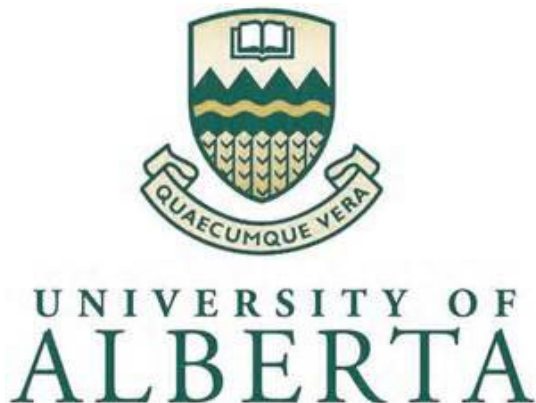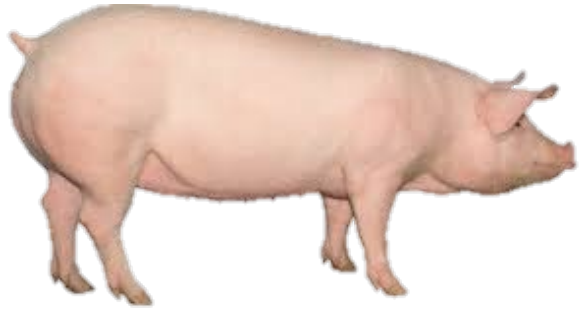# Gilt Development – Laying the Foundation for Future Performance

Jennifer Patterson

January 8th and 9th, 2025
Banff Pork Seminar

Key Concepts

- Sow lifetime productivity – *a long process & a complex trait*

- The loss of early parity sows is a challenge in our industry

- Good gilt management from birth is the foundation of future sow lifetime productivity

- Rethinking gilt management - "Parity 1 Development"

- Important performance metrics for "Parity 1 Development"

Key Concepts

○ Sow lifetime productivity – *a long process & a complex trait*

○ The loss of early parity sows is a challenge in our industry

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○ Rethinking gilt management - "Parity 1 Development"

○ Important performance metrics for "Parity 1 Development"

Sow lifetime productivity

*"The total number of <u>quality</u> pigs weaned during the productive lifetime of a female; from the time she **becomes breeding eligible** until she leaves the herd"*
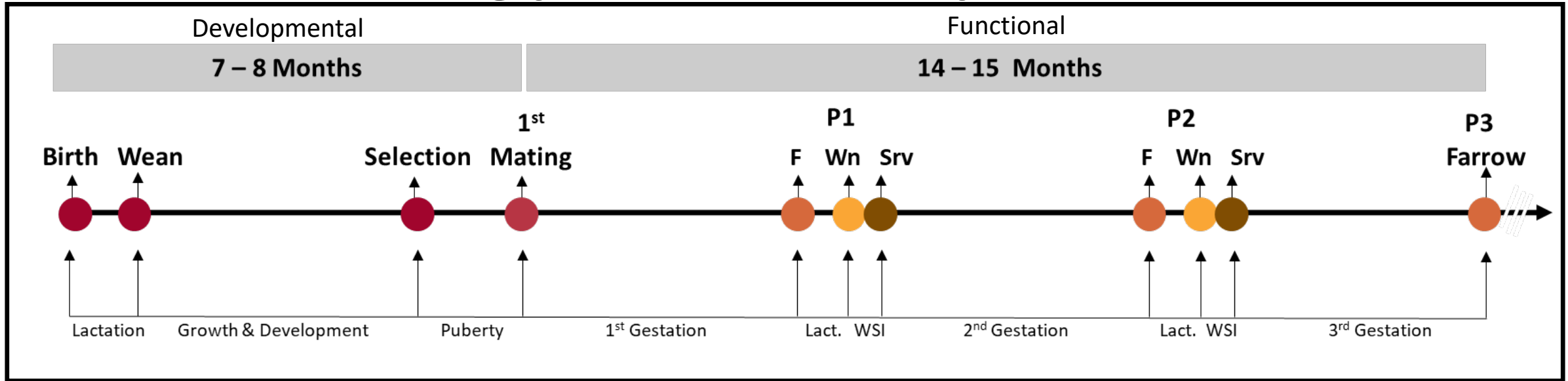
— *NPB, 2010*

Longevity/Retention --- Productivity

Fertility --- Reproductive Efficiency

Koketsu et al. 2020

Sow lifetime productivity
--- *a long process & a complex trait* ---

- **A long process**
  - A gilt becomes a potential replacement female at birth!
  - A sow should produce at least three litters before being removed from the herd
- **A complex trait**
  - Genetics, health programs, nutrition, environment, stocking density, PEOPLE and biosecurity ~ Dr. Gonzalo Castro (2018)
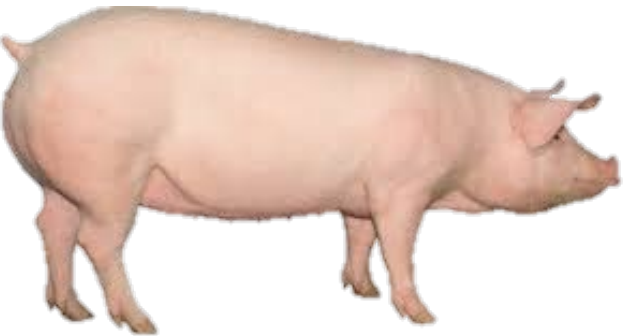
Key Concepts

Sow lifetime productivity – *a long process & a complex trait*

The loss of early parity sows is a challenge in our industry

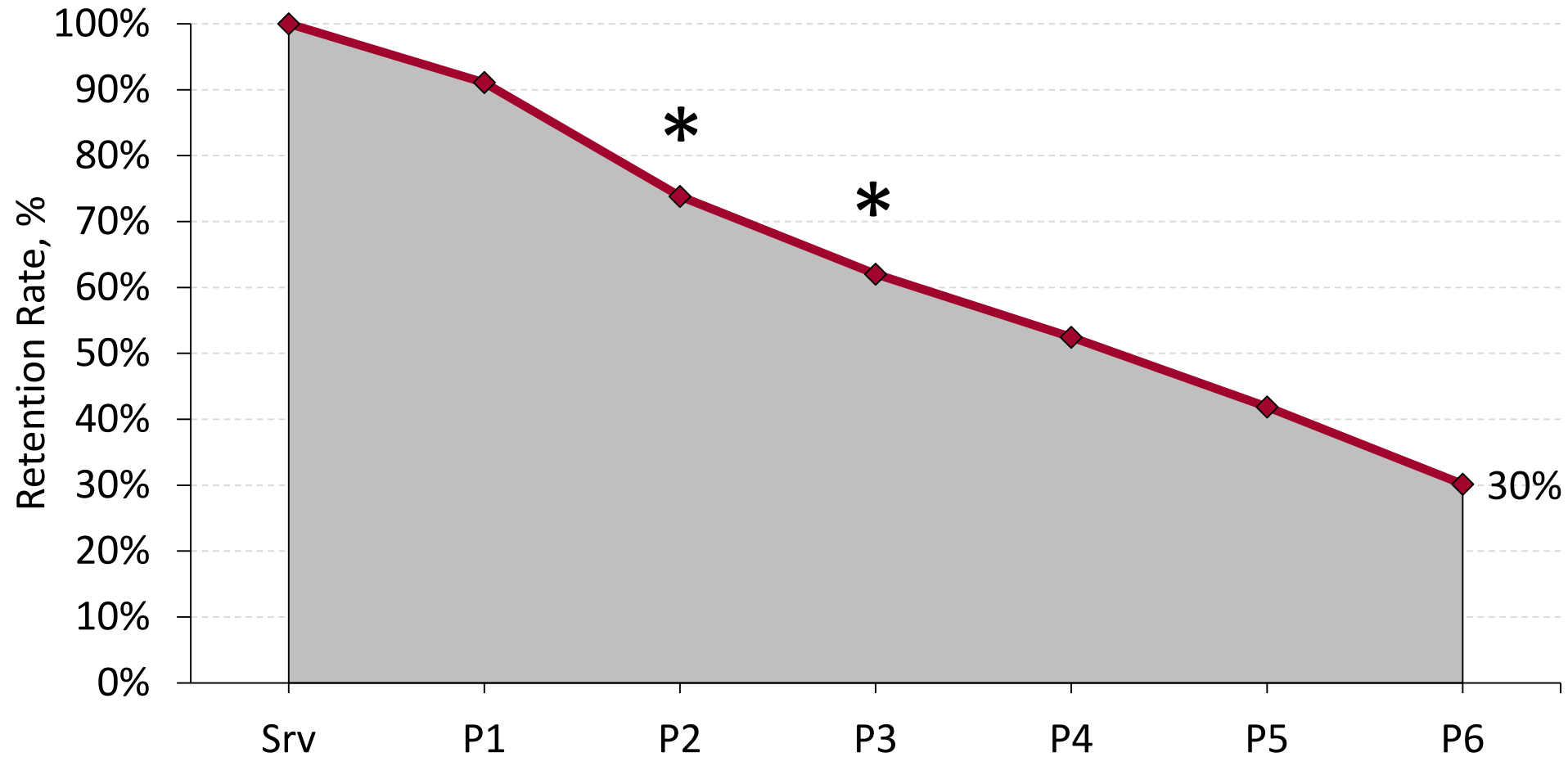Good gilt management from birth is the foundation of future sow lifetime productivity

