A Few Economic and Management Considerations for Dairy Heifers

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Elanco

Three Objectives for Today

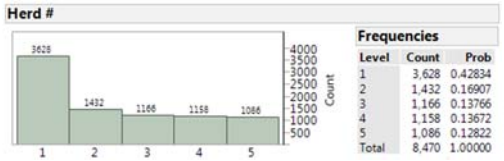
1. Share some data around the heifer breeding window
   - How do "late-conceiving" heifers fare during the remainder of the heifer raising period?
   - How do "late-conceiving" heifers perform during first lactation?
   - What is the economic impact of limiting the number of breeding opportunities in heifers?
2. What are the costs/benefits of early culling of replacement heifers prior to calving?
3. What is the estimated production impact of having a larger proportion of first lactation animals in the herd?

My Suggestion Regarding Heifer Breeding…

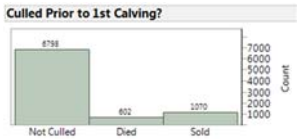
- Cull after 3-4 unsuccessful services or no more than 6 cycles of breeding opportunity
- Don't turn open heifers into a bull pen after AI
  - Often results in keeping heifers that would have been culled otherwise

Question Posed:
What is the Impact of Limiting Breeding Opportunities in Heifers?

- Identified 5 Holstein herds across US that have been using AIDAT feature of DC305
- Had to also have milk records
- 8,470 Holstein heifers born in 2014
- Plan: Follow through 1st lactation or until culled



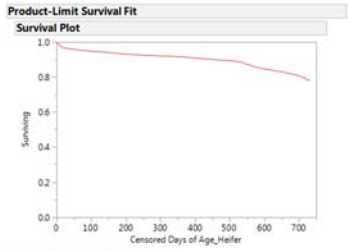
Culling Risk and Time to Removal



Frequencies		
Level	Count	Prob
Not Culled	6,798	0.80260
Died	602	0.07107
Sold	1,070	0.12633
Total	8,470	1.00000

1672 (20% of all heifers) were culled prior to 1st calving

- 40/602 → 7% of dead were pregnant
- 205/1070 → 19% of sold heifers were pregnant



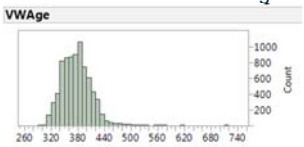
Time to event: Censored Days of Age_Heifer
Censored by Censor Variable_Censored Days of Age H
Censor Code 1

Summary				
Group	Number failed	Number censored	Mean	Std Error
Combined	1,599	6,841	657.767	2.00102

19% of heifers culled by 730 days of age

Used AIDAT as the Individual Heifer VWP

- AIDAT = date heifer entered breeding pen
  - Used to create "VWAge"



Quantiles		
100.0%	maximum	718
99.5%		478
97.5%		436
90.0%		415
75.0%	quartile	395
50.0%	median	376
25.0%	quartile	353
10.0%		339
2.5%		322
0.5%		315
0.0%	minimum	292

Summary Statistics	
Mean	375.98505
Std Dev	31.272587
Std Err Mean	0.3565927
Upper 95% Mean	376.68407
Lower 95% Mean	375.28603
N	7,691

Oneway ANOVA for VWAge by Herd

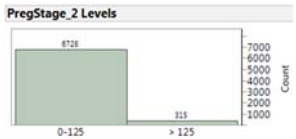
Comparisons for all pairs using Tukey-Kramer HSD

Herd		Mean Days
5	A	411
2	B	390
3	C	380
4	D	366
1	E	361

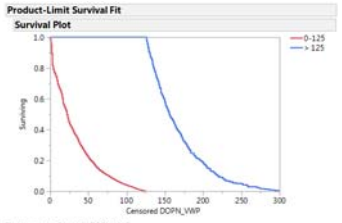
Levels not connected by same letter are significantly different (p<0.01).

