# Council on Dairy Cattle Breeding Research Update

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CDCB Geneticist

CDCB Industry Meeting, October 4, 2023

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# Feed Efficiency & Emissions

## Background
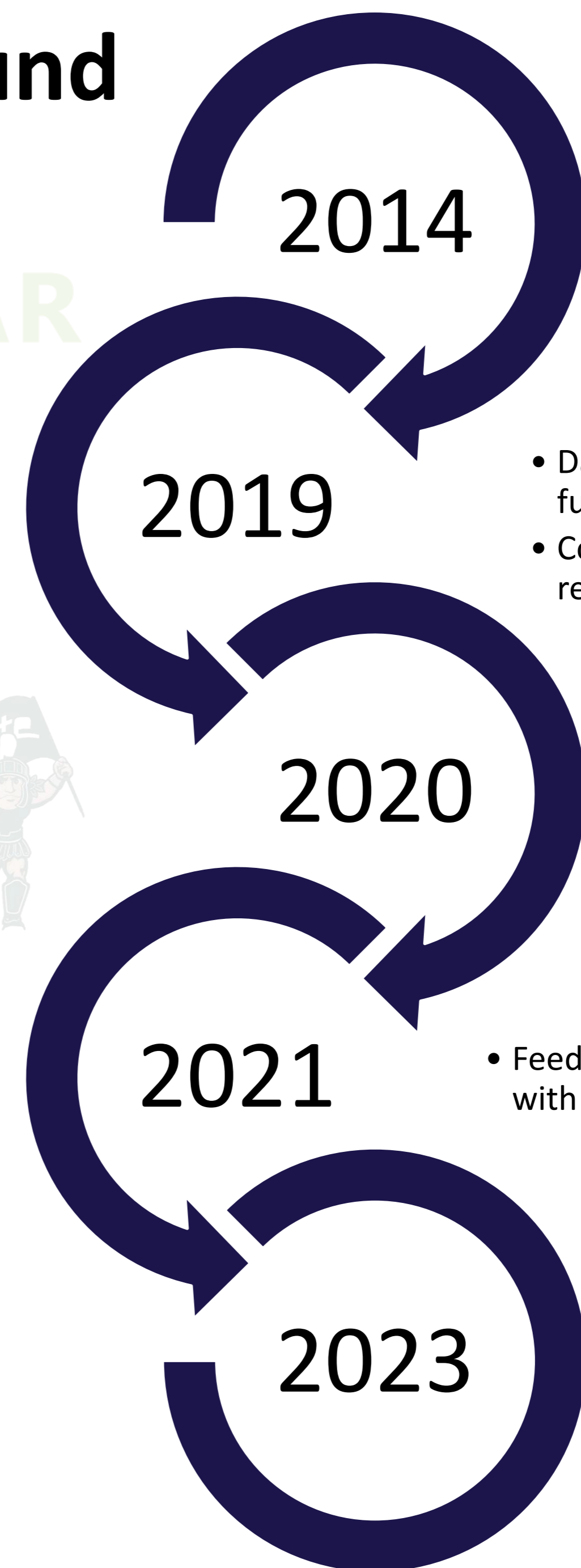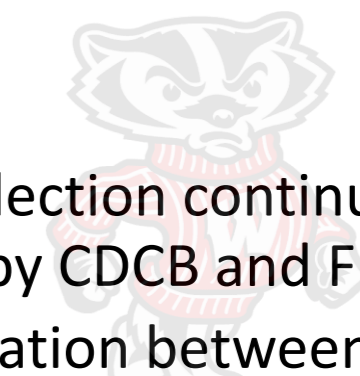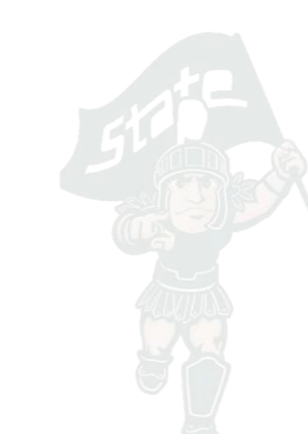
**2014**
- Data collection began, funded by NIFA

