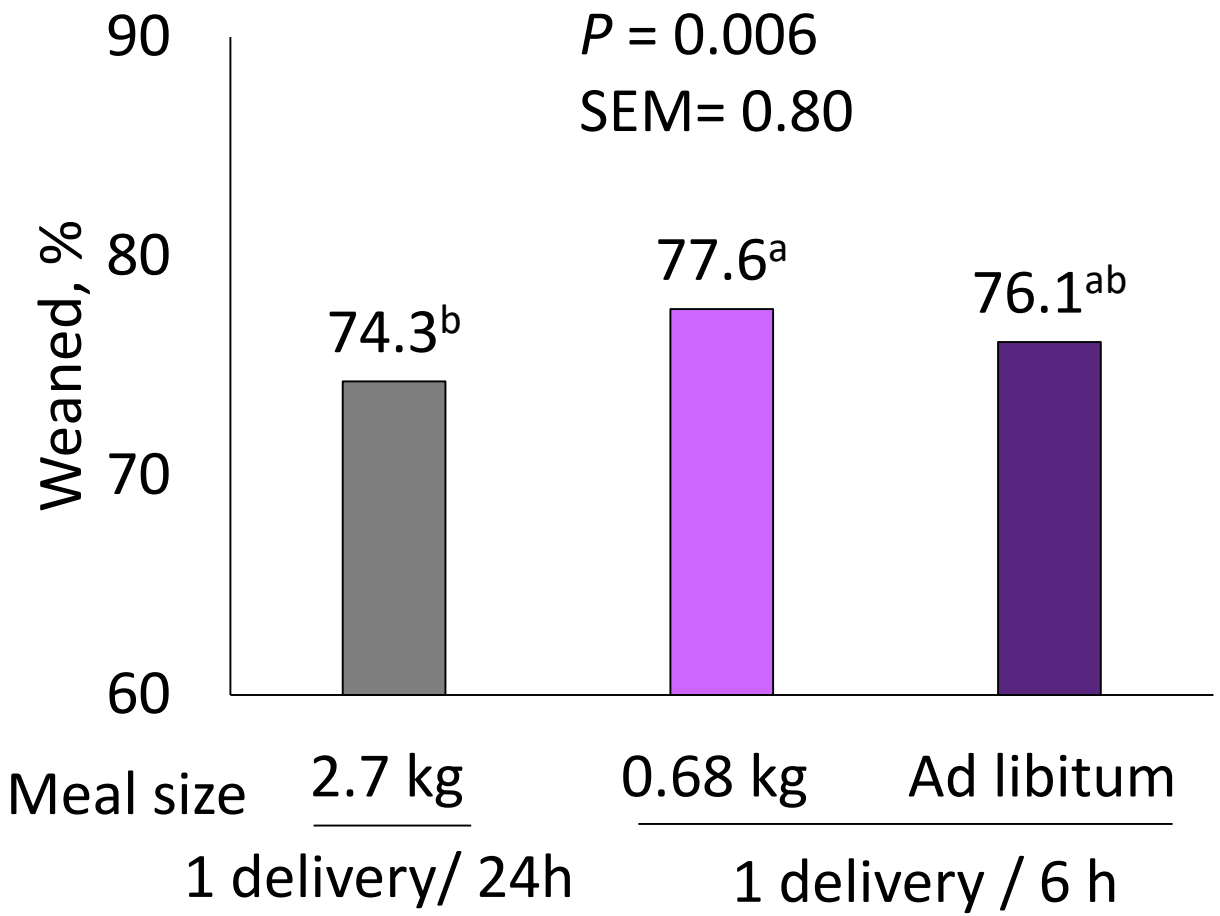


Weaned, % = weaned count/BA

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

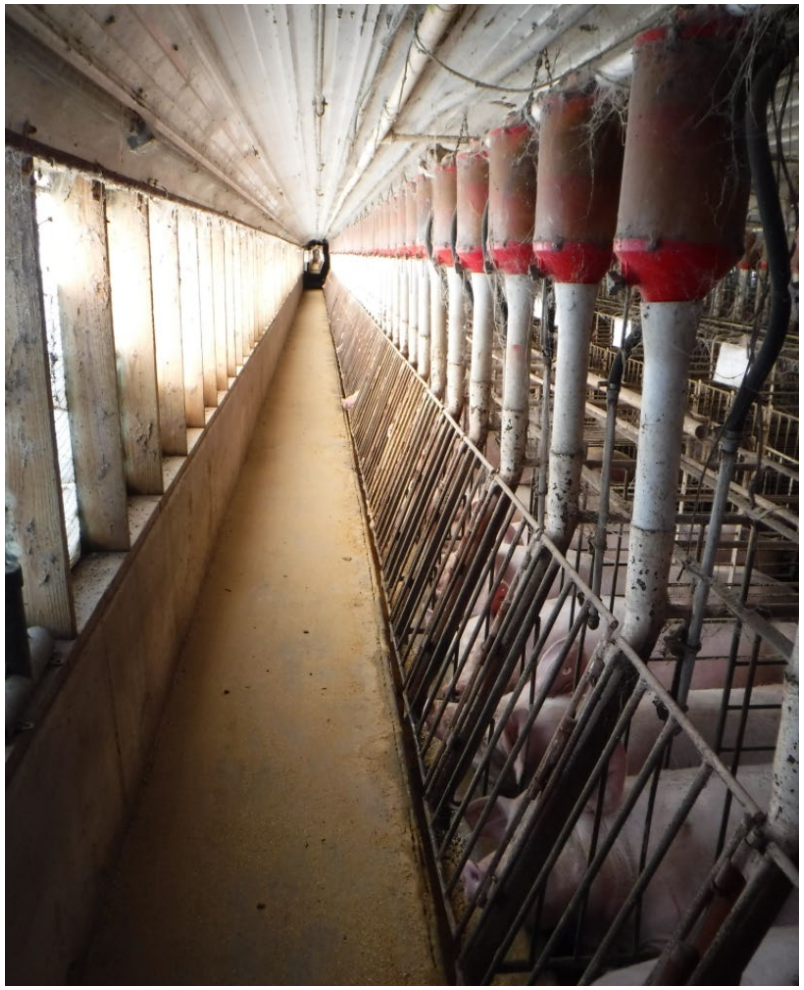
Department of Veterinary Diagnostic and Production Animal Medicine, Iowa State University, Ames, IA, *cjrdvm@iastate.edu

Identifying and treating “at-risk” sows

- **Primary Objectives:**
  - Can sow livability improve 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?

