



Modern Herds, Modern Hurdles: Aligning Fertility Evaluations

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Overview

- ▶ Defining the traits and key components
- ▶ Management changes
- ▶ PTA trends in young animals
- ▶ Aligning the female fertility evaluation
- ▶ Next Steps
- ▶ How can you contribute to NCD?

Defining the traits and key components

Female Fertility Traits

Daughter Pregnancy Rate (DPR)

Cow Conception Rate (CCR)

Heifer Conception Rate (HCR)

Early First Calving (EFC)

Daughter Pregnancy Rate (DPR)



Breed means on Webconnect

- ▶ Predicts % of cows that will become pregnant in each 21-day cycle
- ▶ Positive = higher fertility in offspring expected

Bull A	Bull B
DPR PTA: 0.0 Daughter's expected average: 31.9% PR	DPR PTA: +1.0 Daughter's expected average: 32.9% PR

**PR = pregnancy rate*

Cow Conception Rate (CCR)



Breed means on Webconnect

- ▶ Predicts a lactating cow's ability to conceive
- ▶ Positive = higher fertility expected

Bull A	Bull B
CCR PTA: 0.0	CCR PTA: +1.0
Daughter's expected average: 41.9% CR	Daughter's expected average: 42.9% CR

**CR = conception rate*

Heifer Conception Rate (HCR)



Breed means on Webconnect

- ▶ Predicts a maiden heifer's ability to conceive
- ▶ Positive = higher fertility expected

Bull A	Bull B
HCR PTA: 0.0 Daughter's expected average: 56.1% CR	HCR PTA: +1.0 Daughter's expected average: 57.1% CR

**CR = conception rate*

Early First Calving (EFC)

- ▶ Predicts ability to alter female offspring's age at first calving
- ▶ Positive = earlier calving



Breed means on Webconnect

Bull A	Bull B
EFC PTA: 0.0 Daughter's expected average: 724.3 days	EFC PTA: +1.0 Daughter's expected average: 723.3 days

Data

- ▶ Female fertility evaluations use data from multiple formats
 - Format 1: **pedigree** records
 - Format 4: **lactation** records
 - Format 5: **reproductive** records