Rethinking gilt management - "Parity 1 Development"
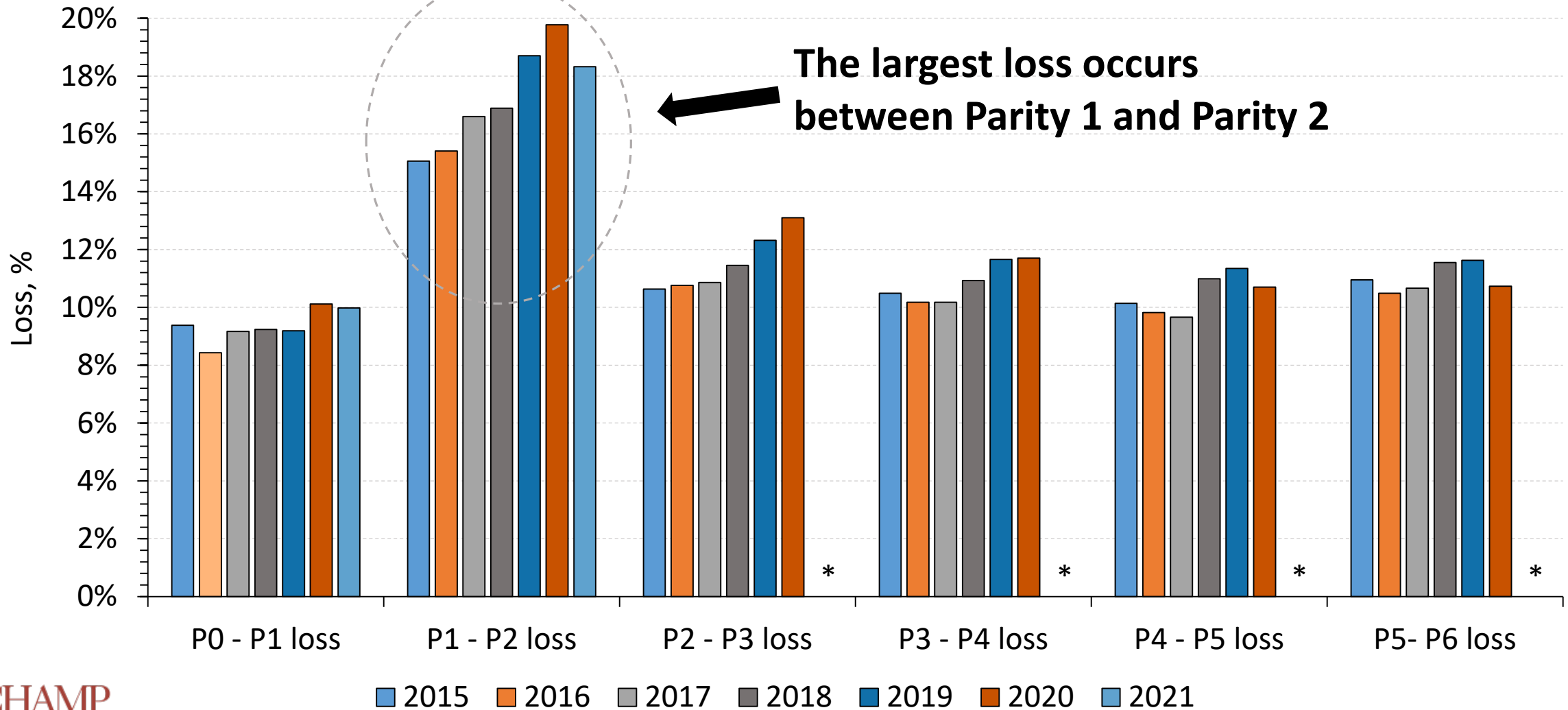
Important performance metrics for "Parity 1 Development"

Sow lifetime productivity –*Trends and Opportunities*
~30 percent of females first served remained in the herd after six parities

Sow lifetime productivity –*Trends and Opportunities*

~Loss between Parity 1 and Parity 2

The largest loss occurs between Parity 1 and Parity 2

Legend: ■ 2015 ■ 2016 ■ 2017 ■ 2018 ■ 2019 ■ 2020 ■ 2021

X-axis categories: P0 - P1 loss, P1 - P2 loss, P2 - P3 loss, P3 - P4 loss, P4 - P5 loss, P5- P6 loss

Y-axis: Loss, %

*Data for gilts entered in 2021 were not included because they did not have enough time to reach later parities.

Trends and Opportunities --- Losses between P1 and P2

Reason	% of Total Removals
Reproduction - cull	15.6%
No Heat - cull	13.1%
Did not conceive - cull	10.2%
Lame - cull	9.2%
Productivity - cull	7.6%
Other reason - death	5.6%
Sudden death - death	5.6%
Other reason - cull	5.4%
Lame - death	5.2%
Unknown - cull	5.2%
Prolapse - death	3.6%
Unknown - death	3.3%
Body Condition - cull	3.3%
Health - cull	2.3%
Euthanized - death	1.8%
Health - death	1.1%
Body Condition - death	0.8%
Prolapse - cull	0.6%
Euthanized - cull	0.2%
Reproduction - death	0.2%
Productivity - death	0.1%
Did not conceive - death	0.0%
Sudden death - cull	0.0%
No Heat - death	0.0%

% of Total Removals

Overall:

- **~ 73 percent was due to culling**
- **~ 27 percent due to mortality**

Known Top three reasons:

- **Reproduction (39.1%)**
- **Lameness (14.4%)**
- **Productivity (7.7%)**

PigCHAMP
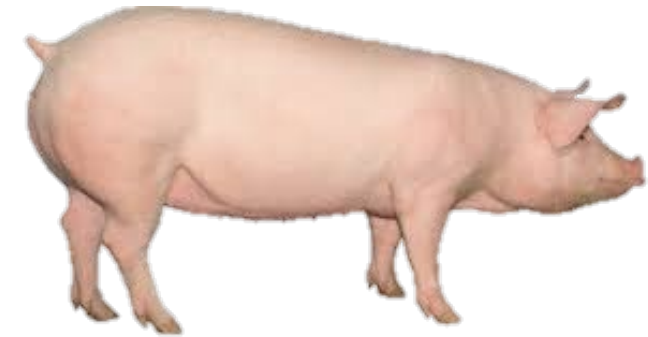Knowledge Software

Key Concepts

Sow lifetime productivity – *a long process & a complex trait*

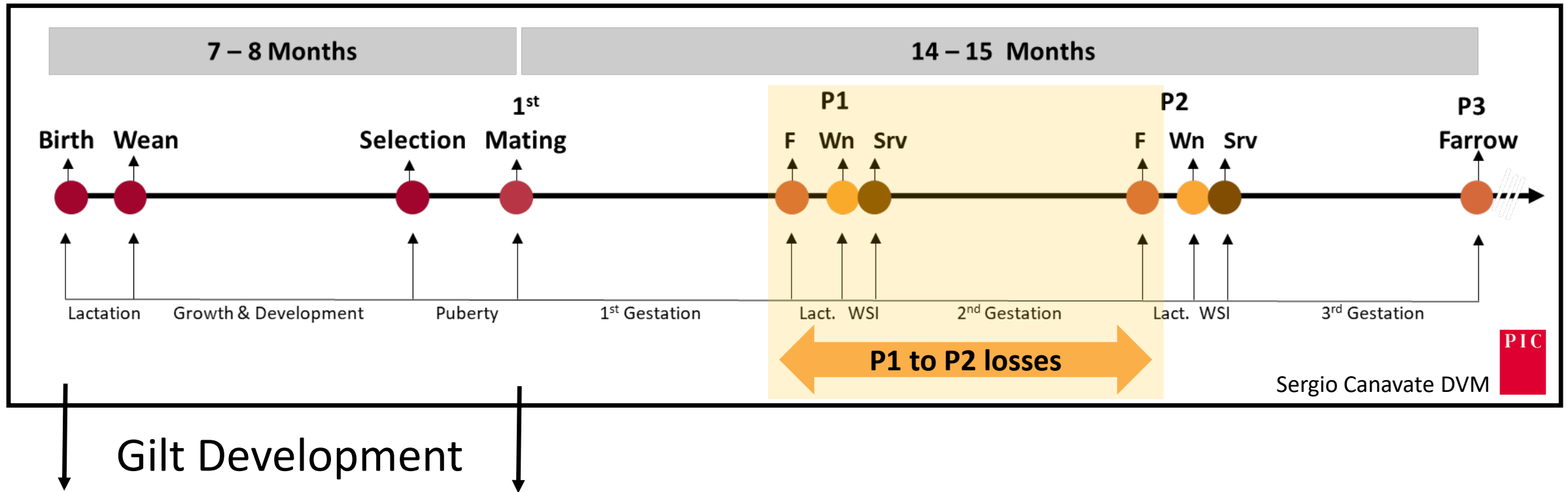The loss of early parity sows is a challenge in our industry

Good gilt management from birth is the foundation of future sow lifetime productivity

Rethinking gilt management - "Parity 1 Development"

Important performance metrics for "Parity 1 Development"

Sow lifetime productivity – Start with the end in mind!

Gilt Development

Litter of origin
- Birth Weight
- Birth Weight Phenotype
- Colostrum Intake
- Weaning Age/Wt
- Number pigs nursing

Pre-Selection
- Conformation
- Structure and legs
- Health (unthrifty)
- Growth Rate

Final Selection
- Response to puberty induction

Eligibility at 1st Mating
- Age at puberty
- Weight at 1st service
- Estrus at 1st Service
- Age at 1st Service

Early management factors for replacement gilts

- **Low individual birth weight (<1.0 kg)**
  - Negatively affects piglet mortality, survival, and growth rate.
  - Delays puberty, reduces piglet production and sow longevity.