Treating “at-risk” sows: 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

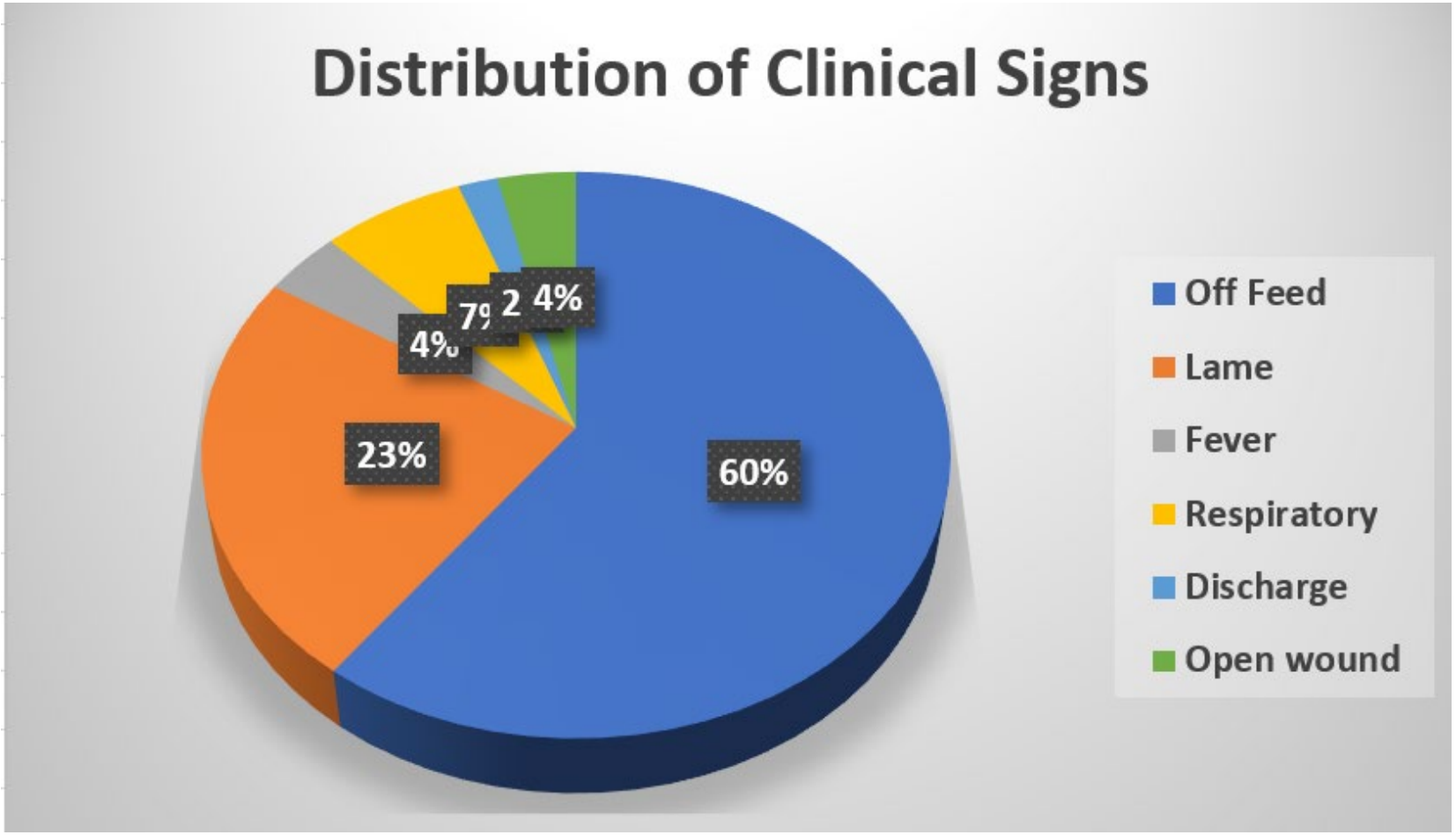


Treating “at-risk” sows: Training