Pregnancy Stage and Time-to-Pregnancy Based Upon Entry into Breeding Pen

- PregStage_2 Levels
  (based upon when pregnancy occurred as a heifer)
  - 0 to 125 days (6 21-d cycles)
  - >125 days



Frequencies		
Level	Count	Prob
0-125	6,728	0.95527
> 125	315	0.04473
Total	7,043	1.00000



Time to event: Censored DOPN_VWP
Censored by Censor Variable DOPN_VWP
Censor Code 1
Grouped by PregStage_2 Levels

Quantiles

Group	Median Time	Lower 95%	Upper 95%	25% Failures	75% Failures
0-125	22	22	23	8	46
> 125	156	152	162	139	184
Combined	23	23	24	9	51

Tests Between Groups

Test	ChiSquare	DF	Prob>ChiSq
Log-Rank	1426.270	1	<.0001*
Wilcoxon	641.4000	1	<.0001*

Counts are total number of pregnancies created

Pregnancies by Interval Since Entering Breeding Pens

	Herd 1		Herd 2		Herd 3		Herd 4		Herd 5		All	
Interval	# Pregs	% of Pregs	# Pregs	% of Pregs	# Pregs	% of Pregs	# Pregs	% of Pregs	# Pregs	% of Pregs	# Pregs	% of Pregs
0 - 20	1260	41.8%	572	47.4%	453	42.1%	329	38.0%	535	60.9%	3149	44.7%
21 - 41	720	23.9%	325	26.9%	211	19.6%	167	19.3%	204	23.2%	1627	23.1%
42 - 62	399	13.2%	169	14.0%	142	13.2%	149	17.2%	85	9.7%	944	13.4%
63 - 83	210	7.0%	70	5.8%	90	8.4%	68	7.9%	35	4.0%	473	6.7%
84 - 104	142	4.7%	32	2.7%	67	6.2%	63	7.3%	12	1.4%	316	4.5%
105 - 125	103	3.4%	25	2.1%	45	4.2%	40	4.6%	6	0.7%	219	3.1%
> 125	183	6.1%	13	1.1%	68	6.3%	50	5.8%	1	0.1%	315	4.5%
Total	3017	100%	1206	100%	1076	100%	866	100%	878	100%	7043	100%

Herd 5 was removed from further analysis, given their success at getting heifers pregnant in first four services, leaving 6,165 heifers remaining

After Eliminating Herd 5, I Also Removed Heifers That Were Culled Prior to First Calving (238) or that Were Sold for Dairy Purposes in First Lactation (30)

Group	# Heifer Pregnancies	# Died After Pregnancy	# Sold After Pregnancy	Total Culled After Pregnancy	# Sold for Dairy Purposes	Net # of Heifers in Analyses
0 - 125	5,851	32 (1%)	163 (3%)	195 (3%)	30 (0.5%)	5626 (96%)
> 125	314	4 (1%)	39 (12%)	43 (14%)	0	271 (86%)
Total	6,165	36 (1%)	202 (3%)	238 (4%)	30	5897 (96%)

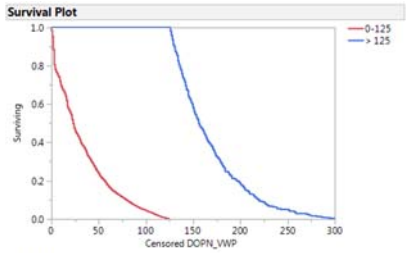
5629 heifers in final data set for analysis of first lactation performance

Heifer Information Until First Calving

Parameter	0 - 125 Group			> 125 Group			Original (All Together)	
# Heifers at Start (excluding 30 with CAR=2)							7354	
# Died (non-pregnant)							503	
# Sold (non-pregnant		% of Orig	% of Group		% of Orig	% of Group	716	% of Orig
# of Heifer Pregnancies Created	5821	79.2%		314	4.3%		6135	83.4%
# Culled between preg and calving	195	2.7%	3.3%	43	0.6%	13.7%	238	3.2%
New total heifers calving	5626	76.5%	96.7%	271	3.7%	86.3%	5897	80.2%
Repro culls if breeding stopped at 125 days:	314	4.3%	5.4%					
Total "additional" culls (repro and later culling)	509	6.9%	8.7%	43	0.6%	13.7%	238	3.2%

- 0 – 125 Group:
  - 97% of pregnant heifers calved
    - 3.3% culled as pregnant heifers
  - But would have resulted in additional 5.3% of Total heifers being culled due to shorter breeding window
- > 125 Group:
  - 86% of pregnant heifers calved
    - 13.7% culled as pregnant heifers
  - "Saved" 3.7% of Total heifers with longer breeding window

Reproductive Performance of Heifers by Group



Quantiles

Group	Median Time	Lower 95%	Upper 95%	25% Failures	75% Failures
0-125	23	23	24	7	49
> 125	156	152	162	139	184
Combined	25	24	26	9	55