- **Low litter birth weight phenotype**
  - Repeatable litter trait – average litter birth weight
  - Carries the same risks as above, especially for mortality, survival and growth.
  - A low birth weight phenotype reduces the efficiency of a gilt replacement program

Early management factors for replacement gilts

- **Colostrum intake**

  - Plays a vital role in promoting pig health, growth rate and survivability (Faccin et al., 2022)

  - Positive relationship between colostrum ingestion and uterine development (Bartol, 2013)

  - Survive vs Thrive (Stewart, 2022)

- **Nursing litter size**

  - Strategic cross fostering of replacement females – reduce size of lactation litter

  - Gilts weaned from smaller litters had higher overall retention rates, farrowing rates and pigs born alive (Flowers, 2022)

Early management factors for replacement gilts

- **Pre-weaning growth and weaning weight**
    - Pre-weaning growth rate associated with early age at puberty (Vallet et al., 2016)
    - Positively associated with the proportion of sows that farrowed two litters and the total number of pigs produced over 4 parities (Knauer, 2016)

- **Weaning age**
    - Increasing weaning age by 3 days represented an increase of 0.5 pigs per sow per year (Knauer, 2016)
    - Consider a wean age of 24 days for replacement females (Faccin et al., 2022)

Sow lifetime productivity – Start with the end in mind
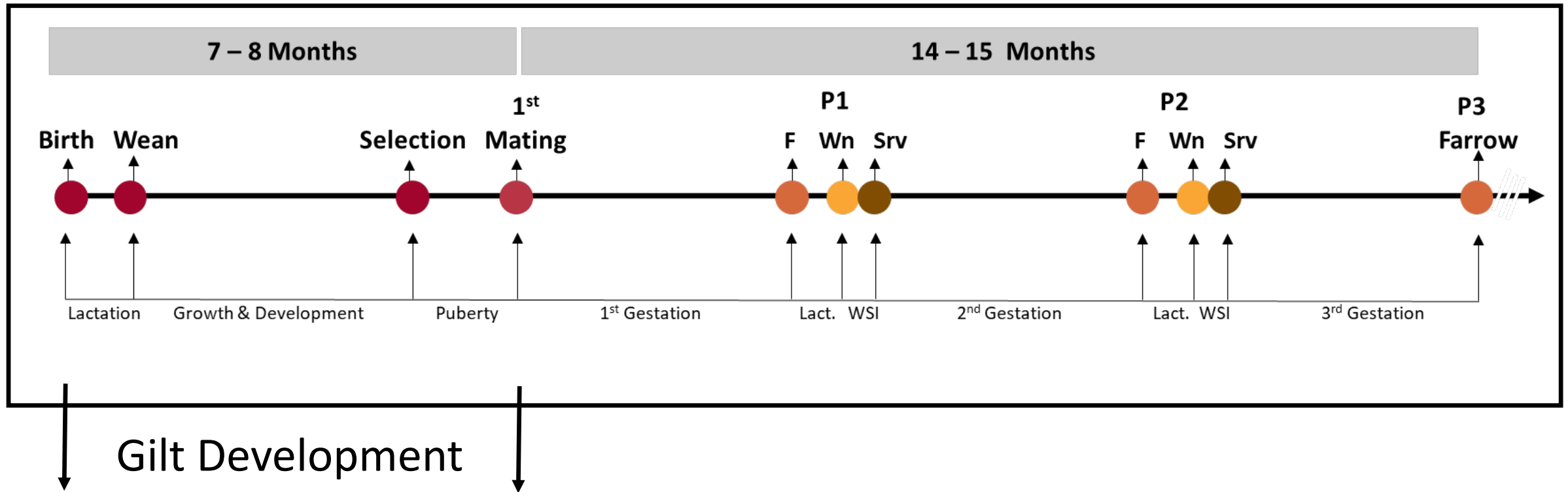
7 – 8 Months	14 – 15 Months

Birth — Wean — Selection — 1st Mating — **P1** F Wn Srv — **P2** F Wn Srv — **P3** Farrow

Lactation — Growth & Development — Puberty — 1st Gestation — Lact. WSI — 2nd Gestation — Lact. WSI — 3rd Gestation

Gilt Development

Litter of origin
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- Birth Weight Phenotype
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- Estrus at 1st Service
- Age at 1st Service

"The quality of the gilt selected today will impact the productivity of the farm in the future."

Matt Romoser, Iowa Pork Industry Center, Gilt Development Series

Pre-Selection – Start off with the best females
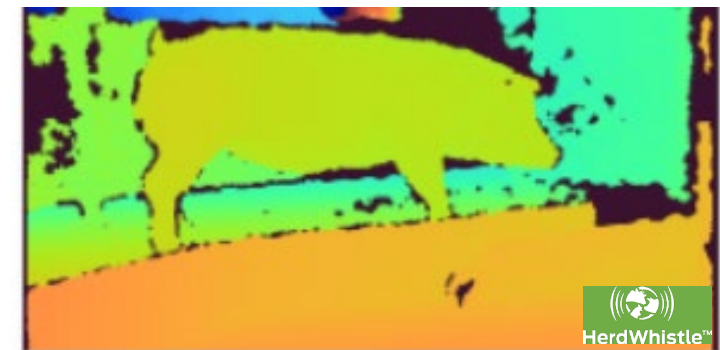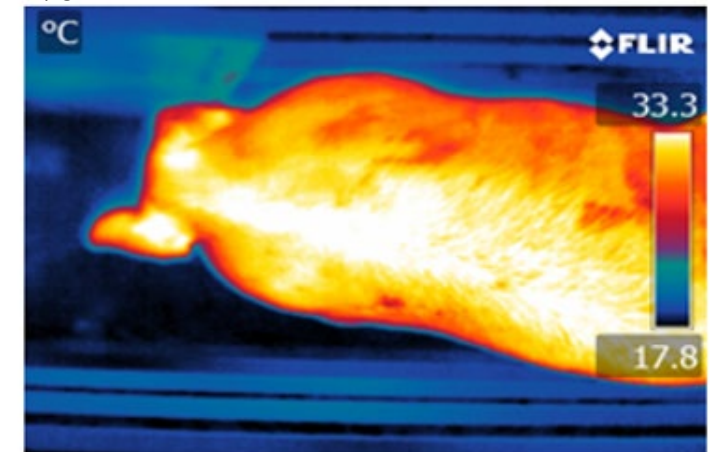
✕ **Gilts to be culled:**

- Poor health
- Any defects or are unthrifty
- Growth rate
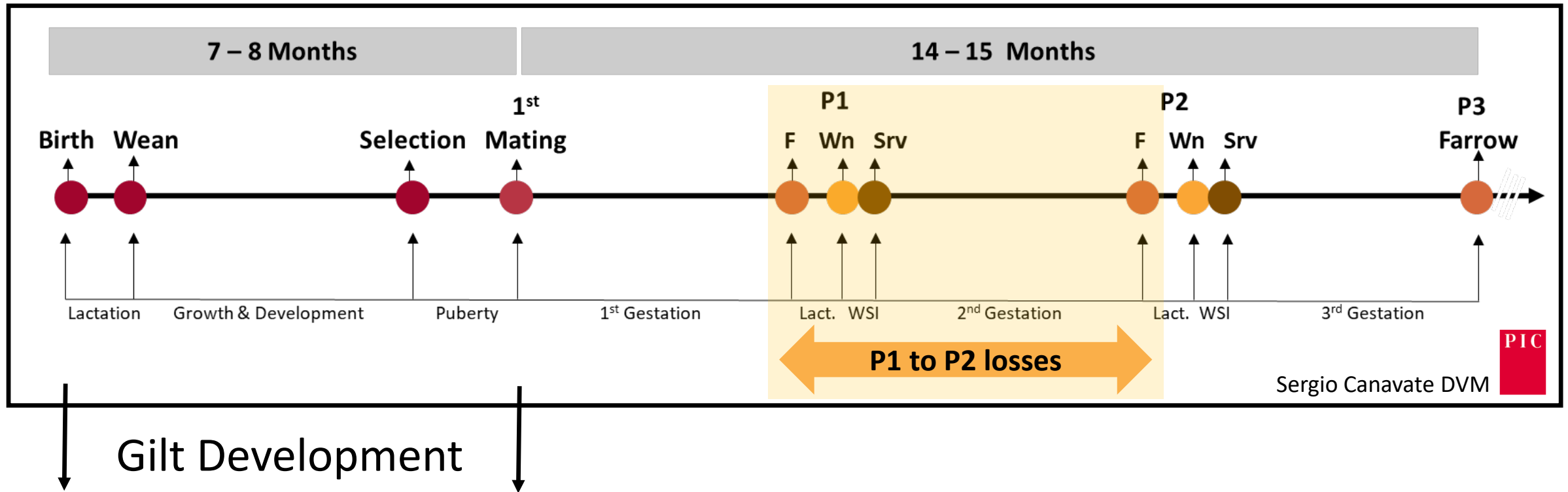
✓ **Gilts to be "Pre-Select" gilts:**

- Adequate number and quality of teats
- Structure, conformation, locomotion
- Vulva width
- Multispectral imaging of weight, BCS, and metabolic efficiency
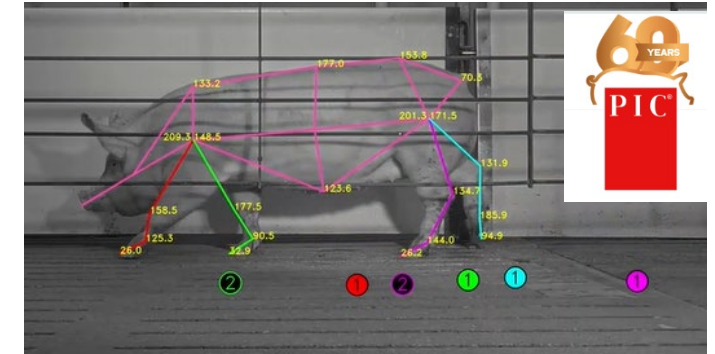
https://gb.pic.com/resources/dr-saskia-bloemhof-pic-camera-scores-pigs-better-than-humans-can/