**2019**
- Data collection continues, jointly funded by CDCB and FFAR
- Collaboration between 5 U.S. research institutions

**2020**
- Feed Saved evaluations introduced by CDCB

**2021**
- Feed Saved added to Net Merit index with August evaluations

**2023**
- Feed Saved evaluations currently include 8,887 phenotypic records from U.S. Holsteins and 1,187 from Canadian Holsteins for a total over 10,000 records

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# Feed Efficiency & Emissions



The Greener Cattle Initiative is a consortium of stakeholders who share knowledge, leverage investments and accelerate research to identify, develop and/or validate scientifically sound, commercially feasible and socially responsible practices and technologies that reduce enteric methane emissions from dairy and beef cattle to slow the effects of climate change.



Cattle Industry Consortium Funds Research Aimed at Reducing Enteric Methane Emissions

September 14, 2023    Champaign, IL & Madison, WI

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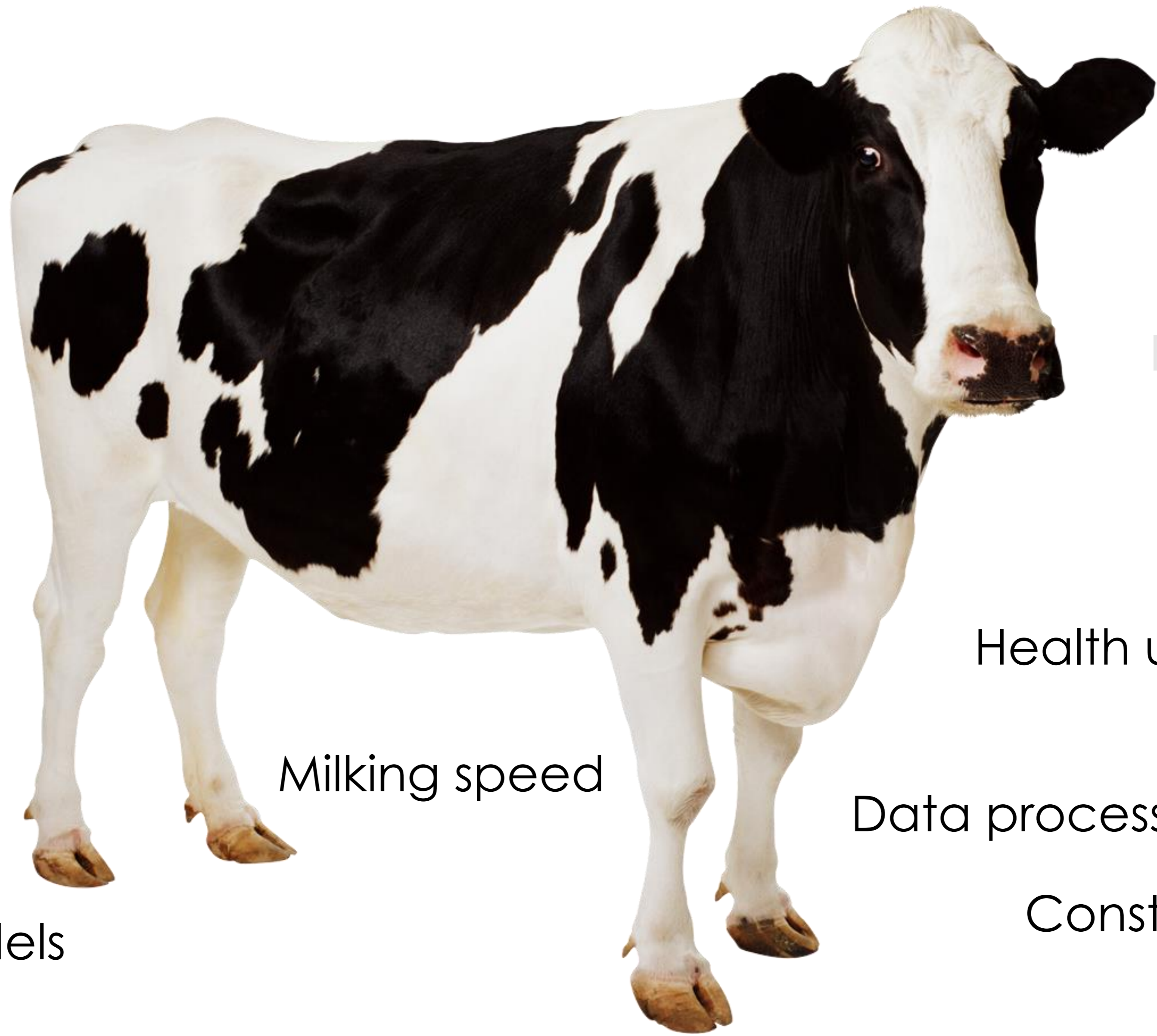
# Health updates

