



Effect of mastitis on milk production and profitability

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Outline

120 minutes

Impact of mastitis

Performance and
profitability

Primary and secondary

Mastitis, reproduction, and other diseases

Fertility and
pregnancy loss



Decision tree

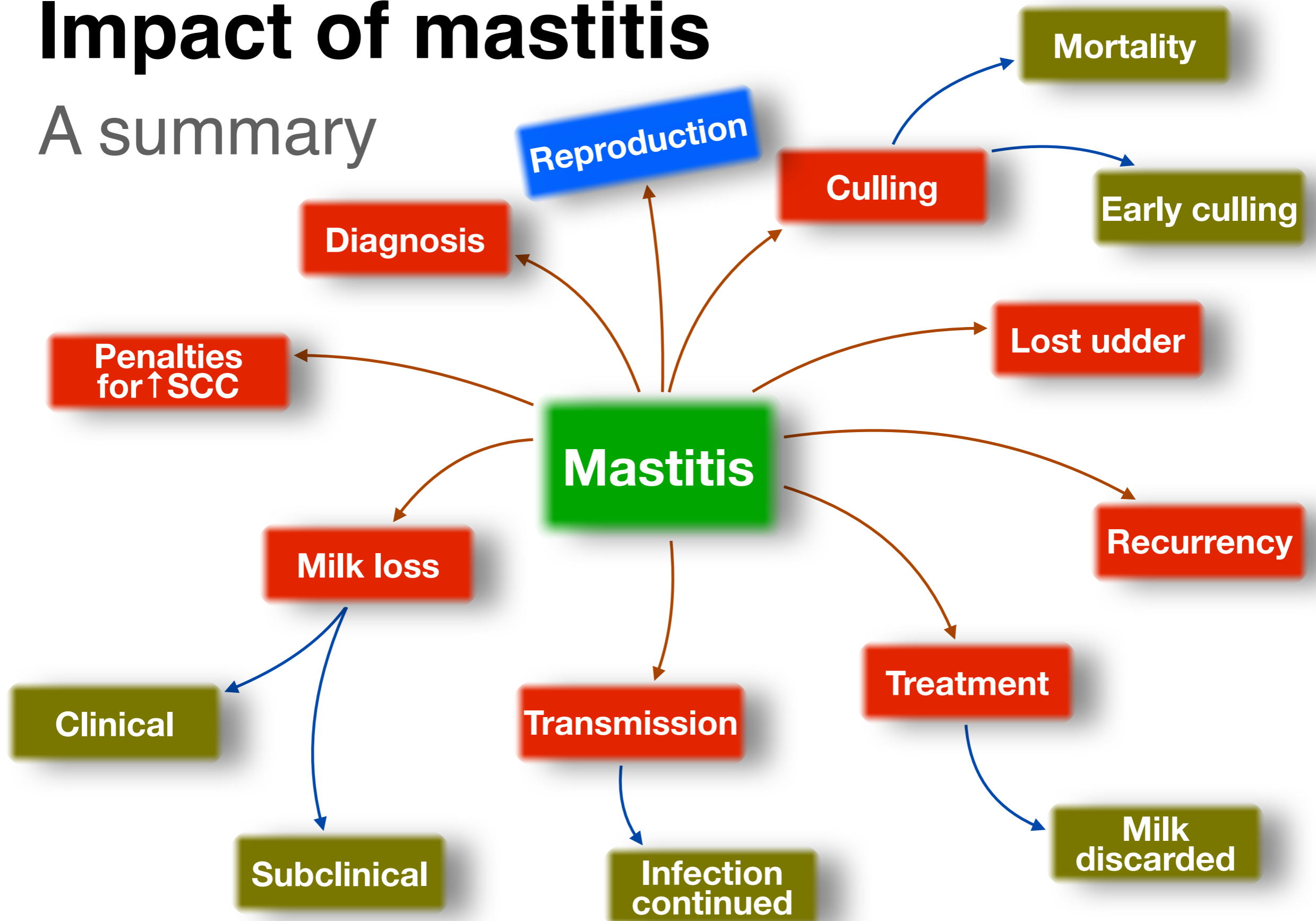
An example for data
processing and analysis