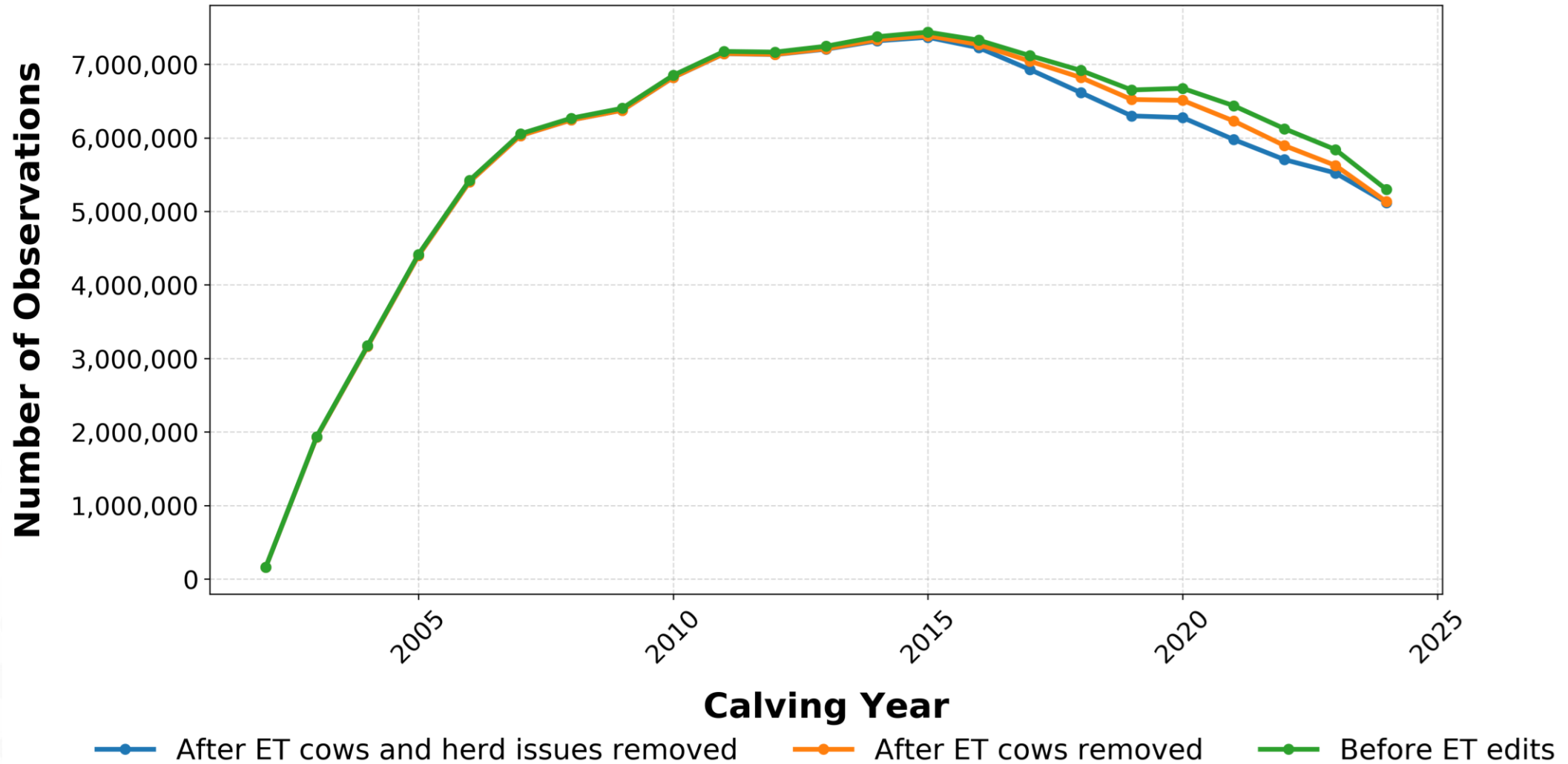
Key Components

- ▶ Calving dates
- ▶ Information about individual inseminations
- ▶ Pregnancy confirmation
- ▶ Embryo transfer status
- ▶ Contemporary groups
- ▶ Animal data

Embryo Transfer (ET) Edits

- ▶ Two ET edits applied to reproductive records with inseminations
 - ET cows' and heifers' inseminations are removed if resulting calf:
 - » Birth from embryo transfer
 - » Split embryo
 - » Clone from nuclear transfer
 - » Or embryo pedigree (implantation date stored as birth date)
 - ET record discrepancies: birth codes vs. reproductive events by herd

Number of Records by Calving Year Across ET Edits in National Cooperators Database