- Brown Swiss health evaluation

- Johne's evaluation

- Health evaluation improvements

- Hoof health project

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# Health updates

# Health updates

## Brown Swiss health evaluations

Health evaluations include Brown Swiss cows since August 2022

**Incorporation of foreign data for Brown Swiss clinical mastitis through Interbull**

- Majority of bulls contributing clinical mastitis data from Switzerland and France

- All bulls with clinical mastitis data have genotypes in U.S.

- Noticeable impact for traditional and genomic mastitis evaluations for Brown Swiss

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# Health updates





## Johne's evaluations

- Research started by AGIL ~2009

- Additional recent data available for further analysis

- Internship projects – 2019 and 2022

- Feasibility study – can we use genetic selection to improve resistance to Johne's disease?  **YES!**

- Next steps are to further evaluate the best model going forward and perform a test run with the currently available data

- More hurdles to get through – routine data pipeline, data sensitivity concerns



**Feasibility study of genetic evaluation for Johne's disease in U.S. Holstein dairy cattle**

| | |
|---|---|
| Journal: | *Journal of Dairy Science* |
| Manuscript ID | JDS.2023-23788.R1 |
| Article Type: | Research |
| Date Submitted by the Author: | 12-Sep-2023 |
| Complete List of Authors: | Novo, Larissa; University of Wisconsin - Madison, Animal and Dairy Sciences; Council on Dairy Cattle Breeding, Parker Gaddis, Kristen; Council on Dairy Cattle Breeding Wu, Xiaolin; Council on Dairy Cattle Breeding McWhorter, Taylor; Council on Dairy Cattle Breeding Buchard, Javier; Council on Dairy Cattle Breeding Norman, Howard; Council on Dairy Cattle Breeding Dürr, João; Council on Dairy Cattle Breeding Fourdraine, Robert; Dairy Records Management Systems Peñagaricano, Francisco; University of Wisconsin-Madison, Animal and Dairy Sciences |
| Key Words: | infectious disease, heritability, genetic trend, reliabilities |