- 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

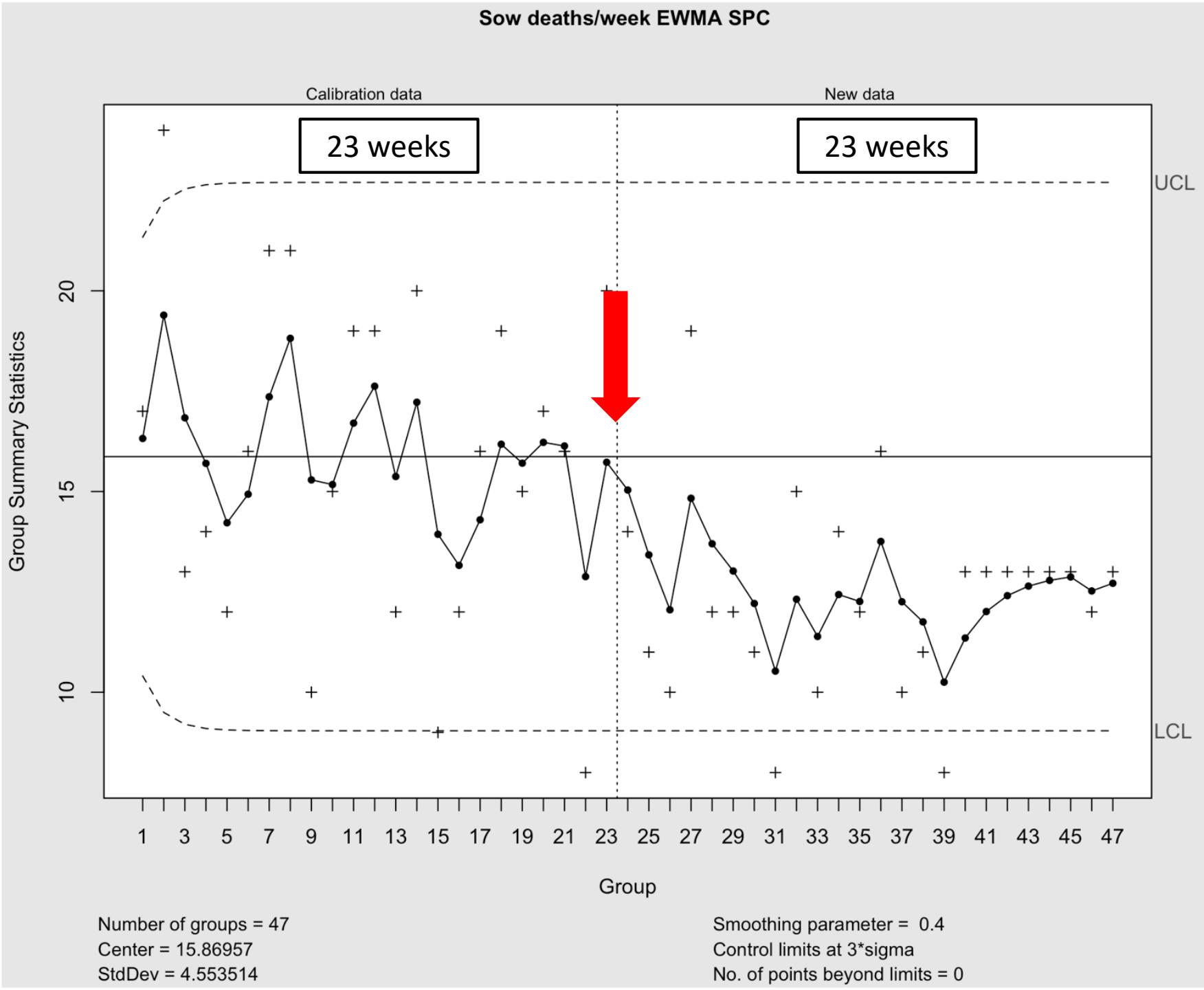
Treating "at-risk" sows: 2 week Evaluation