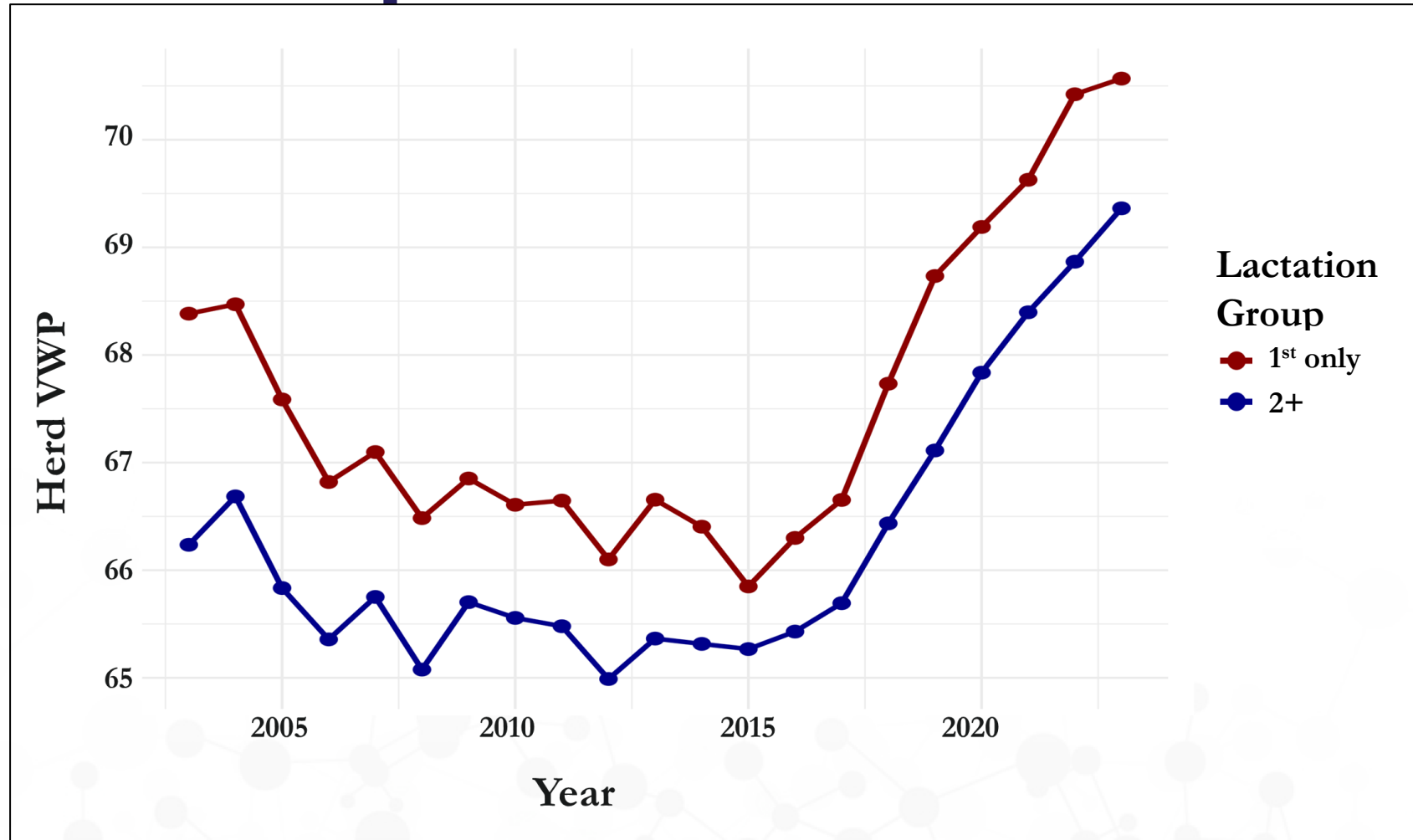


Management changes

Voluntary Waiting Period (VWP)

- ▶ Number of intentional days between calving and the first service
- ▶ Industry reported recent use of herd-specific or animal-specific VWP
- ▶ DPR currently assumes a VWP of 50 days, plus grace period of 70 days

VWP by herd-year and lactation group in National Cooperators Database



Evaluation Proposed Update #1

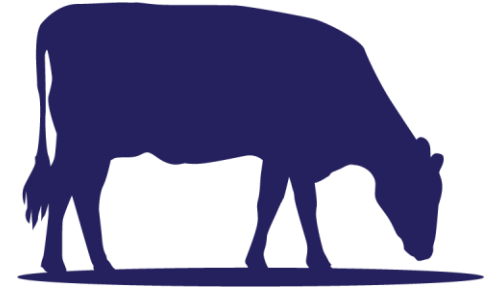
- ▶ DPR formula to include VWP by herd-year and by lactation group
 - 1st lactation only
 - 2nd and later lactations