Sow lifetime productivity – Start with the end in mind

Gilt Development

Litter of origin
- Birth Weight
- Birth Weight Phenotype
- Colostrum Intake
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Pre-Selection
- Conformation
- Structure and legs
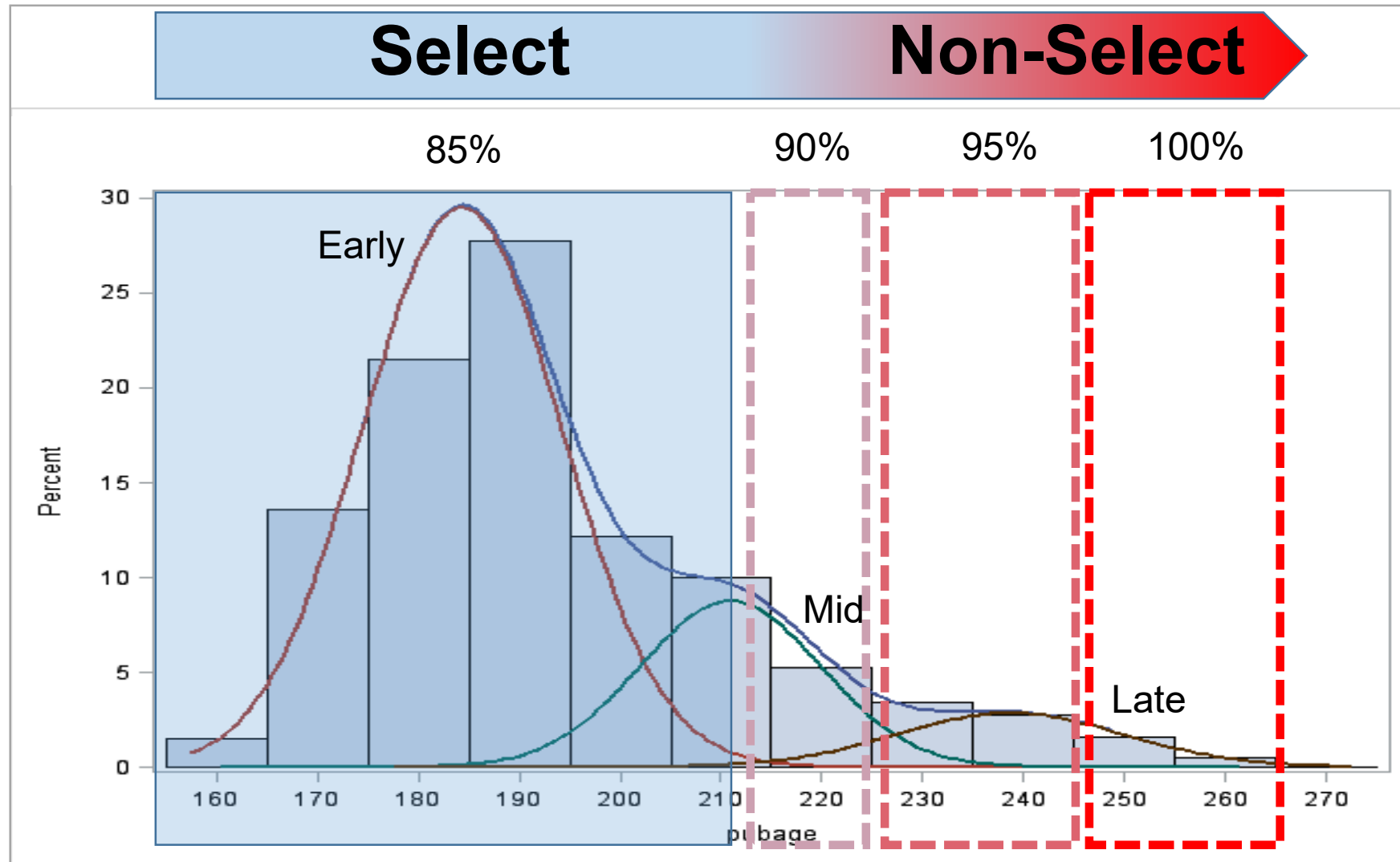- Health (unthrifty)
- Growth Rate

Final Selection
- Response to puberty induction

Eligibility at 1st Mating
- Age at puberty
- Weight at 1st service
- Estrus at 1st Service
- Age at 1st Service

Early responses to effective boar stimuli is _the_ critical selection tool

~95% of gilts will cycle in 100 days…. BUT….

Vallet, 2015

"Select" gilts are more productive than "Non-Select" Gilts

- Earlier age at puberty is associated with greater retention and pigs born to 3rd parity

- Culled less due to reproductive problems

- Higher farrowing rate, more pigs born alive

- Inseminated earlier & have fewer NPD

- Culled later and were older at removal

Sterning et al., 1998; Koketsu et al., 1999; Schukken et al., 1994; Patterson et al., 2010; Saito et al.. 2011, Kaneko and Koketsu, 2012, Roongsitthichai et al., 2013

The boar is an essential (an often under recognized) component of GDU

- The "boar effect" is a combination of tactile, visual, auditory, and olfactory cues.

- A consistent supply of mature, high libido, size appropriate, mobile, vasectomized boars is essential.

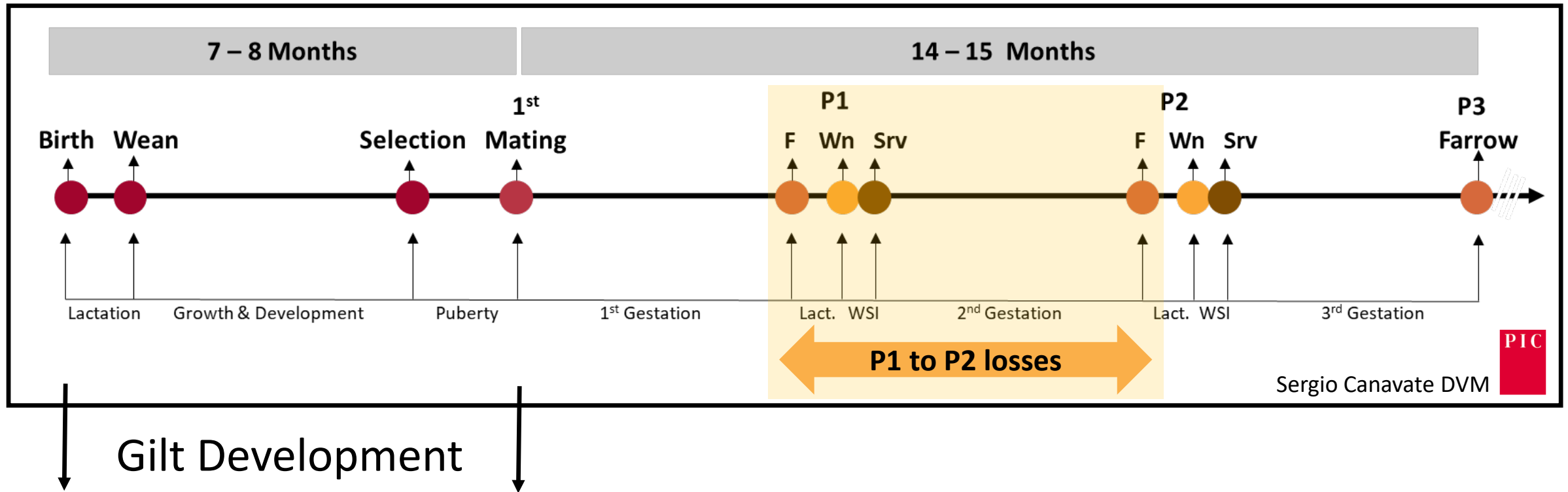- Boar replacement programs are critical.

Puberty Stimulation & Heat Detection Programs

- Daily direct exposure to a rotation of boars maximize the "boar effect".

- Direct boar contact is better than fenceline contact.

- Taking the gilts to the boars is more effective compared to taking the boar to the gilts pen.

- Gangs of boars?

- **Design efficient systems that maximize exposure to the "boar effect".**

Sow lifetime productivity – Start with the end in mind

Gilt Development

Litter of origin	Pre-Selection	Final Selection	Eligibility at 1st Mating
• Birth Weight	• Conformation	• Response to puberty induction	• Age at puberty
• Birth Weight Phenotype	• Structure and legs		• Weight at 1st service
• Colostrum Intake	• Health (unthrifty)		• Estrus at 1st Service
• Weaning Age/Wt	• Growth Rate		• Age at 1st Service
• Number pigs nursing			

Gilt Eligibility Targets at 1ˢᵗ Service

Figure adapted from PIC 2023

Age at puberty (wk)
(Start of puberty stimulation)

Age at service (d)

Weight at service (kg)

Estrus at service (#)
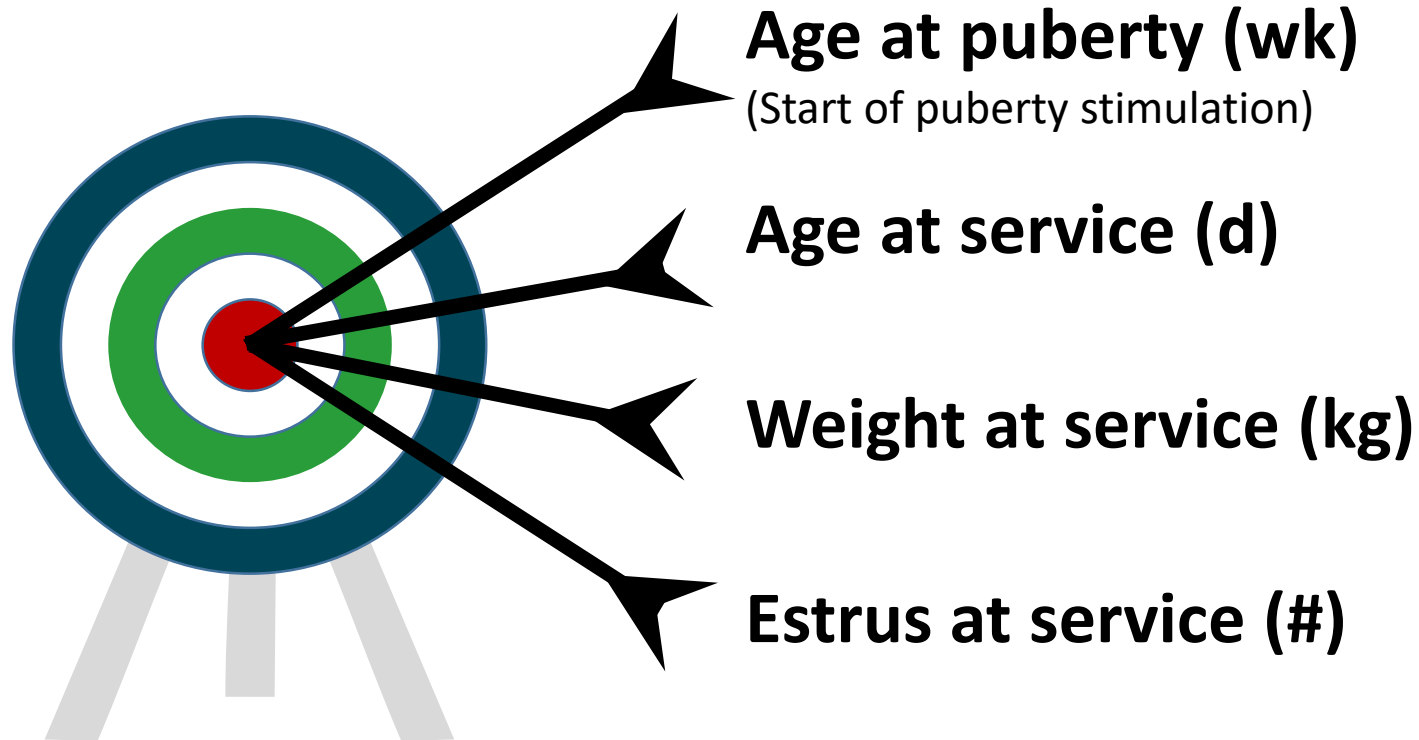
AcuFast	Hypor	PIC	Topigs Norsvin
23	25	24	23
203-224	>250	200-225	210-240
136-150	>150	135-160	150-170
2-3	2+	2+	2-3

*Follow the recommendations of your genetic supplier

If you were to choose one, what would it be?   All of them

Age at puberty

--- Age at the start of puberty stimulation ---

- Start boar stimulation early (23-24 weeks).