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



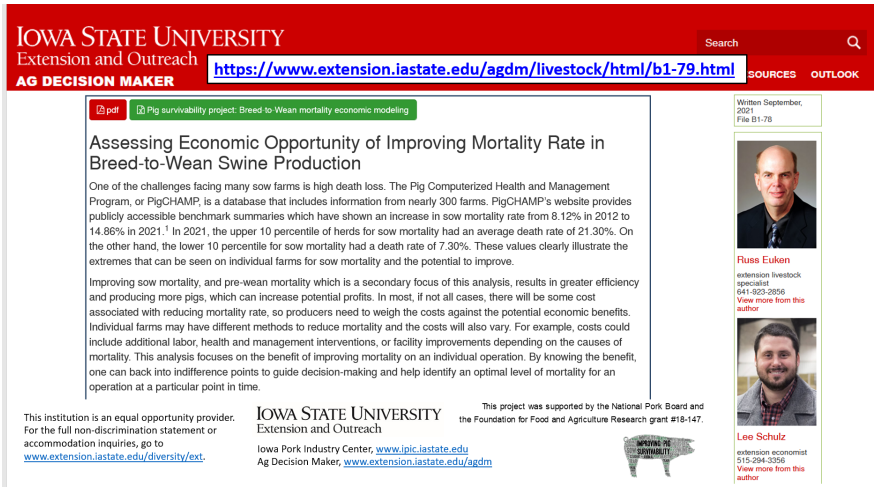
Evaluation of Training

- 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**



What is 4.25% worth?

- ISU Economic Opportunity Model
  - Opportunity cost of losing pregnant fema
  - 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**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https://www.extension.iastate.edu/agdm/livestock/html/b1-79.html
SOURCES OUTLOOK

pdf Pig survivability project: Breed-to-Wean mortality economic modeling

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.[1] 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.