Evaluation Proposed Update #2

- ▶ Potential new trait: First Service to Conception (FSC)
 - Number of days from first service to conception
 - Not a function of VWP
 - Interval trait that accounts for individual cow VWP changes

First Service to Conception

- ▶ Predicts lactating cow's ability to conceive, as interval trait
- ▶ Positive = fewer days to conception



Bull A	Bull B
FSC PTA: 0.0 Daughter's expected average: 55.67 days	FSC PTA: +2.0 Daughter's expected average: 53.67 days

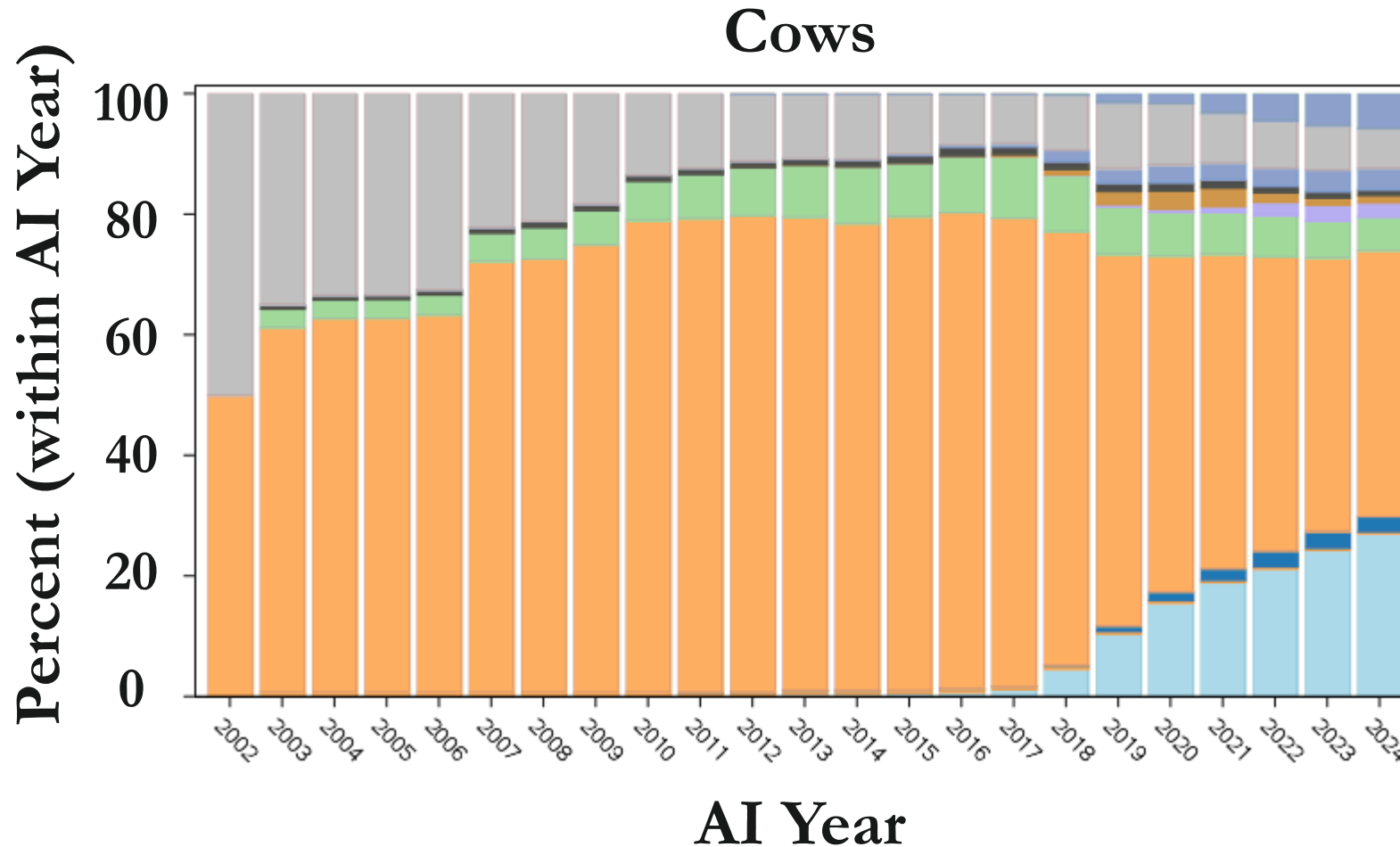
Management Changes: Inseminations

- ▶ NAAB reported the increased use of beef-on-dairy the last few years
 - “Breaking this down further, the beef on dairy semen sales increased by about 317,000 units both in the U.S. and for export [from 2023 to 2024]”

Inseminations and Conception Rates

- ▶ Conception rates are calculated using individual inseminations
- ▶ Before consolidating all inseminations to create a conception rate per lactation
 - They are adjusted to account for variation from one insemination to another
- ▶ Current evaluation adjusts inseminations for region by month, and mating type by year (includes sexed)
 - But do not consider breed of the service sire

Service Sire Breeds in National Cooperators Database



In 2024:

43.0% Holstein

28.9% Angus

6.6% Unknown

6.2% Crossbred Beef

5.2% Jersey

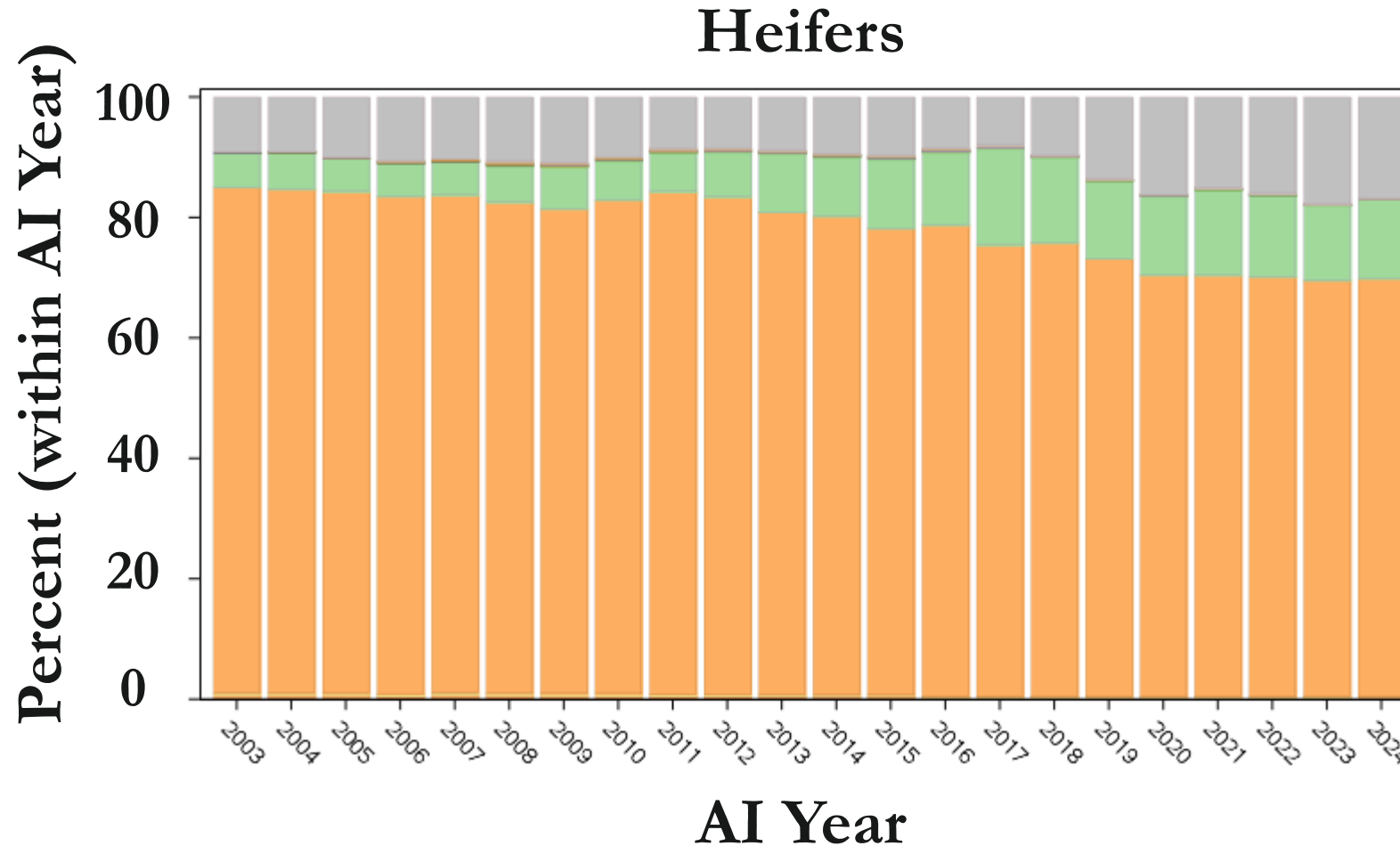
3.3% Simmental

2.6% Charolais

1.0% Kobe (Wagyu)

3.2% Other

Service Sire Breeds in National Cooperators Database



In 2024:

68.4% Holstein

17.8% Unknown

13.2% Jersey

0.6% Brown Swiss

Guernsey

Ayrshire

Montbéliard

Nordic Red

Other

Evaluation Proposed Update #3

- ▶ Inseminations to be adjusted for
 - Service sire breed
 - Breeding Event Type *(included in current system)*
 - » Artificial insemination (AI) with traditional, non-gender select semen