>125 Group:

- 133 more median days open
- 6.3 breeding cycles extra
- Assuming 65% insemination risk → 4 more services and more pregnancy checks

Longer time to pregnancy also means longer time in the heifer program for the > 125 Group, all else being equal

Heifer Costs Up to Calving for First Time

Parameter	0 - 125 Group			> 125 Group			Original (Total Group)	
# Heifers at Start (excluding 30 with CAR=2)							7354	
# Died (non-pregnant)							503	
# Sold (non-pregnant		% of Orig	% of Group		% of Orig	% of Group	716	% of Orig
# of Heifer Pregnancies Created	5821	79.2%		314	4.3%		6135	83.4%
# Culled between preg and calving	195	2.7%	3.3%	43	0.6%	13.7%	238	3.2%
New total heifers calving	5626	76.5%	96.7%	271	3.7%	86.3%	5897	80.2%
Repro culls if breeding stopped at 125 days:	314	4.3%	5.4%					
Total "additional" culls (repro and later culling)	509	6.9%	8.7%	43	0.6%	13.7%	238	3.2%
Average breeding cost (Included in raising cost)	*-$33.65*			*-$121.78*			*-$37.70*	
Raising cost, incl. breeding, but NOT extra days	-$2,003			-$1,938			-$2,000	
Cost of extra days in the heifer system ($1.75/d)	-2		$3.50	131		-$229		
Total cost of raising heifers			*-$2,000*			*-$2,167*		*-$2,000*
Cost relative to Total Group			$0.5			-$167.0		

- Raising cost estimates derived from Overton Heifer Model, setting the baseline to -$2000 for Total Group.
- Cull heifers sold for $1/lb
- Extra days in heifer program set at $1.75/d (feed, labor, housing, etc.)
- Net cost difference: $0.50 less for 0-125 Group; $167 more for >125 Group

First Lactation Milk Production: 305 Milk (not ME)

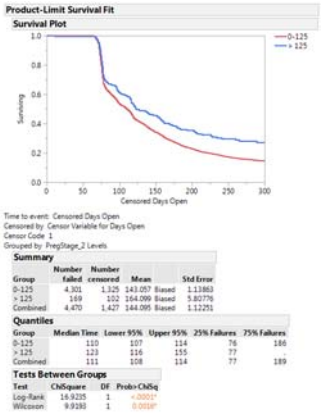
- Mixed effects model with projected 1st Lactation 305 Milk as dependent variable
- Random variables:
  - Herd
  - Month fresh nested in Herd
- Other variables:
  - VWP Age
  - VWP Age^2
  - PregStage

Source	p-value
Herd #	0.23
MonthFsh(Herd)	0.002
VWAge	0.18
VWAge^2	0.23
PregStage_2 Levels	0.002

305M Estimates from Model:

PregStage_2 Levels[0-125]	-376 lb
PregStage_2 Levels[> 125]	376 lb
	-752 lb

Univariate Survival Plots for Time-to-Pregnancy



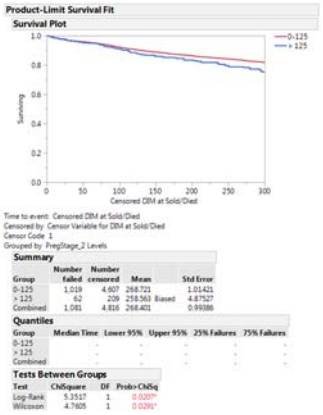
- Heifers that became pregnant by 125 days of entering breeding pen had 13 days less median days open during first lactation
- P<0.01

Nominal Logistic Model for Pregnancy by 300 DIM

What does this really mean?

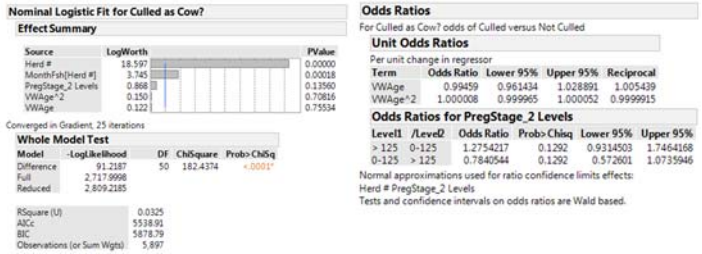
77% of 0-125 heifers were pregnant as cows by 300 DIM
66% of >125 heifers were pregnant as cows by 300 DIM

Univariate Survival Plots for Time-to-Removal



- Heifers that became pregnant by 125 days of entering breeding pen had a lower risk of removal by 300 DIM of their first lactation
- P<0.03

Nominal Logistic Model for Culling by 300 DIM



Nominal Logistic Fit for Culled as Cow?