Written September, 2021
File B1-78

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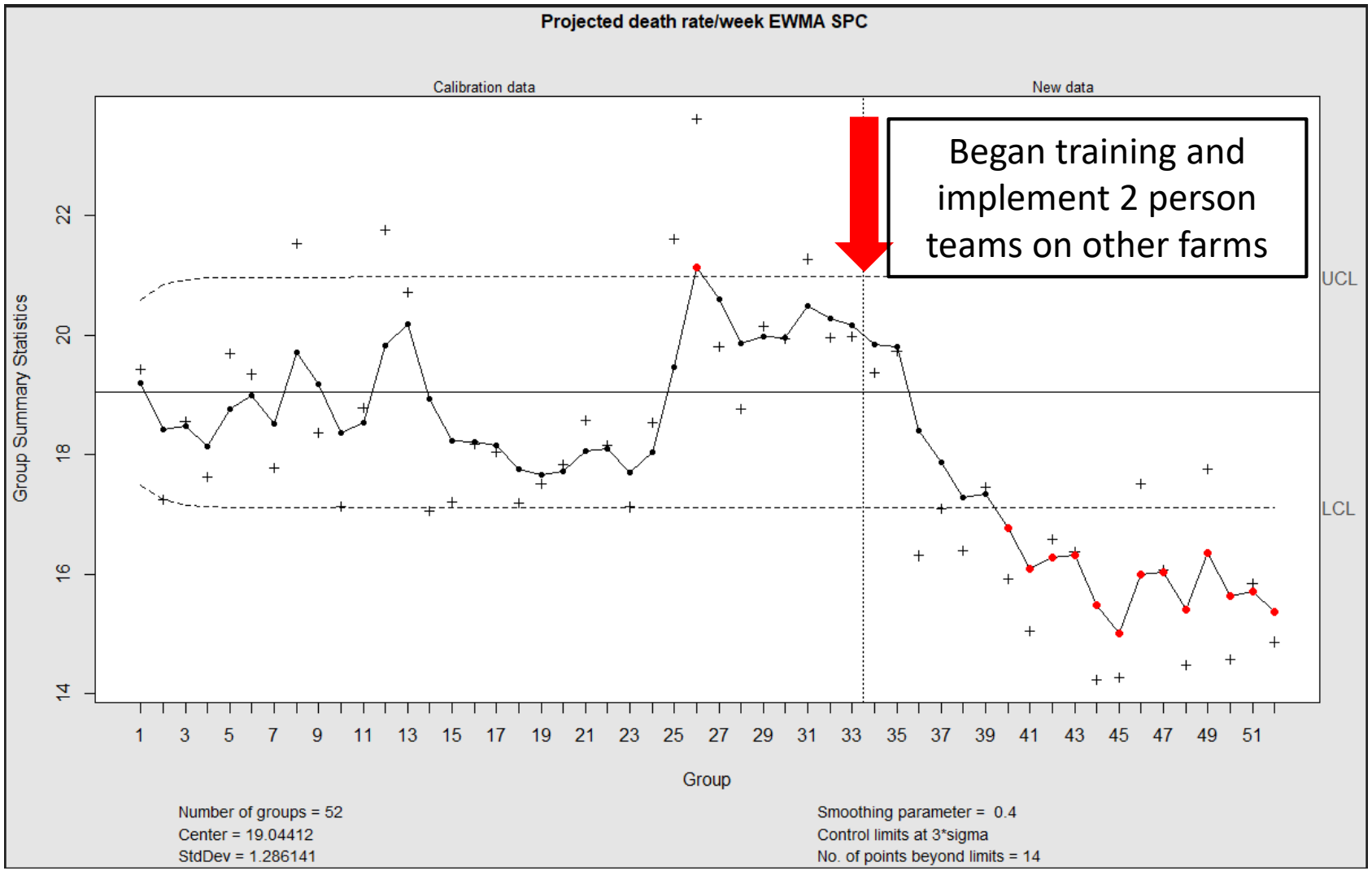
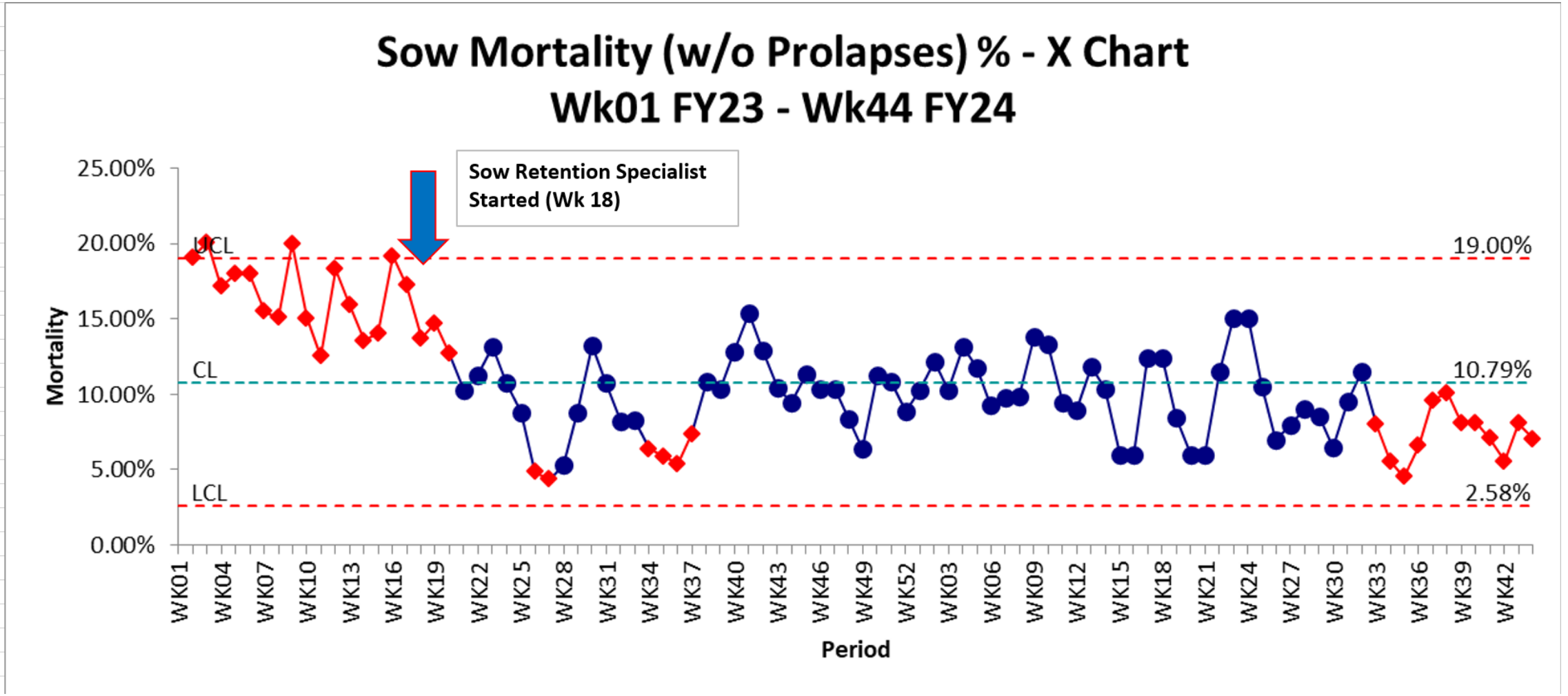
This project was supported by the National Pork Board and the Foundation for Food and Agriculture Research grant #18-147.