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Manuscripts

# Health updates

## Health trait evaluation improvements

| Run | TOTAL | HOL | JER | BSW |
|---|---|---|---|---|
| April 2018 | 1.8 M | 1.8 M | - | - |
| Aug 2018 | 2.0 M | 2.0 M | - | - |
| Dec 2018 | 2.2 M | 2.2 M | - | - |
| April 2019 | 2.4 M | 2.4 M | - | - |
| Aug 2019 | 2.6 M | 2.6 M | - | - |
| Dec 2019 | 2.8 M | 2.8 M | - | - |
| April 2020 | 4.0 M | 3.2 M | 382 K | - |
| Aug 2020 | 4.4 M | 3.7 M | 478 K | - |
| Dec 2020 | 4.7 M | 3.9 M | 520 K | - |
| April 2021 | 5.1 M | 4.2 M | 582 K | - |
| Aug 2021 | 5.5 M | 4.5 M | 645 K | - |
| Dec 2021 | 5.9 M | 4.8 M | 689 K | - |
| April 2022 | 6.3 M | 5.1 M | 733 K | - |
| Aug 2022 | 6.6 M | 5.3 M | 766 K | - |
| Dec 2022 | 6.9 M | 5.5 M | 809 K | - |
| April 2023 | 7.1 M | 5.7 M | 840 K | 18.5 K |
| Aug 2023 | 7.4 M | 6.0 M | 882 K | 18.9 K |

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# Health updates

## Health trait evaluation improvements

- Significant growth in phenotypic records since introduction

- Re-estimation of variance components and heritabilities for all currently evaluated health traits

**Current Status:** Testing impact of these updates

**End Goal:** Provide better evaluations for health traits

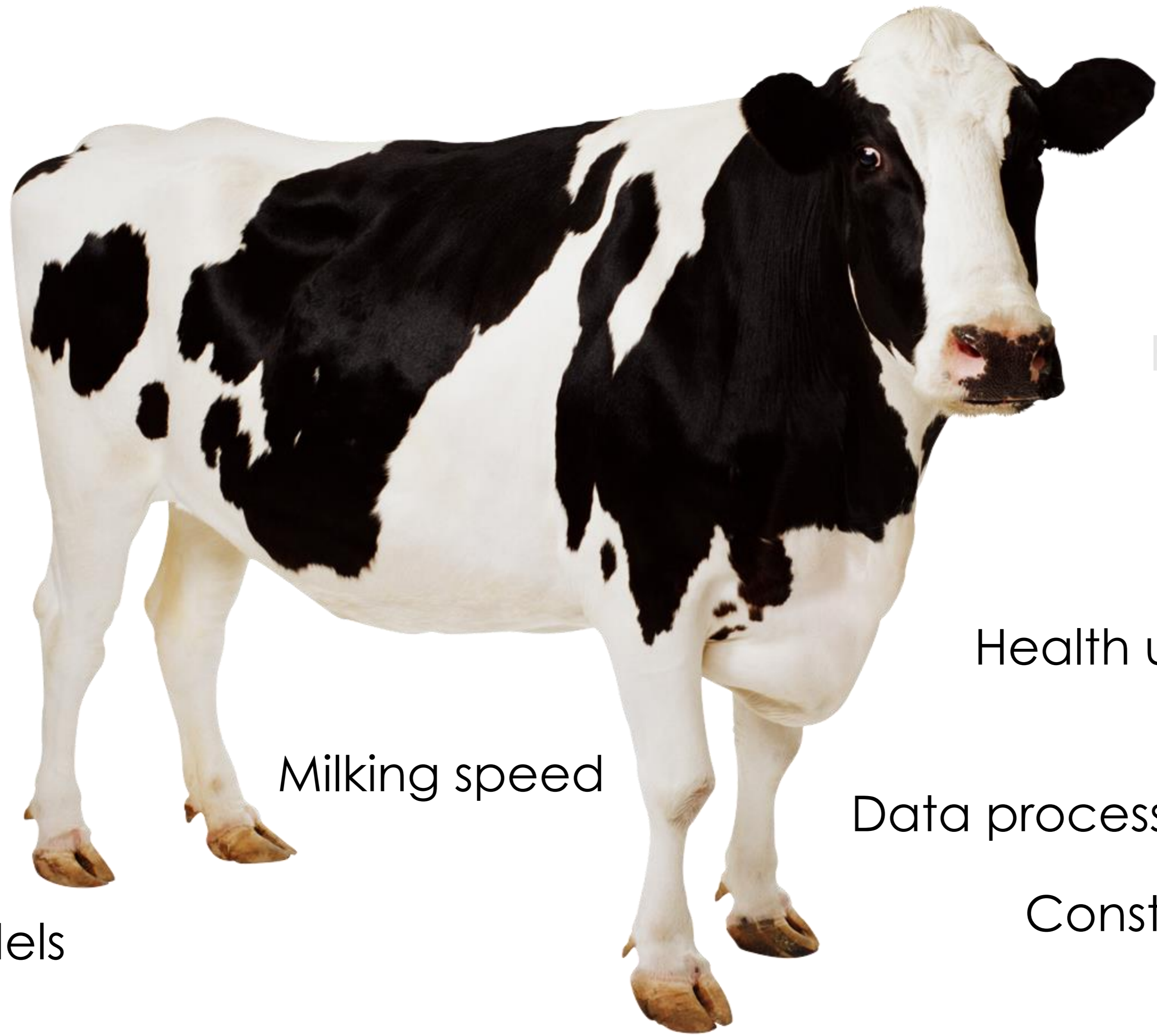CDCB
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# Health updates