 - » AI breeding with gender selected semen
 - » Natural service breeding
 - » Unknown
 - Short cycle

PTA trends in young animals

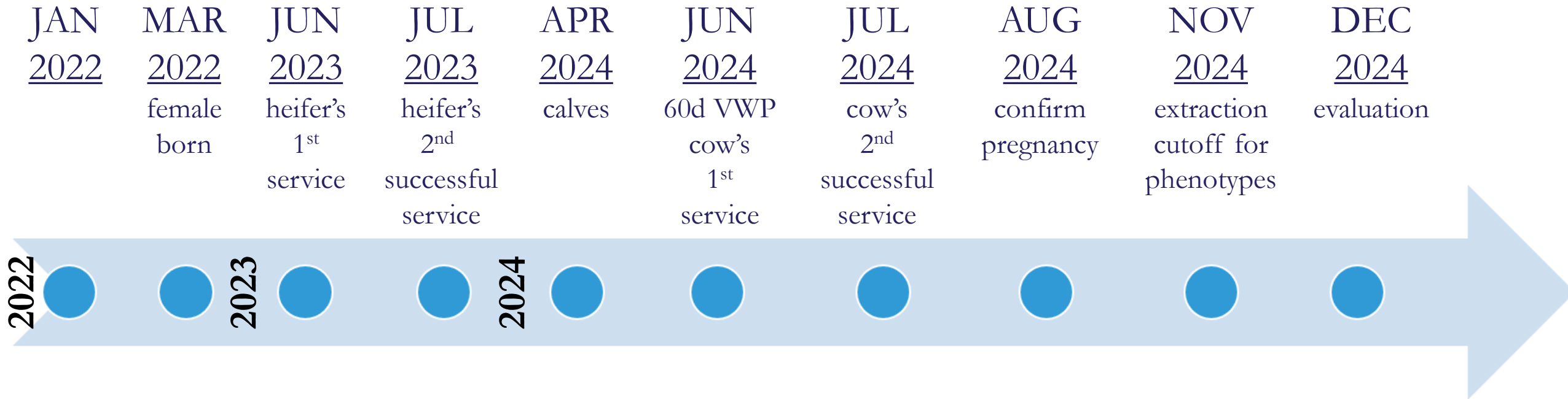
Young Sire Trends

- ▶ To ensure stability, methodologies should be reviewed
- ▶ In recent years, subtle but consistent seasonal patterns have been observed
- ▶ Some young bulls gradually, but consistently decline from evaluation to evaluation as more info is accumulated
 - Expect more variety in changes, upwards and some downwards