Effect Summary

Source	LogWorth	PValue
Herd #	18.597	0.00000
MonthFsh[Herd #]	3.745	0.00018
PregStage_2 Levels	0.868	0.13560
VWAge^2	0.150	0.70816
VWAge	0.122	0.75534

Converged in Gradient, 25 iterations

Whole Model Test

Model	-LogLikelihood	DF	ChiSquare	Prob>ChiSq
Difference	91.2187	50	182.4374	<.0001*
Full	2,717.9998			
Reduced	2,809.2185			

RSquare (U)	0.0325
AICc	5538.91
BIC	5878.79
Observations (or Sum Wgts)	5,897

Odds Ratios

For Culled as Cow? odds of Culled versus Not Culled

Unit Odds Ratios

Per unit change in regressor

Term	Odds Ratio	Lower 95%	Upper 95%	Reciprocal
VWAge	0.99459	0.961434	1.028891	1.005439
VWAge^2	1.000008	0.999965	1.000052	0.9999915

Odds Ratios for PregStage_2 Levels

Level1	/Level2	Odds Ratio	Prob>Chisq	Lower 95%	Upper 95%
> 125	0-125	1.2754217	0.1292	0.9314503	1.7464168
0-125	> 125	0.7840544	0.1292	0.572601	1.0735946

Normal approximations used for ratio confidence limits effects:
Herd # PregStage_2 Levels
Tests and confidence intervals on odds ratios are Wald based.

What does this really mean?

10% of 0-125 heifers were culled as cows by 300 DIM
12% of >125 heifers were culled as cows by 300 DIM

First Lactation Comparison of the Two Groups

- 0 – 125 group
  - Milk = - 376 lb
  - Median days open = 110
  - RR for pregnancy by 300 DIM = 1.33
  - 77% pregnant by 300 DIM
    - 23% open after 300
  - Total culling risk = 29%
    - Median days until culling = 214
- > 125 group
  - Milk = + 376 lb
  - Median days open = 123
  - RR for pregnancy by 300 DIM = 0.75
  - 66% pregnant by 300 DIM
    - 34% open after 300 DIM
  - Total culling risk = 44%
    - Median days until culling = 278

Economic Assumptions for First Lactation

- Feed: 0.78 Mcal NE_L/lb at $0.11/lb dry matter
- Milk: 3.7% fat, 3.0% protein at $17/cwt
- Marginal milk value of $12.50/cwt
- Median days open value of $1.00 (does not include impact on culling of non-pregnant cows)
- Value of first lactation animal over course of lactation = $2000
- Market value of cull cow = $750
- 5% mortality risk in each group
- Net cull cost = $1288

Economic Summary for First Lactation

First Lactation Information:

Parameter	0 - 125 Group		> 125 Group		Original (Total Group)		
First Lactation Culls							
Total removals	29%	$9	44%	-$184	30%	-$382	0
Days until 50% of culls removed	214		278		260		
Milk Difference (lb)	-376	-$2	376	$86	-341	-$41	0
Reproduction - Median DOPN	110	$1	123	-$12	111	$0.00	0
Total First Lactation Losses		$7		-$111		-$423	0

- Total Group Values were used as a baseline for comparison
- "Days until 50% culls removed" was used to estimate milk loss
  - E.g. 29% of 0-125 Group lost milk through 214 DIM; 71% experienced full estimated loss
- Median DOPN for 0-125 Group was less than Total Group, thus a net gain instead of a loss

Summary of Impacts of Breeding Heifers Late

Parameter	0 - 125 Group	> 125 Group	Original (Total Group)
Total cost of Raising Heifers	-$2,000	-$2,167	-$2,000
Raising Cost Relative to Total Group	$1	-$167	
Culling Losses, First Lactation	$9	-$184	
Milk Losses, First Lactation	-$2	$86	
Reproductive Losses, First Lactation	$1	-$12	
Total First Lactation Losses	$7	-$111	
Net Gain (Cost Savings) or Loss (Add'n Cost) vs Total Group	$8	-$278	