## Hoof Health Initiative

- Data available for 2 herds (IA and MN)

- Internship project: data wrangling & cleaning

- Investigating how to best use CattleEye data

- How does mobility score as measured by CattleEye impact hoof health (trimmer-reported lesions), conformation score, production, and longevity

- Additional herds being added from CA (7k cows) and AZ (4k cows)

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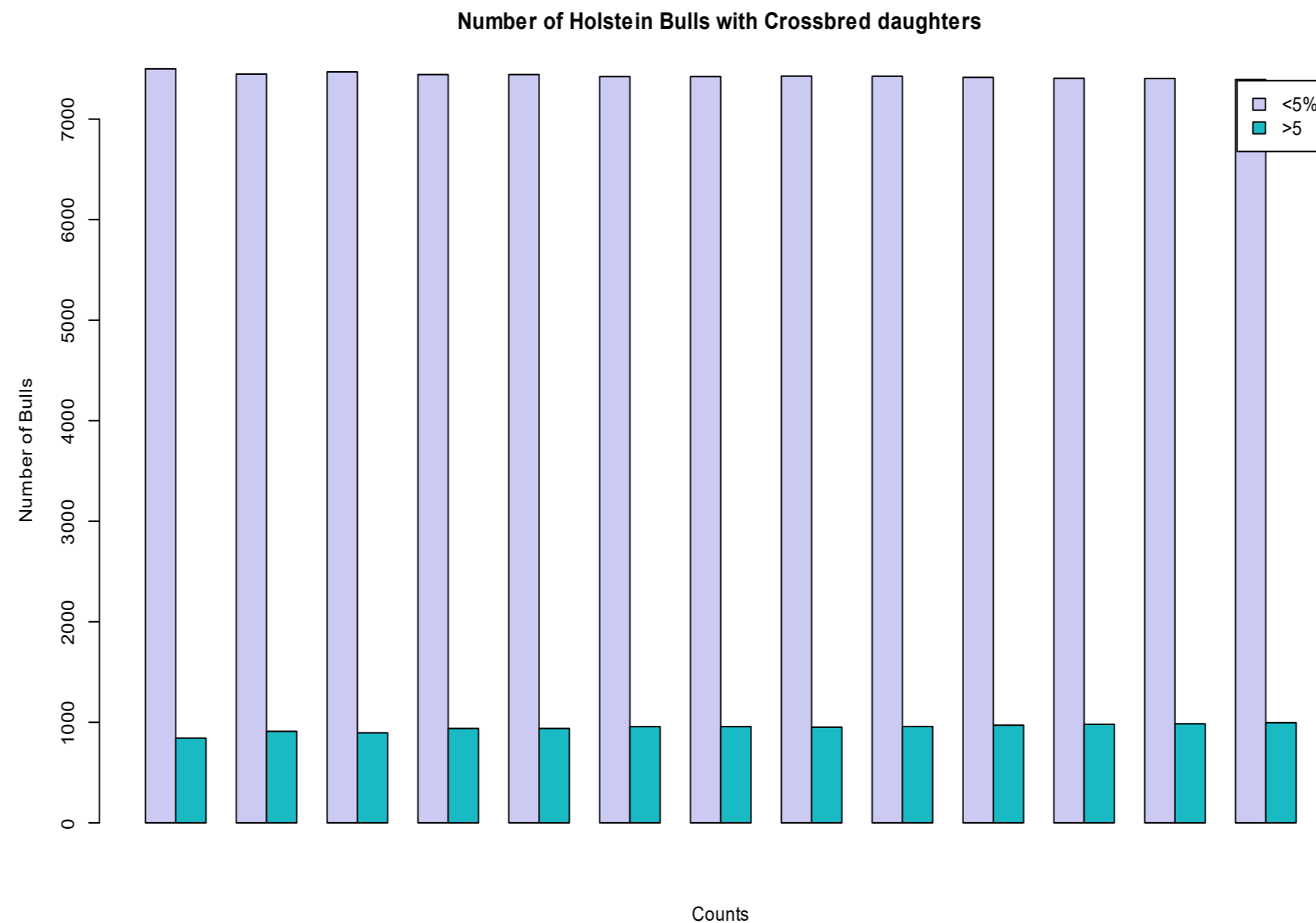
# Internship projects