- A recorded pubertal estrus by 200 days of age is critical.

- This allows "Select" gilts to be bred at **second estrus** and at acceptable target weights.
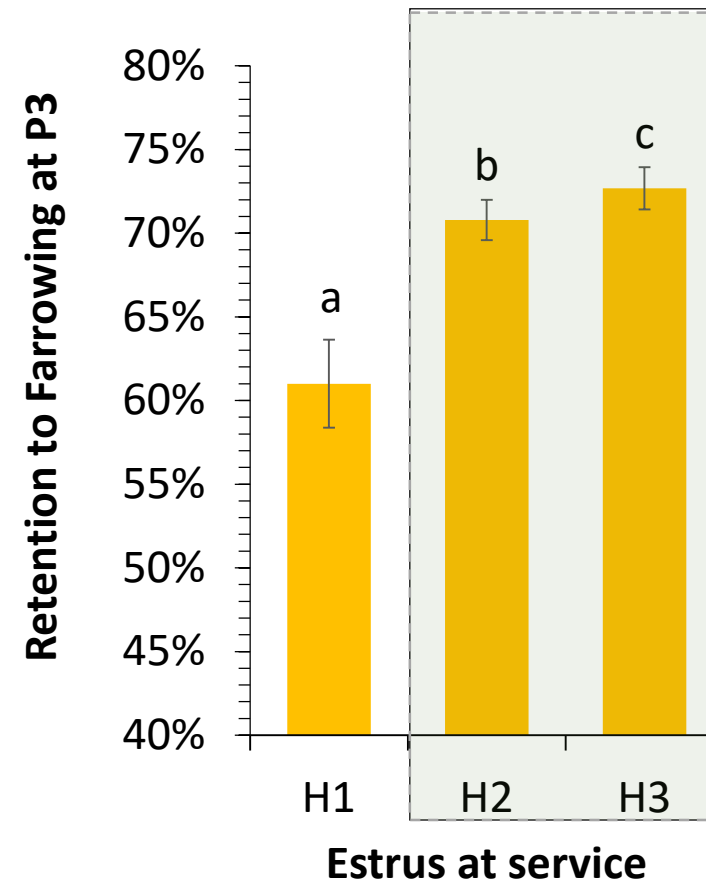

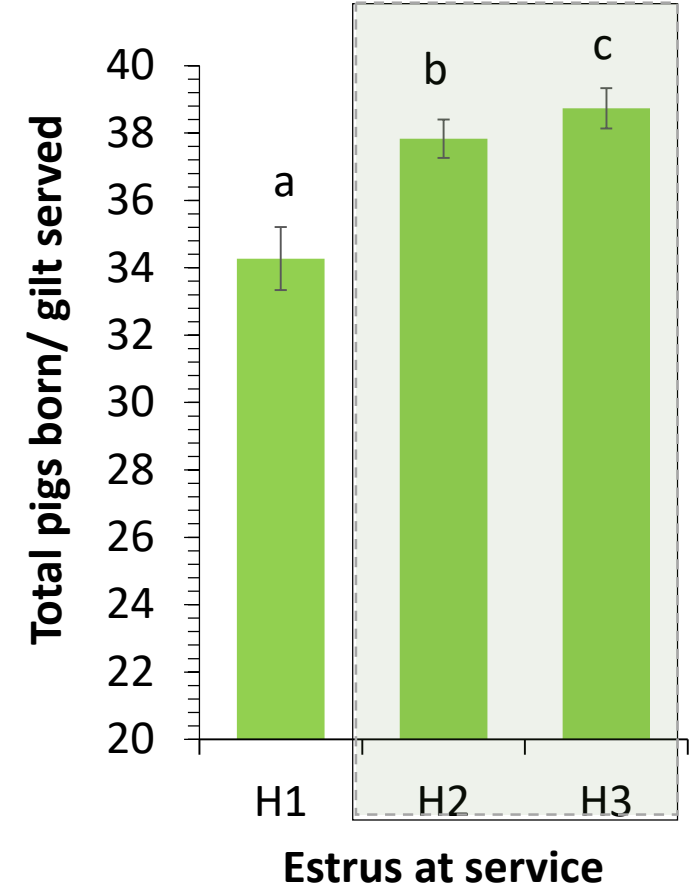Start of puberty stimulation - 25 weeks (180 days)

Start of puberty stimulation - 23 weeks (160 days)

Age at puberty (d)