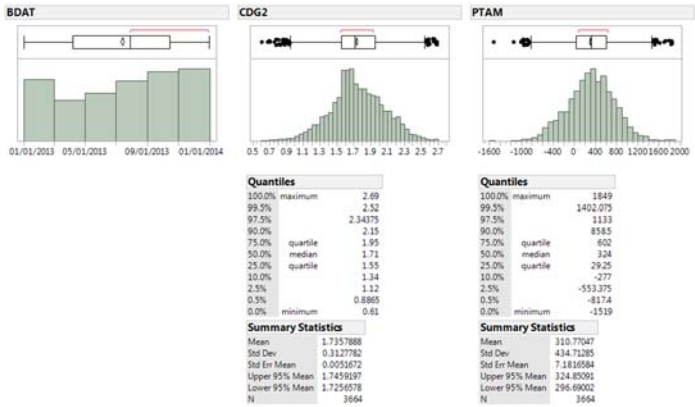
- In this analysis, using the data gathered from these Holstein herds:
  - The 0-125 Group (n=5626, 95.4%) had an advantage of $8 in total value vs. the Original Total Group
  - The 0-125 Group had an advantage of $286 in total value vs. the > 125 Group (n=271, 4.6%)
- Assuming that sufficient heifers to more than meet potential replacement needs, the recommendation from *this* analysis would be limit heifer breeding to 6 cycles

Questions Thus Far?

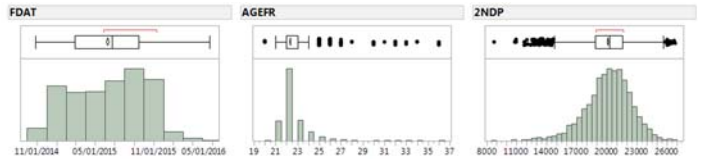
Next, What About the Cost/Benefit of Early Selective Culling of Heifers?

- Two large dairy herds from two geographically diverse areas of US
- Heifers born during 2013 were evaluated using records from DC305
- Backups were dated July 26, 2016
- Goals:
  - Determine if potential culling candidates can be accurately identified during the heifer rearing process
  - What is the value of using this approach if there are more heifers than needed in the pipeline?

Descriptive Data – All Heifers that had Current Dairy Gain 2 (CDG2), Predicted Transmitting Ability – Milk (PTAM), and Current Dairy Gain 3 (CDG3) Recorded were Included



Descriptive Data for Heifers in Data Set



Quantiles

100.0%	maximum	36
99.5%		29.87
97.5%		25
90.0%		24
75.0%	quartile	23
50.0%	median	22
25.0%	quartile	22
10.0%		21
2.5%		21
0.5%		21
0.0%	minimum	20

Summary Statistics

Mean	22.340856
Std Dev	1.2568878
Std Err Mean	0.0215175
Upper 95% Mean	22.383044
Lower 95% Mean	22.298667
N	3412

Quantiles

100.0%	maximum	26860
99.5%		25348.2
97.5%		24160
90.0%		22802
75.0%	quartile	21620
50.0%	median	20320
25.0%	quartile	18835
10.0%		17238
2.5%		15079
0.5%		12735.9
0.0%	minimum	8750

Summary Statistics

Mean	20139.047
Std Dev	2258.7576
Std Err Mean	39.219033
Upper 95% Mean	20215.943
Lower 95% Mean	20062.151
N	3317

Created Culling Criteria for Post-Weaning Evaluation

- First, eliminated the heifers that died/were sold by dairies prior to 63 days of age
- Then, if below the lower quartile for both CDG2 (1.55) *AND* PTAM (29), identified them as “Wean Cull”

Frequencies

Level	Count	Prob
Farm Removed	30	0.00819
Not Wean Cull	3359	0.91676
Wean Cull	275	0.07505
Total	3664	1.00000

Created A Model To Predict 2nd305 Milk Using Variables Available At The Time Of Weaning

Effect Summary

Source	LogWorth	PValue
Birth Month[Herd2]	34.381	0.00000
Wean Cull	14.303	0.00000
Herd2	3.262	0.00055

Summary of Fit

RSquare	0.089305
RSquare Adj	0.082666
Root Mean Square Error	2163.383
Mean of Response	20139.05
Observations (or Sum Wgts)	3317