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

System wide implementation (n=40 farms)



What about other systems?



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?

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Farrowing	5.5%
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Age/Parity	0.3%
Production	1.1%
Prolapse	22.6%
Structure/body Condition	23.5%
Other/Unknown	34.0%
General Health	11.6%

Sudden deaths: 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

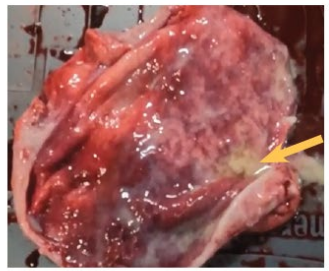
Uterus with pyometra and retained pigs (resorbed)

Peritonitis

Sow Necropsy Manual (developing)

Bladder (Vejiga)

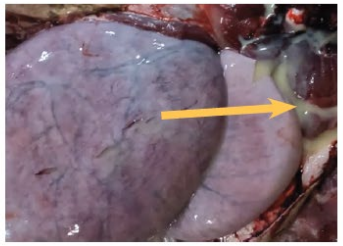
Thickened (Engrosado)

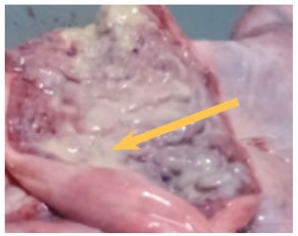


Pus

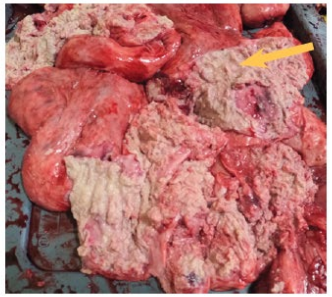
Bladder (Vejiga) 26

Uterus (Útero)