Weight (kg)
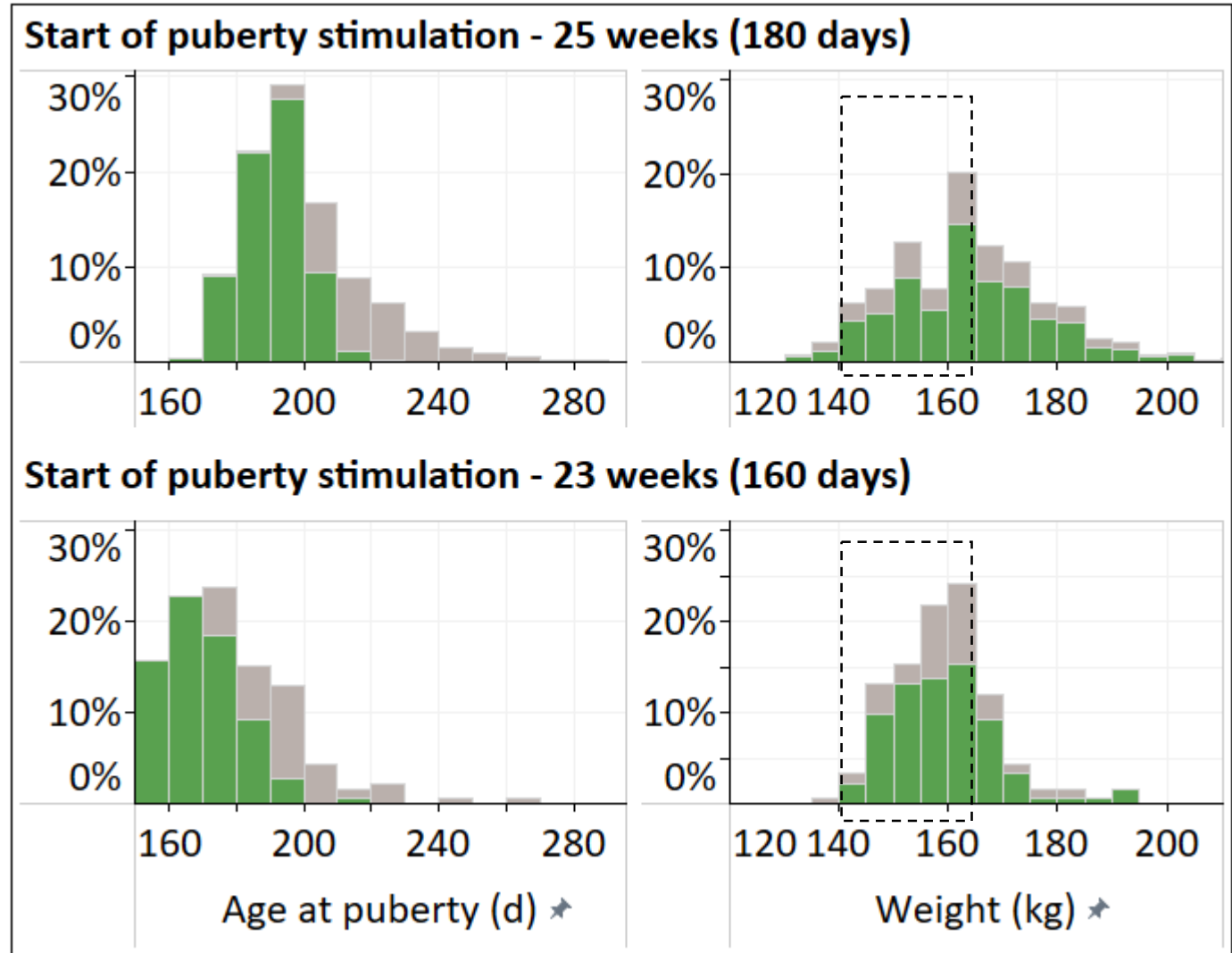
Estrus at Service

Farrow rate & total born:
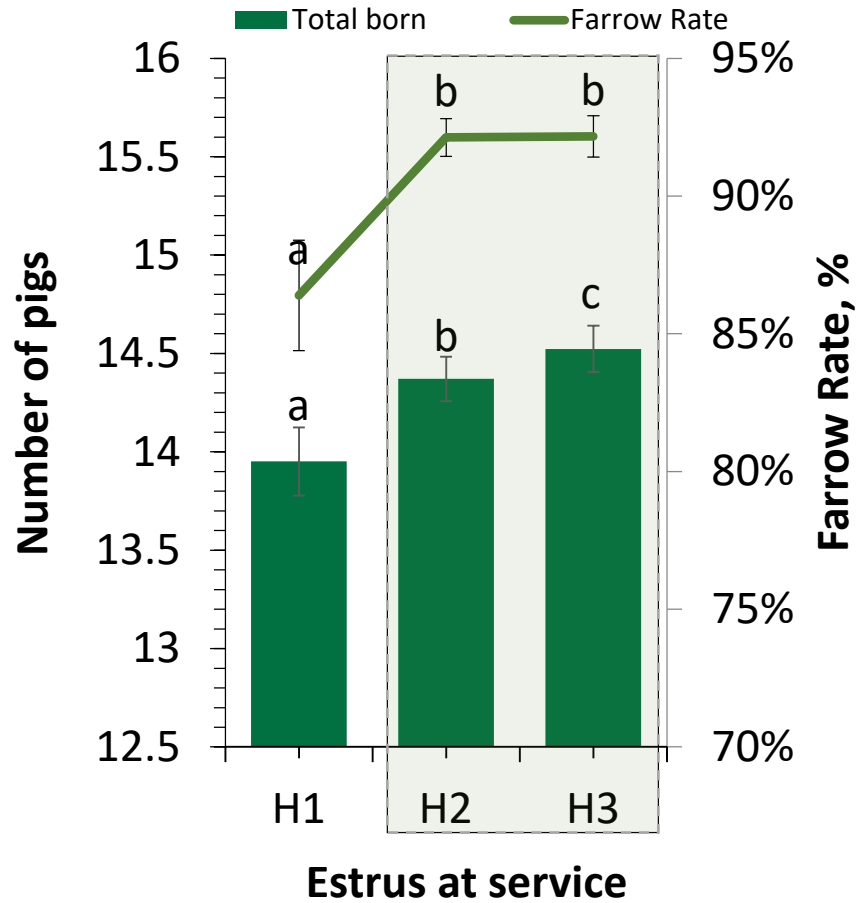
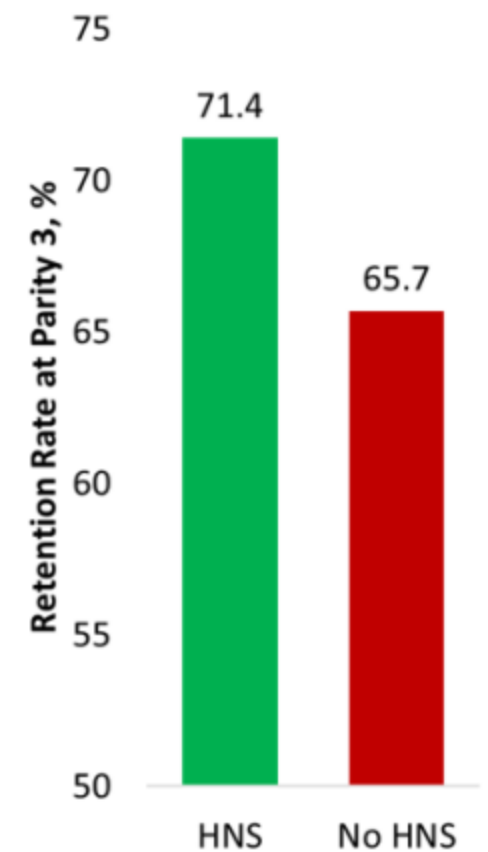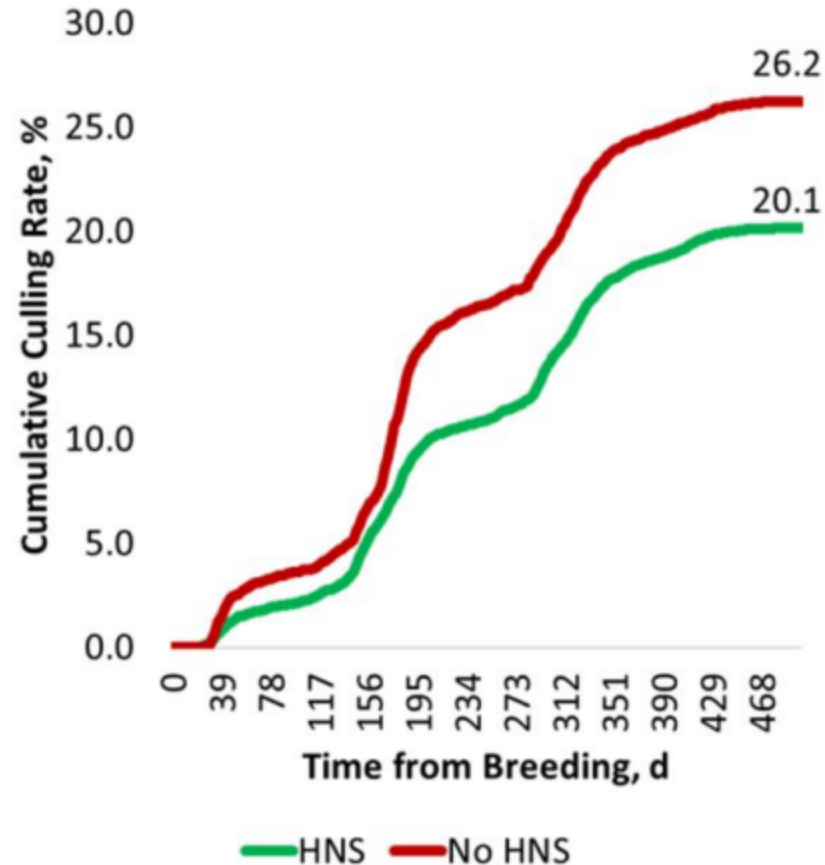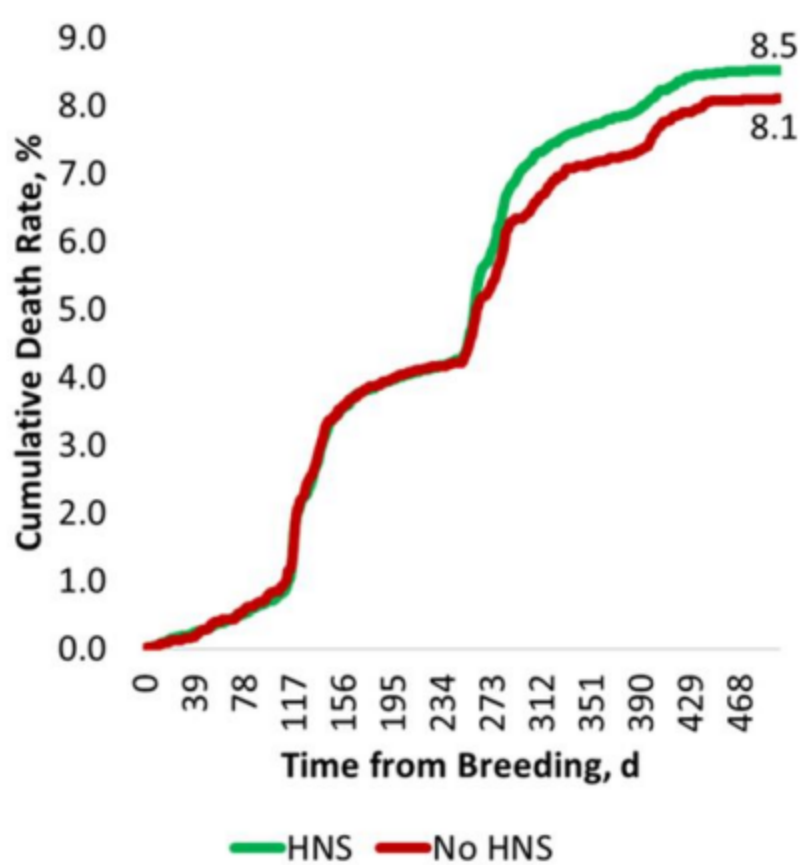## Retention to P3:

Total pigs born to P3:

Breed gilts on at least at 2ⁿᵈ detected estrus

DEATH AND CULLING RATE AFTER BREEDING TO PARITY 3

Francisco Cabezon (PhD) and Gustavo Pizarro (DVM) George Foxcroft Reproduction Workshop 2023

**Breed gilts on at least at 2ⁿᵈ detected estrus**
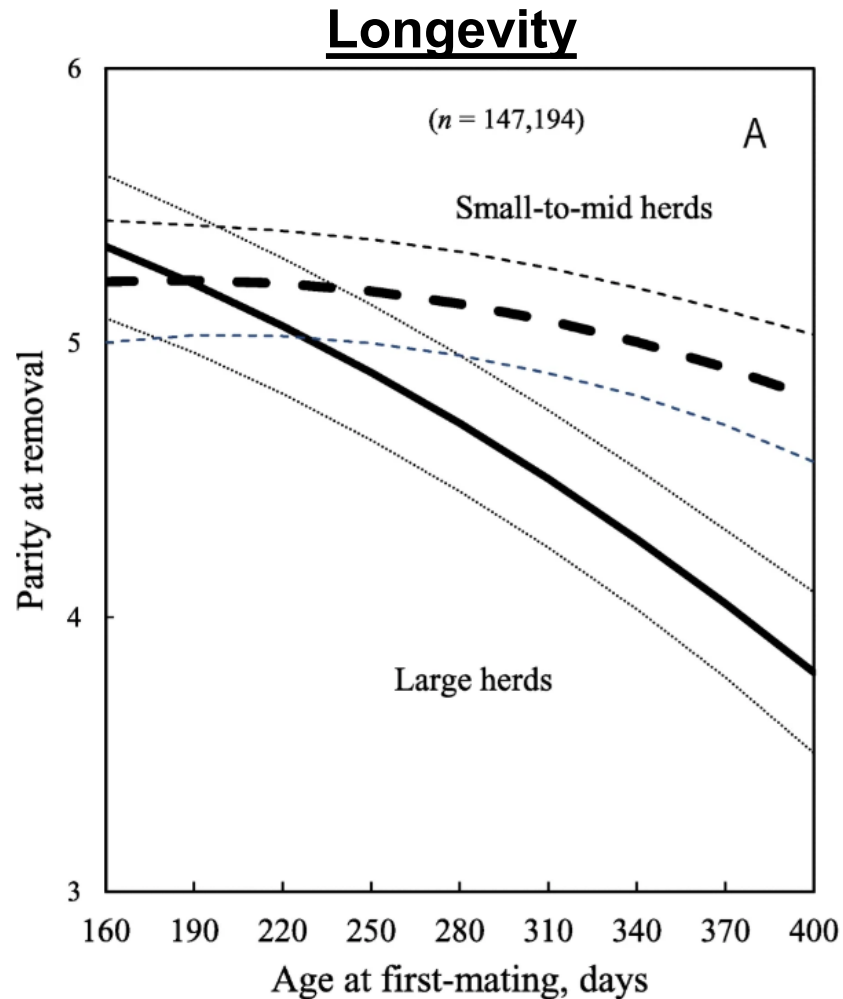
Weight at service

Heavy weights at breeding are a risk factor for retention, productivity and efficiency of the breeding herd.