Wean Cull

Least Squares Means Table

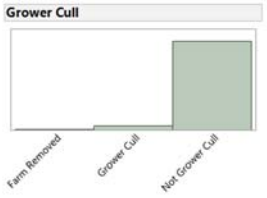
Level	Least Sq Mean	Std Error	Mean
Not Wean Cull	20261.560	41.33466	20236.7
Wean Cull	19127.840	140.76887	18941.3

Not Wean Cull minus Wean Cull (LS Means) 1134 lb

Not Wean Cull minus Full Population (LS Means) 567 lb

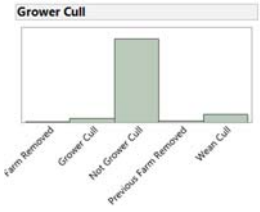
Next, Created a New Culling Criteria for Grower Evaluation and Repeated the Process

- If below the lower quartile for CDG2 (1.62) and PTAM (109), identified them as “Grower Cull”



Frequencies

Level	Count	Prob
Farm Removed	3	0.00089
Grower Cull	144	0.04287
Not Grower Cull	3212	0.95624
Total	3359	1.00000



Frequencies

Level	Count	Prob
Farm Removed	3	0.00082
Grower Cull	144	0.03930
Not Grower Cull	3212	0.87664
Previous Farm Removed	30	0.00819
Wean Cull	275	0.07505
Total	3664	1.00000

N Missing 6992
5 Levels

Grower Cull – Predicted 2nd305M Performance Using Data Available at ~4 Months of Age

Response 2NDP

Effect Summary

Source	LogWorth	PValue
Birth Month[Herd2]	31.080	0.00000
Grower Cull	4.865	0.00001
Herd2	3.127	0.00075

Summary of Fit

RSquare	0.075812
RSquare Adj	0.06852
Root Mean Square Error	2172.066
Mean of Response	20236.68
Observations (or Sum Wgts)	3,067

Effect Details

Birth Month[Herd2]

Grower Cull

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Not Grower Cull	20,300.567	42.43613	20,278.9
Grower Cull	19,461.622	189.01506	19,327.1

Not Grower Cull minus Grower Cull (LS Means)	839 lb
Not Grower Cull minus Full Population (LS Means)	478 lb

Assuming that We Can Predict Which Heifers will be of Lower Value, What is the Impact on the Cost of Raising?

- To examine this question, created three scenarios:
  - Cull selected heifers post-weaning
  - Cull selected heifers post-weaning and post-grower
  - Cull selected heifers post-weaning and at springer stage
- Assumptions used:
  - Housing costs are fixed: i.e., with additional selective culling, cost/remaining heifer for cost of housing increases
  - Labor costs are partially fixed: i.e., with additional selective culling, cost/remaining heifer are treated as 50% fixed, 50% vary based on # of heifers

Estimated Value Minus Raising Cost for Each Scenario (using modeled least square means estimates)

	Scenario 1: Cull Selected Heifers at Post-Weaning			Scenario 2: Cull Selected Heifers at Post-Weaning and Post-Grower			Scenario 3: Cull Selected Heifers at Post-Weaning and at Springer Stage		
	Baseline	Scenario	Net	Baseline	Scenario	Net	Baseline	Scenario	Net
Total Raising Cost per Heifer Calving	($2,214)	($2,262)	($48)	($2,214)	($2,289)	($75)	($2,214)	($2,267)	($53)
Predicted Value per Heifer Calving	$2,200	$2,383	$183	$2,200	$2,372	$172	$2,200	$2,372	$172
Net Benefit (or Cost) of Scenario			$135			$97			$119

Outcomes of Heifers in Modeled Exercise

	Actual Results		Performance Culling	
Total Heifers Starting			3664	
Heifers Culled after Weaning			275	8%
Heifers Culled after Grower			144	4%
Heifers Sold/Died by Farm	243	7%	243	7%
Total Heifers Actually Calving	3421	93%	3002	82%

- Very low actual culling level:
  - 93% of heifers in system calved
- With performance culling:
  - 82% of heifers in system calved
  - Must have extra heifers (or be willing to purchase heifers) to make this approach work

Questions from this Section?

A Lot of Work Around Trying to Understand the Economics of Management Efforts to Improve the Quality of Replacement Heifers…

1. Cost/Benefit of Limiting Breeding Opportunities
2. Cost/Benefit of Early Culling

- Why bother?

- All dairies need replacement heifers
- Our goal should be to bring better quality heifers into the herd – these are the future lactating cows
- BUT, what is the impact of bringing better quality heifers into the herd?

