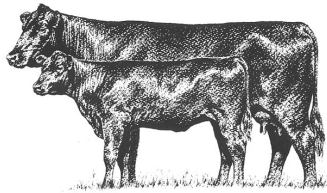# Length of Productive Life EPD

National Angus Conference & Tour

Fountain of Youth for Monkeys

Introduction

- Cow fertility and longevity has the greatest impact on cow-calf profitability

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Do we need another EPD

- Birth Weight
- Weaning Weight
- Yearling Weight
- Mature Weight
- Carcass Weight
- Ribeye Area
- Marbling
- Backfat
- Calving Ease Direct
- Yearling Height
- Mature Height
- Scrotal Circumference
- Docility
- Residual ADG
- $ Value Index(s)

Do we need another EPD- Maternal Traits

- Milk (WWM)
- Calving Ease Maternal
- Heifer Pregnancy

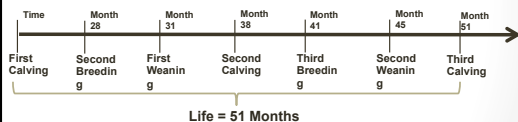- No direct evaluation of cow longevity

Overview

- Create a prediction of long-term female productivity for Angus cattle
- Utilize existing calving and disposal information
- Report in a easy to understand unit of time not probability
- Apply survival model techniques to form predictions

Length of Productive Life

- What is the economically relevant trait…
Productive cow that breeds every year and maintains structure and condition

- Other genetic evaluations of long term reproductive productivity
  - Stayability (Red Angus, Simmental, NALF, Gelbvieh)
  - Length of productive life (dairy breeds)

What data goes into Length of Productive Life

- Dates:
  - When did she start producing
  - When did she end producing

Time	Month 28	Month 31	Month 38	Month 41	Month 45	Month 51
First Calving	Second Breeding	First Weaning	Second Calving	Third Breeding	Second Weaning	Third Calving

Life = 51 Months

Marriage of Existing Data With New Data

- MaternalPlus data is ideally suited for a trait such as productive life
- Accurate disposal codes lead to accurate evaluation
- When disposal data is not available, err on the side of caution

Stayability vs. Length of Productive Life

Stayability

- Probability a cow will remain in the herd to six year of age given she produced a calf at two.
- Threshold nature (yes/no)
- Six years was identified as break even benchmark
- No allowance for females yet to reach benchmark
- No performance indicator traits
- Expressed as a probability

Length of Productive Life

- Number of days a females is expected to remain productive in the herd
- (semi)Continuous data
- Risk of failure or success over a period of time
- Censoring allows early data collection
- Performance indicators:
  - Pounds of Milk
  - Milk components
  - WWT,CEM,WWM

Aggregate Stayability

- First stayability EPD released in 1993 (RAAA)
- Sire was 8 years old before his daughter reached the benchmark => low accuracy
- Earlier benchmark as indicators

Stayability

Age	3yr	4 yr	5 yr	6 yr
3yr	0.11	0.84	0.46	0.49
4yr		0.12	0.85	0.70
5yr			0.11	0.60
6yr				0.12

h^2 on diagonal, genetic correlations above

(Brigham et al., 2009)

Survival Models

- Currently no beef breeds use this methodology to access genetic merit
  - Difficult data to sort through and evaluate
  - Heritability is low (all evaluation methods of female fertility are)
- Prominent in dairy evaluations
  - Data is much more complete and detailed
- Computationally demanding
  - Computer horsepower to do such evaluations is relatively new

Why survival models

- **Censoring**
  - We can use what we know about her contemporary group to "weight" her observation that she'll keep producing for additional time

- She became a ET donor cow… she is still being productive just a different definition of productive
- We know a cow has produced a calf this year and is bred to produce another next year
  - ie – She's still in production

Why do cows leave the herd

- What affects a cow **productive** life span
  1. Pregnancy status
  2. Structure
  3. Disposition
  4. Age
  5. Offspring performance
  6. Location
  7. Weather

Survival Curve
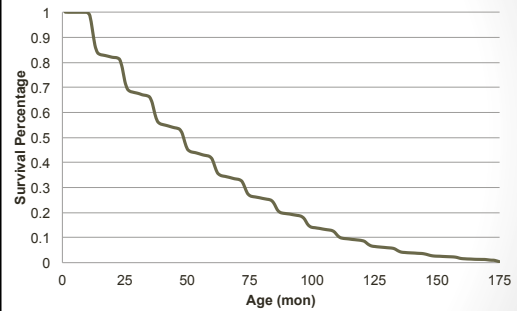
Automobile analogy

- Every driver is at a different risk of having an accident at any given time
  - Location
  - Age
  - Activities while driving