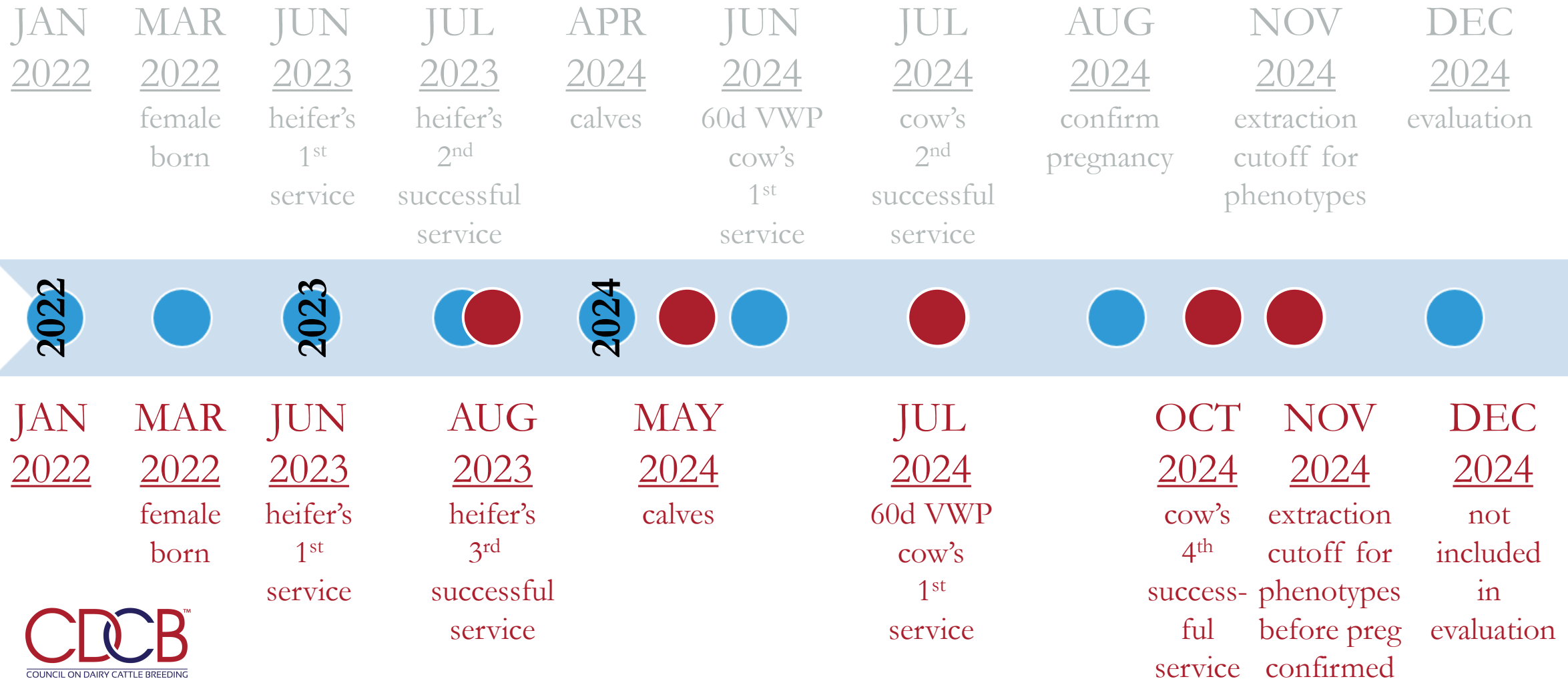
Young Sire Trend Explanation

- ▶ This is derivative of the trait itself
- ▶ High fertility heifers will likely be higher fertility cows and enter the data stream earlier than lower fertility cows born in the same year