**Objective:** Investigate the impact of crossbred daughters on bull evaluations

Are reliabilities over- or under-estimated due to crossbred daughter information?



Number of Holstein Bulls with Crossbred daughters

# Internship projects

**Objective:** Investigate the impact of crossbred daughters on bull evaluations

Are reliabilities over- or under-estimated due to crossbred daughter information?



Number of Jersey Bulls with Crossbred daughters

# Internship projects

**Objective:** Investigate the impact of crossbred daughters on bull evaluations

Are reliabilities over- or under-estimated due to crossbred daughter information?

Using US bulls with no genotypic or foreign information included

Holstein milk yield EBV showed slight bias, but no conclusion to what caused it

No large differences in the change of PTA across time for either HO or JE

**NEXT STEPS:**
- Gain a better understanding of the results

- Investigate impact of heterosis

- Investigate the percent heterosis vs. reliability

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# Data processing

## Genomic Team



## Improve efficiency

- Prepare for the future (~25M genotypes)
- Simplify ingestion
- Decrease processing time
- Maintain data quality & integrity

## Better user experience

- Provide high quality service
- Generate relevant information for users
- Update system for industry needs
- Continuous improvement

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# Constructed ID



- Constructed IDs are created to link calves to MGS and MGGS

- Implementation began April 2023; historical updates continuing

- Real dam ID is preferred over constructed IDs

- Improved accuracy
  - Improved genetic and genomic estimations
  - Improved inbreeding estimates
  - 1 point increase in average reliability

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# Single step models

**Needs**

- A pipeline that runs actual computations in less than 1 day

- Meaningful results – genomic PTAs, SNP solutions, meaningful trends, little or no re-ranking of bulls with many progeny

# Single step models

## Issues to be addressed

- National cooperator database is the largest dairy database in the world
- Every test takes a few hours or days (or longer)
- Software (blupf90) has not been fully optimized for dataset this large in a production setting
- Creating realistic tests is difficult

# Single step models

## Current Status

- Started with **Fertility** – more complex

- Model improvements, software improvements, better theory of how to model missing parents

- Next steps – include genotypes

  - Test with 40k genotypes ✓

  - Testing use of APY method

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**Research topics**

# Fertility



- Implementation of reproductive technologies have drastically shifted industry standards
  - Sexed semen usage
  - Timed AI protocols
  - Embryo transfer
- How does this impact fertility evaluations?
- *Beginning stages of discussion and research*