- Increased litter size with increased service weight (Bruun et al., 2021)

- Lower retention to 3rd parity (Patterson and Pinilla, 2020)

- Increased risk for locomotion and structural problems (Amaral Filha et al,. 2010).

- Heavier at a farrowing and throughout their productive life

- Increased demands for maintenance (Bortolozzo et al., 2009).

- Increased risk of stillborns (Bortolozzo et al., 2009; Faccin et al., 2017)

Age at service

Increased age at mating results in poorer "Sow Lifetime Productivity"

Longevity

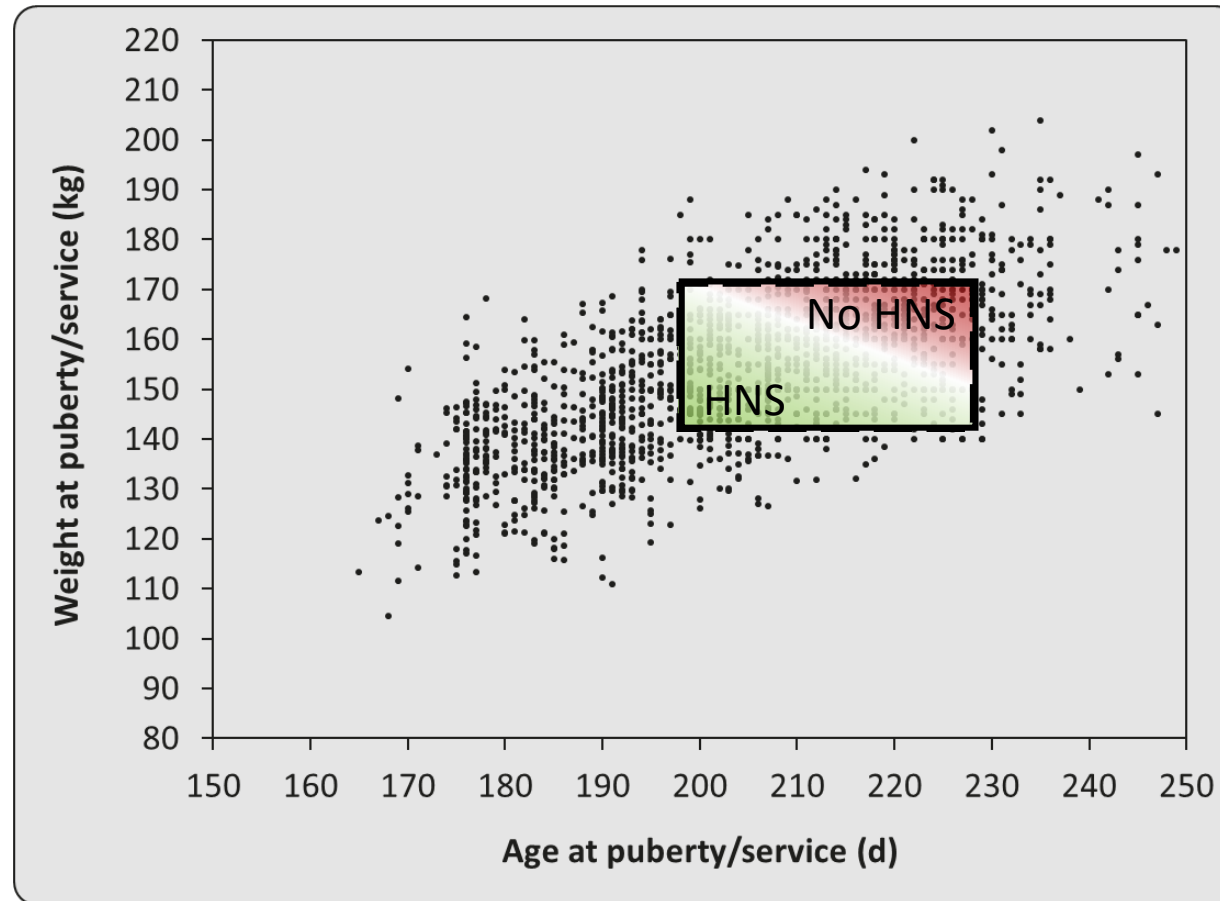### Productivity

Koketsu et al., 2020
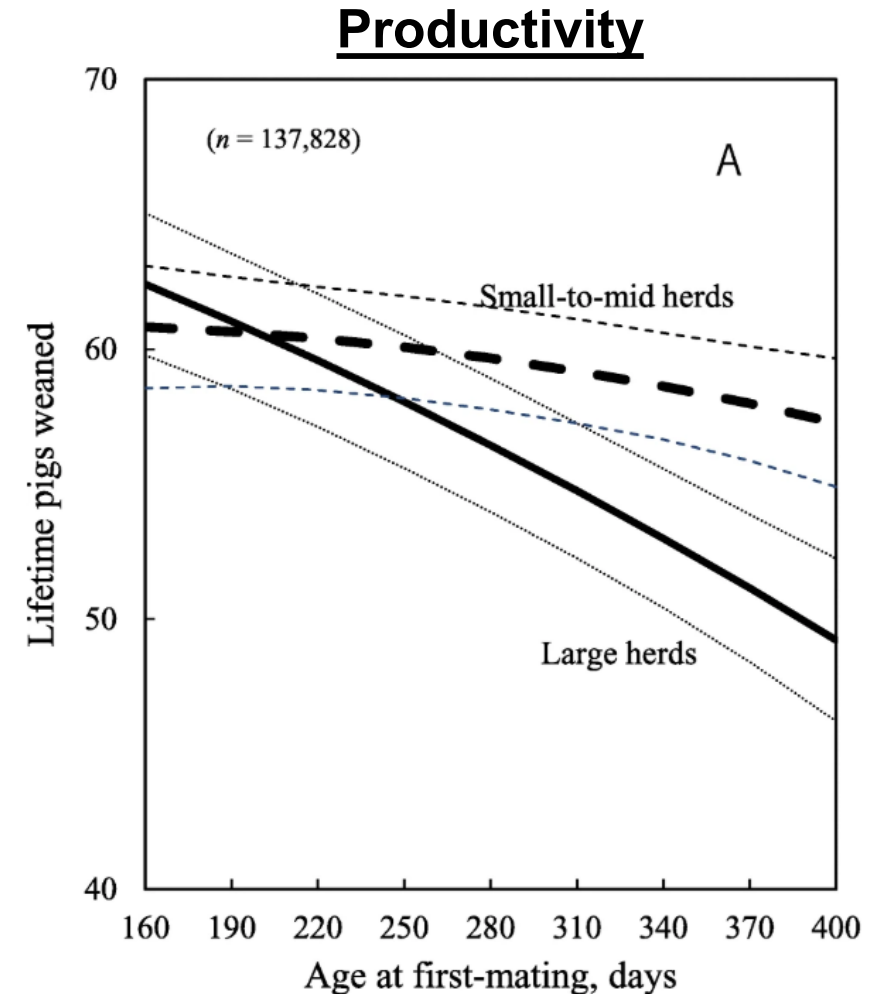
The "Fertility Quadrant"

Heavier Weight at Service

↑ 1st litter size
↑ Physical size
↑ Stillborn
↑ Lifetime maintenance costs
↑ Feed costs
↓ Retention to 3rd litter
↑ Risk of lameness
↑ Feed refusals

Lighter Weight at Service

↓ 1st litter size
↓ Performance during 1st lactation
↓ Body reserves during lactation
↓ Feed intake capacity

Scatterplot — Weight at puberty/service (kg) vs Age at puberty/service (d), with "No HNS" and "HNS" regions labeled.

HNS at service

↑ 1st litter size
↑ Farrowing rate
↑ Pigs after four litters
↑ Culling rates

Earlier Age at Puberty

↑ retention to 1st, 2nd, 3rd litter
↑ rebreeding success
↑ piglets during their lifetime
↓ fewer NPD (inseminated earlier)

Older Age at Service

↑ risk of being over weight
↓ piglets during their lifetime
↑ # of low efficiency sows
↑ weaning to service intervals
↑ risk for late returns

(Patterson and Canavate, 2023)

Key Concepts

Sow lifetime productivity – *a long process & a complex trait*

The loss of early parity sows is a challenge in our industry

Good gilt management from birth is the foundation of future sow lifetime productivity
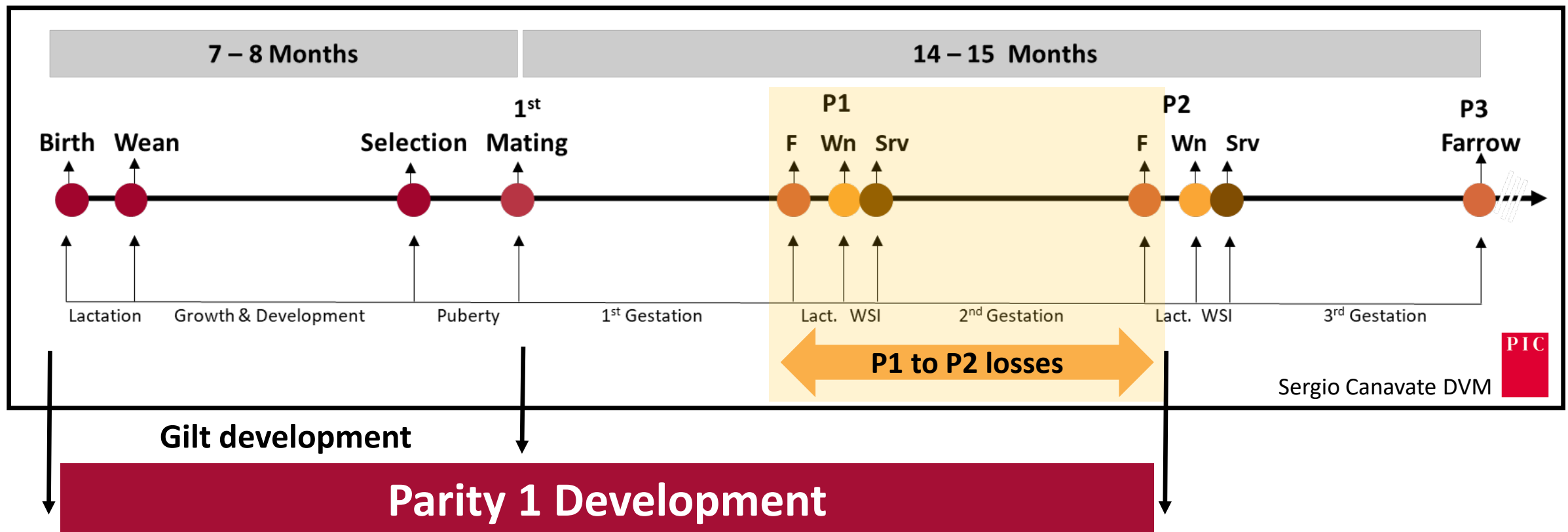
Rethinking gilt management - "Parity 1 Development"

Important performance metrics for "Parity 1 Development"

Rethinking gilt management – P1 Development

Gilt development does not stop at 1st mating

Goal is to deliver the "right" gilt to the farrowing unit.