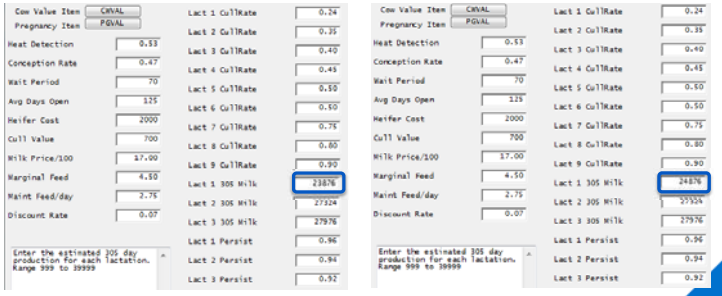
Culling Decisions Should be Made on the Basis of Economics

- Once a dairy is "full", the goal should be to focus on continuous improvement: examine each slot frequently in order to place a cow in that slot that will make the dairy as profitable as possible
  - Much of the time, this means keeping the current cow (to dilute investment in cow)
  - Other times, this means replacing the cow with one that is expected to be better

- Key question: Is the value this slot brings to the dairy greater if I keep the *current cow* or if I replace her with an *average replacement heifer?*

Used DC305's CowVal Tool to Examine this Question

- Selected 5 Holstein herds and ran CowVal twice for each herd
- The only difference – Projected 305Milk for Heifers was increased by 1000 lb
- After each run:
  - –Generated average CWVAL for cows 75-400 DIM and RC=2-4
  - –Calculated % of cows with CWVAL<-100 for DIM=75-400 and RC=2-4



Change in CWVAL Associated with an Increase in Projected 305 Milk of Incoming Heifers

	Original P305M		P305M + 1000 lb		Difference	
Herd	Avg Cwval	%< -100	Avg Cwval	%< -100	Cwval	%< -100
1	1180	2.8%	1074	3.8%	-106	1.0%
2	1251	1.0%	1151	1.5%	-100	0.5%
3	1068	4.4%	950	5.9%	-118	1.6%
4	580	6.7%	504	9.5%	-76	2.8%
5	1006	5.8%	881	7.9%	-125	2.0%
					-105	1.6%

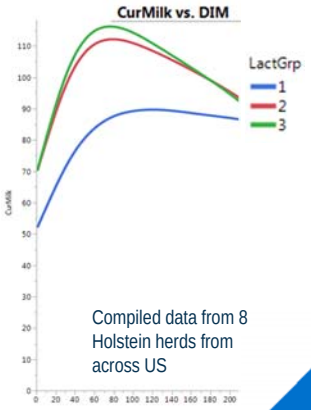
- In cows that were 75-400 DIM with a repro code of 2-4, average CWVAL decreased 105 when incoming heifers were 1000 lb higher in Projected 305 Milk
- 1.6% more cows identified as cull candidates
- Therefore, with increasing production potential of incoming heifers → greater culling pressure on existing herd

Remember, Replacement Heifers Should Come into the Herd to REPLACE a LESS Valuable Cow Currently in the Herd

- Common sense – we all understand this BUT…
- It is often difficult to NOT bring all heifers into the herd
- Calving all heifers AND keeping them all has been the historical norm but with better reproductive performance in the herd and many more heifers due to sexed semen, this is likely NOT the best tactic for a stable herd
- This could lead to 50+% annual herd turnover
  - Justifiable IF the quality of the heifers is truly much improved
  - Probably NOT economical in most scenarios

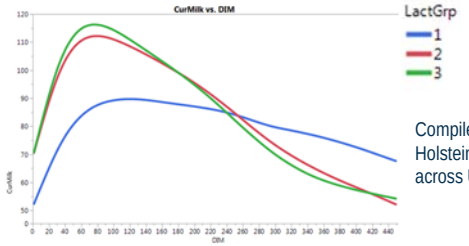
So, What is the Impact of Increasing the Proportion of First Lactation Animals in the Herd on Milk per Cow?