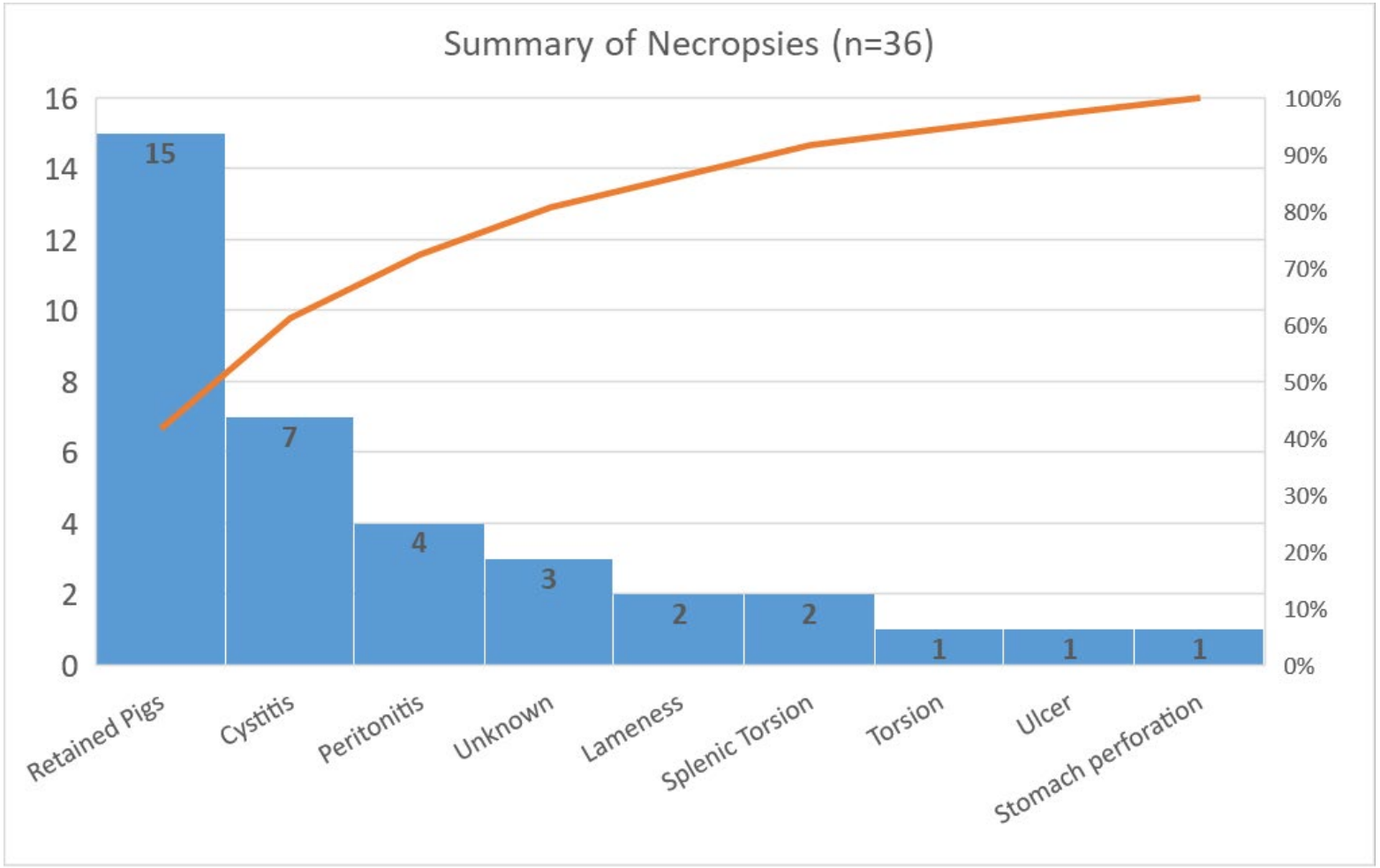


Pus Present (Presencia de pus)



Uterus (Útero) 43

Summary of 36 necropsies to date



Over 40% of sudden deaths are from retained pigs!!

Sow Livability Projects: Summary of Studies

- **Pelvic organ prolapse (POP)** is a complex problem with many factors:
  - On farm management practices can be associated with POP
    - i.e. feeding strategies
  - Microbiota
    - Vaginal microbiota may be a feature of or a predisposition for POP
  - Endocrine
    - Endocrine shifts suggests multiple organs and tissues are involved and affected
  - Immune
    - Markers of inflammation and immune activation are associated with POP risks
  - Genetic
    - POP is heritable *in some lines*

Sow Livability Projects: Summary of Studies

- Increasing feeding frequency (4 times vs single per day) **improved piglet survival** to weaning, but did not impact farrowing duration
- In U.S., we have not prioritized **early detection and individual sow treatments**, particularly in breeding and gestation
  - **Lack of appetite** is a great early indicator (*once per day feeding systems*)
  - 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.

Acknowledgments

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