Parity 1 Development

Feed management prior to breeding	Flush feeding during the cycle after puberty improves ovulation rate when gilts are below the target weight for breeding.
Feed management during gestation	Gilts should be fed to maintain or build body reserves without becoming over-conditioned at farrowing.
Body condition (weight) at farrowing	Impacts number of stillborns, colostrum and milk production, feed intake and body condition loss during lactation.
Management during 1st lactation	Individualized care for sows and their litters during their first lactation.
Management post weaning/breeding	Culling for no heat, failure to conceive and lameness are leading causes of loss between Parity 1 and 2.

Key Concepts

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Important performance metrics for "Parity 1 Development"

Current opportunities in data management

If You Can't Measure It, You Can't Improve It

(William Thomson, Lord Kelvin)
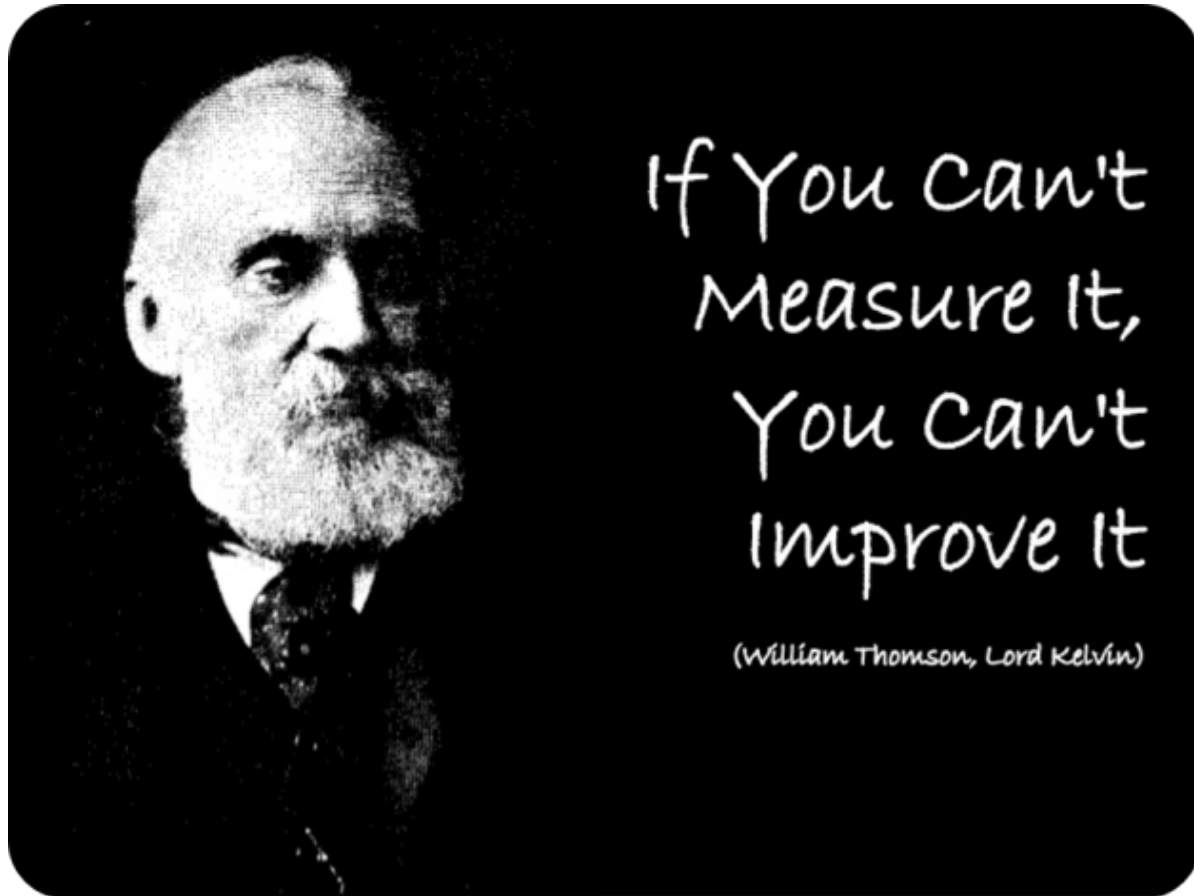
- Record data accurately.
- Use data that is collected on a daily basis to enable data-driven decision making.
- Data in the replacement gilt are often lacking.

Current opportunities in data management
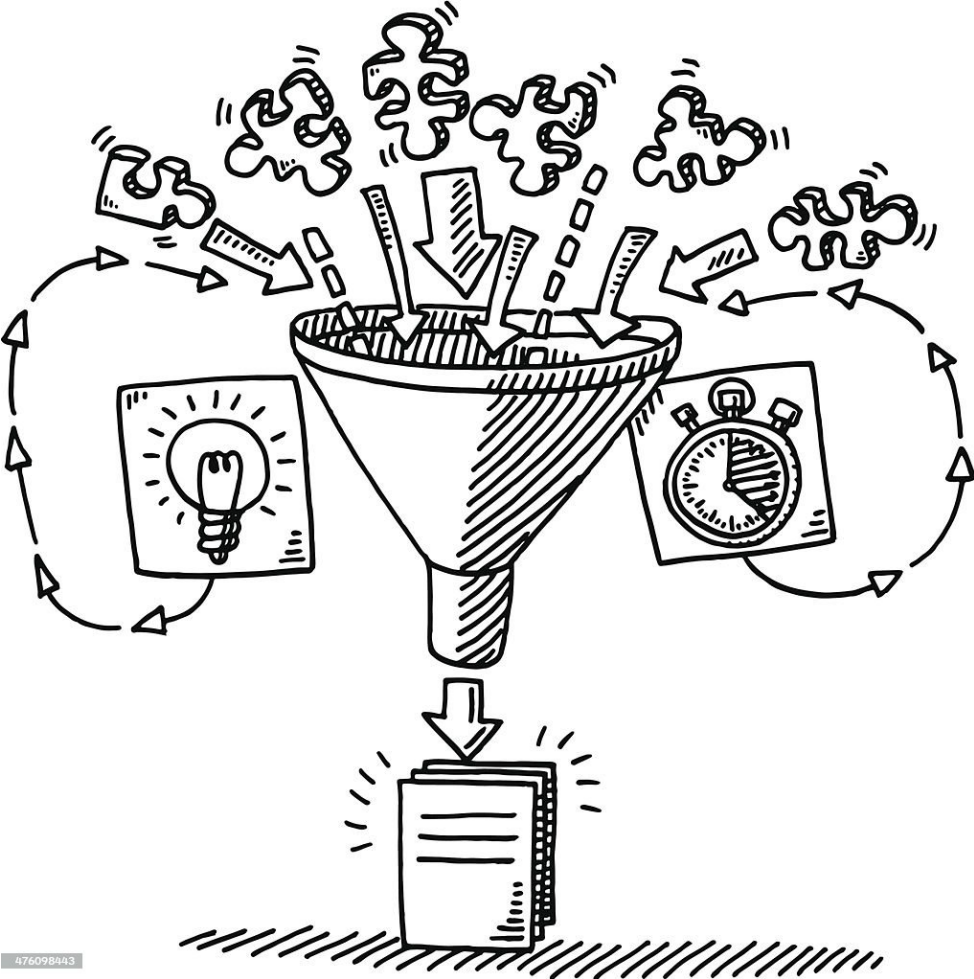
Opportunities in data management – Key Metrics

☑ Selection rates

☑ Response dynamics of successive cohorts of gilts to puberty induction programs

☑ The "Fertility Quadrant" - Age at puberty, estrus, weight and age at service

☑ Outcome response variables including conception and farrowing rates and litter size
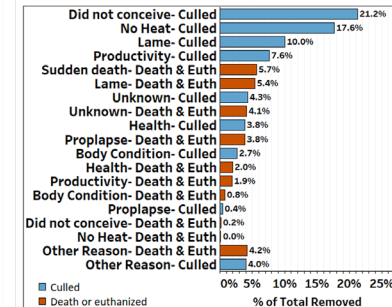
☑ P1 Development Reports - productivity and retention.

Percent in Quadrant	80.1%

	May	Jun	Jul	Aug	Sep	Oct
	77.7%	72.7%	71.4%	90.2%	86.6%	79.9%

Age at puberty	Age at service	% HNS	Weight at service
90.3%	93.6%	89.9%	89.1%

Percent loss of females between parities classified by year of entry into the herd.
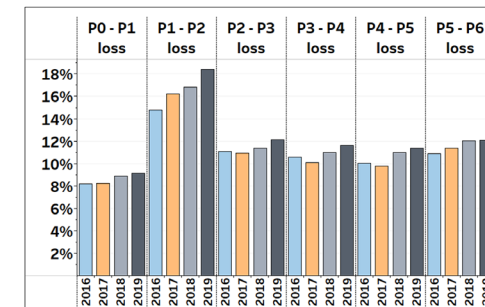
Breakdown of removal reason between parity 1 and parity 2.

Conclusions and Key Considerations

- Start with the end in mind.

- Good gilt management drives sow lifetime productivity (SLP).

- Sow lifetime productivity is a long process and a complex trait.

- The loss of early parity sows is a challenge in our industry.

- Expand view from traditional gilt development to focus on a sustainable P1 development.

- Measuring and managing the key components of gilt development is critical.