- When people think about this question, our minds instantly jump to this comparison of lactation curves:
  - Large difference in milk/cow/day in early to mid lactation
  - Large difference in peak milk



Compiled data from 8 Holstein herds from across US

But That is not the Whole Story…



Compiled data from 8 Holstein herds from across US

Interval	20 - 60	61 - 100	101-140	141-180	181- 220	221-260	261 - 300	301 - 340	341 - 380	381 - 420	421 - 460
Avg Milk/Cow (lb)	92.5	99.0	99.5	96.3	90.5	83.8	75.1	68.5	65.3	64.3	63.2
Lact=1	35%	35%	37%	37%	38%	39%	40%	41%	43%	47%	52%
Lact=2	31%	31%	31%	31%	31%	31%	31%	30%	28%	26%	23%
Lact>2	34%	34%	32%	32%	30%	30%	29%	29%	29%	27%	26%

Overall Average (lb)	88.5	
Lact=1	83.3	38%
Lact=2	90.7	31%
Lact>2	92.7	31%

Taking the Previous Information One Step Further: "What is the Impact of Changing Lact=1 Percentage on Predicted Herd-Level Milk?"

Lact=1	83.3	38%	
Lact=2	90.7	31%	0.81
Lact>2	92.7	31%	
Overall Average	88.5		

% Lact=1 Step	0.03
L=1 vs. L=2 Factor Step	0.1

Sensitivity Table for Estimated Herd Milk Based on Parity Distribution Changes

Lact=2 / Lact=1	% Lactation = 1									Avg Decline
	26%	29%	32%	35%	38%	41%	44%	47%	50%	per Step
60%	89.9	89.6	89.3	89.0	88.7	88.4	88.0	87.7	87.4	0.32
70%	89.9	89.6	89.2	88.9	88.6	88.3	88.0	87.6	87.3	0.32
80%	89.8	89.5	89.2	88.9	88.5	88.2	87.9	87.5	87.2	0.33
90%	89.8	89.5	89.1	88.8	88.4	88.1	87.8	87.4	87.1	0.33

Average herd-level milk decrease/day for each additional % point increase in Lact=1 0.11

Based upon the test-day information previously reviewed, increasing the % of the herd that is first lactation by 1% point is estimated to lower average milk/cow/day by 0.11 lb.

Another Approach for Estimating the Impact of Increasing the Proportion of First Lactation in a Herd on Milk Production

- Extracted test-day data from 8 Holstein herds from around U.S. for a 3-year period
- Fit Least Squares Means model with the following variables:
  - o LactGrp
  - o DIM
  - o DIM^2
  - o DIM^3
  - o Test Year
  - o Test Month
  - o LactGrp*DIM
  - o LactGrp*DIM^2
  - o LactGrp*DIM^3
  - o LactGrp*Test Year

Predicted Least Squares Means Estimated Milk by Changing Parity Distribution

DIM for Herd	% Lactation = 1										Avg Decline per Step
	25%	28%	31%	34%	37%	40%	43%	46%	49%	52%	Change in %L=1
130	102	101	100	99	99	98	97	96	96	95	0.74
140	101	100	100	99	98	98	97	96	95	95	0.70
150	100	100	99	98	98	97	96	96	95	94	0.65
160	99	99	98	97	97	96	96	95	94	94	0.61
170	98	98	97	96	96	95	95	94	94	93	0.56
180	97	96	96	95	95	94	94	93	93	92	0.51
190	95	95	94	94	93	93	92	92	91	91	0.46
200	93	93	93	92	92	91	91	91	90	90	0.41
Average milk decrease/d for each additional % point increase in lact=1											0.19

Based upon this model and these 8 herds, each additional increase in % of lactation = 1 results in a drop in milk/cow/day of 0.19 lb

Assumption: % lactation = 2 eqals 70% of % lactation = 1.
The result of changing this relationship was minimal in this data set (<0.01 lb per % point increase in lact=1).

Summary

- Each additional percentage point of first lactation animals is predicted to produce slightly less current milk (cash flow decision) but if selection has been made appropriately, improves the total value of the herd (economic decision)
- Actual impact depends on many things:
  - Culling risk by parity
  - Reproductive performance
  - Culling philosophy near end of lactation
  - Housing and management
  - Size and production potential of incoming heifers

Summary

- Increased use of sexed semen and improved repro programs allow more opportunities for voluntary culls (of both cows and heifers)
- Having the ability to make more selective economic culls is a good thing, but it requires decisions to be made…
- Our focus should be on the following:
  - Reduce the risk of lowering the value of cows currently in the herd (lower disease-related reasons for culling)
  - Increase potential of incoming heifers through better feeding, management, genetics, etc.
  - Cull appropriately based on incoming projected value vs. current animal projected value

Thanks For Your Attention!

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