- Difference in insurance rates
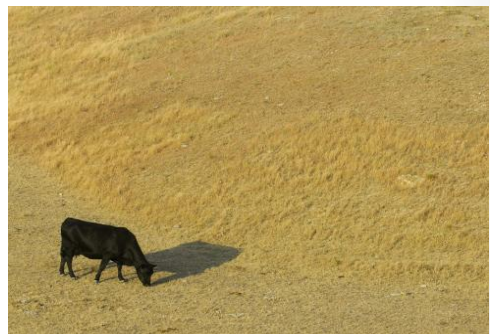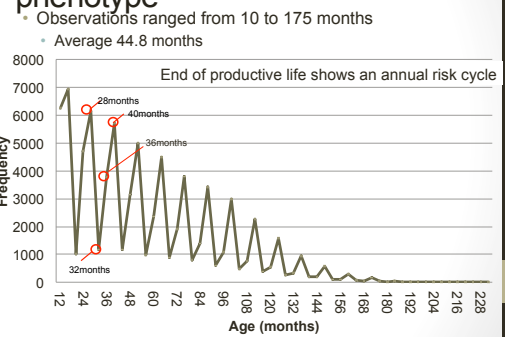
High risk driving

Low risk driving

Low risk environment

High risk environment

Length of Productive Life phenotype

- Observations ranged from 10 to 175 months
- Average 44.8 months

Beef Improvement Federation Guidelines

- Four major hurdles in evaluations of longevity measures

1. How are the interval or endpoints defined
   - Time between first and last calf

2. How will the record be treated if the animal leaves the herd for a non-production reason
   - Disposal codes

Beef Improvement Federation Guidelines

3. How will the record be treated if the animal is still in production at the time of the evaluation
   - Censor these animals to receive partial credit

4. The distribution is heavily skewed
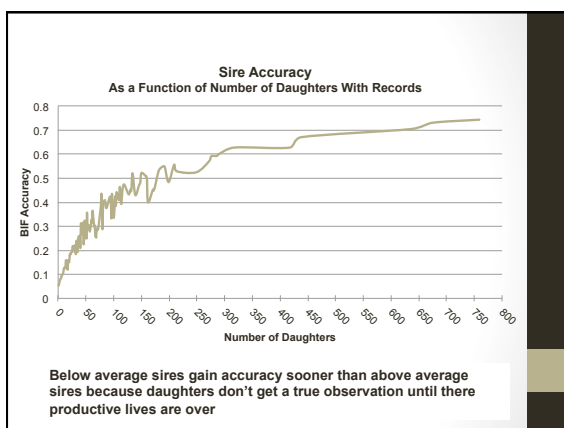   - Statistical models

Heritability

- Using AAA records from 1990 to present length of productive life heritability is 0.10
- Although 10% is considered a lowly heritable trait, it is within the range of other existing traits (HP) and literature estimates of other breeds

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Productive Life EPD, months	
Bull A	+9
Bull B	-3.5
Difference	12.5

Interpretation:
On average, the daughters of Bull A will be productive for an additional twelve and a half months.

Or daughters of Bull A would be expected to have one additional calf compared to Bull B daughters based on a annual calving cycle.

Sire Accuracy
As a Function of Number of Daughters With Records

Below average sires gain accuracy sooner than above average sires because daughters don't get a true observation until there productive lives are over

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Sire accuracy by number of daughters

# Daughters	Average Accuracy
10	0.12
25	0.17
50	0.29
100	0.39
150	0.49
200	0.55
300	0.62
400	0.63
700	0.75

Challenges of lowly heritability traits

- Most estimates of reproductive performance, regardless of definition, are considered low.
- Genetic progress can be slow in lowly heritable traits
  - Since the average generation turnover in beef is between 4 to 6 years
- Careful planning and long-term goals to avoid making a mistake that will remain for years

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Things to remember when developing selection strategies

- Generation interval
  - The youngest animals "should" be the best genetics
- Accuracy
  - High accuracy bulls - Less possible change
- Intensity
  - The choosier we are the better the next generation will be
- Genetic variance that exists
  - Trait specific…we can't change this

Conclusions

- There is genetic variation in length of productive life

- We have the data and MaternalPlus will add data rapidly

- Possibility of female productivity index to bring together HP and LIFE as a more powerful tool

- Genomic opportunities