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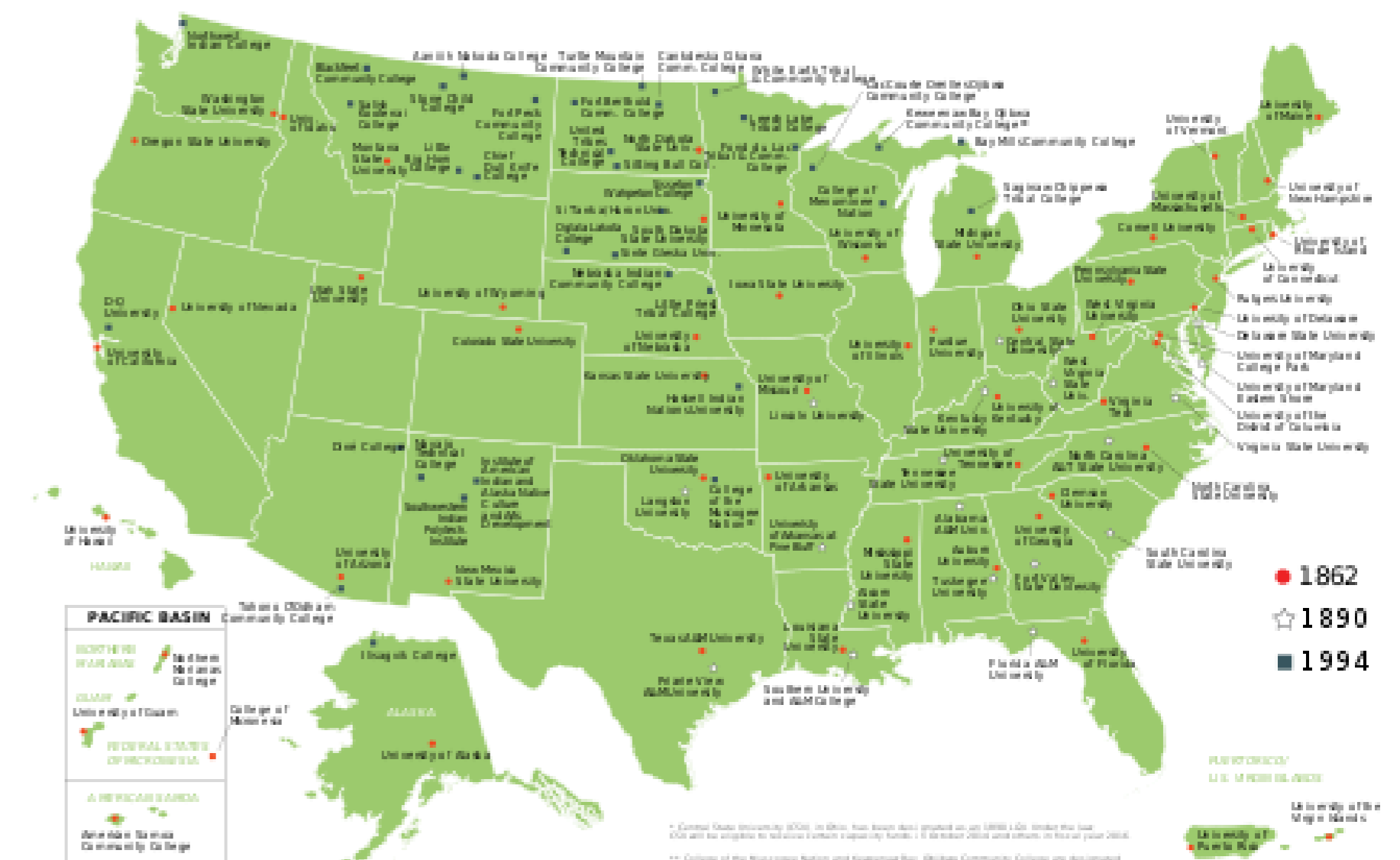Health updates

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# THANK YOU FOR YOUR ATTENTION

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