Example of HIGH Fertility Cow's Data Entering December 2024 Evaluation



Example of LOW Fertility Cow's Data Entering December 2024 Evaluation



Young Sire Trend Explanation

- ▶ Higher fertility females entering the data pipeline earlier
- ▶ When a young bull gets his first daughter records, the highest fertility records are entered first
- ▶ After more daughters enter, we see a more normal distribution of his daughter's performance

Evaluation Proposed Update #4

- ▶ 1st lactation cows must be at least 3 years old (36 months) before their phenotype can be included
 - Allows for both high and moderate/low fertility daughters to enter evaluation closer together

Aligning the female fertility evaluations

Evaluation Proposed Update #5

- ▶ DPR available data has doubled since its development
 - No longer a need to predict incomplete records
 - ~0.02% to 3.95% of raw data across all years

Evaluation Proposed Update #6

- ▶ To improve computational efficiency, all data extraction programs will be updated

Evaluation Proposed Update #7

- ▶ CCR and new trait, FSC, to include days-in-milk at first insemination covariable

Evaluation Proposed Update #8

- ▶ Uncorrelated EFC will be moved to its own model for computational efficiency as the new trait, FSC, is highly correlated with existing traits

Variance Component Updates

- ▶ Using the last 10 years of data, variance components were re-estimated leading to updated **heritability**

	Current	Re-estimated
DPR	1.4%	2.9%
CCR	1.6%	2.9%
HCR	1.0%	1.4%
FSC	-	3.2%
EFC	2.7%	6.0%

Variance Component Updates

- ▶ Using the last 10 years of data, variance components were re-estimated leading to updated **genetic correlation**



A genetic correlation between two traits shows how the genes affecting one trait are related to the genes affecting the other.

Variance Component Updates

- ▶ Using the last 10 years of data, variance components were re-estimated leading to updated **genetic correlation**



- +1.0 If animal has good genes for trait 1, likely has good genes for trait 2
- 1.0 If animal has good genes for trait 1, likely has bad genes for trait 2
- 0.0 Genes for trait 1 give no information about genes for trait 2

Variance Component Updates

- ▶ Using the last 10 years of data, variance components were re-estimated leading to updated **genetic correlation**

	Current	Re-estimated
CCR-FSC	-	+0.98
DPR-FSC	-	+0.96
DPR-CCR	+0.86	+0.94
DPR-HCR	+0.36	+0.56
CCR-HCR	+0.45	+0.52
HCR-FSC	-	+0.46

Why are strong correlations useful?

- ▶ DPR has available data from 1960 – current
- ▶ CCR, HCR, and FSC only have data from 2002 – current
- ▶ Including DPR in the multi-trait model, gives more information to other traits

Evaluation Proposed Update #9

- ▶ New variance component estimates, thus new genomic parameters

Next Steps

Next Steps

- ▶ The Interbull validation process is needed for the potential new trait before it can be incorporated
- ▶ The next available Interbull test is January 2026
- ▶ We will need to pass this validation before the updates and potential new traits can be added into the evaluation
- ▶ Excited to share more news as this develops and moves closer to implementation in the evaluation

Call to Action

How can you contribute to the National Cooperator Database?

- ▶ Ensure service sire is properly recorded
 - NAAB bull ID with each reproductive event
 - Allows us to use service sire breed as factor in evaluation
- ▶ Ensure ET birth codes and reproductive events are both recorded
- ▶ Ensure animal ID is unique and recorded correctly
- ▶ Ensure animal has sire, dam, and date of birth



THANK YOU FOR YOUR ATTENTION

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COUNCIL ON DAIRY CATTLE BREEDING