Economic value of a dairy cow

Basic principles

Impact of mastitis

A summary



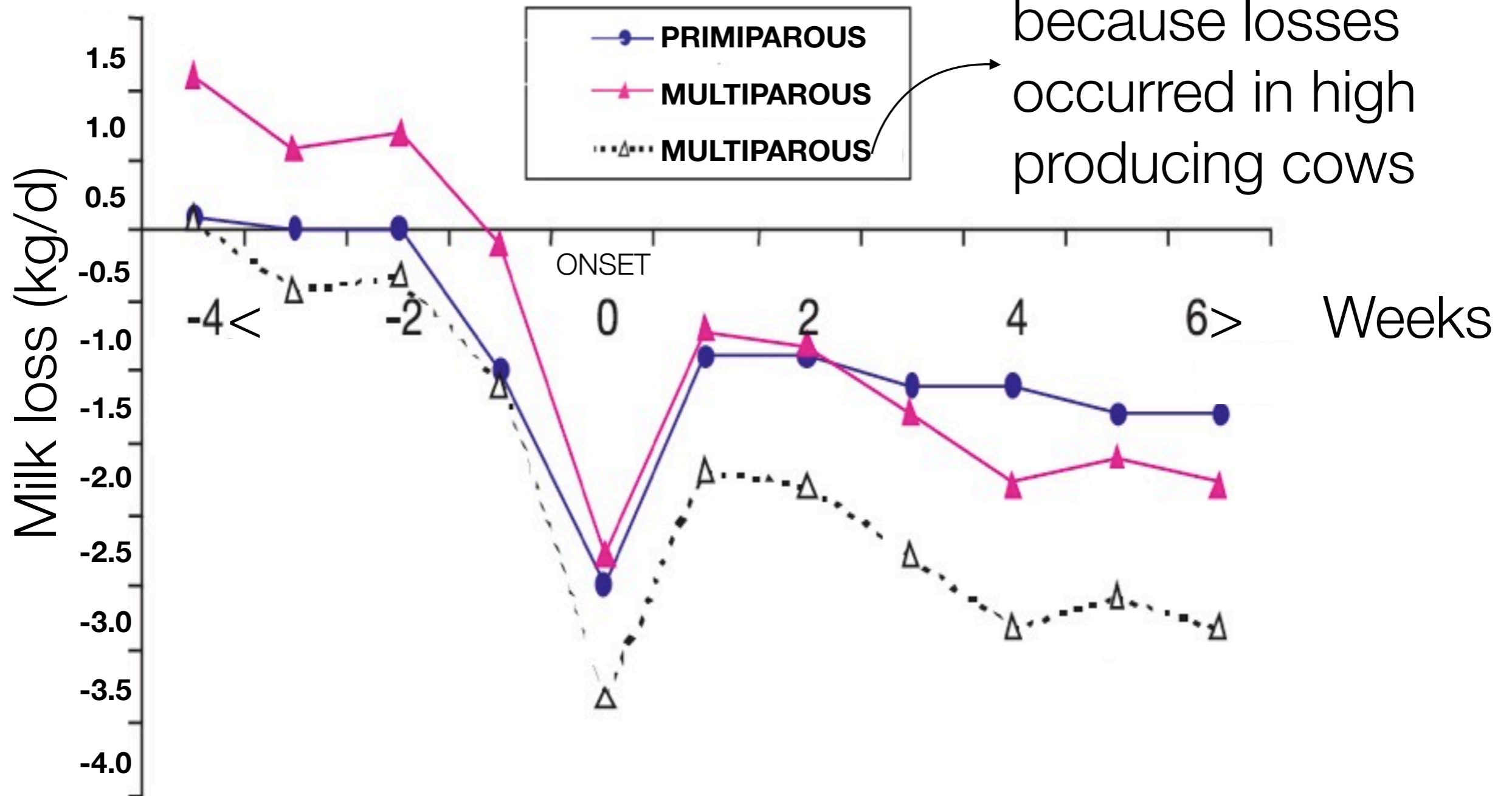
Impact of mastitis

Loss for an average case, an example

Source of loss	\$/cow per yr	% total
Reduced milk	121.00	66.0
Discarded milk	10.45	5.7
Early replacement	41.73	22.6
Extra labor	1.14	0.1
Drugs	7.36	4.1
Veterinary Services	2.72	1.5
Total	184.4	100

Milk loss

Clinical mastitis

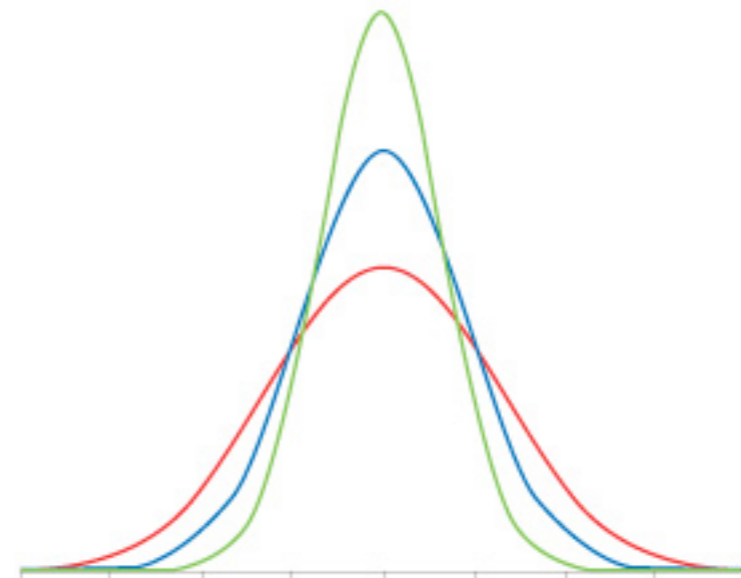


Milk loss

Clinical mastitis

375 kg (5%) loss

Average case for Holstein
2nd month



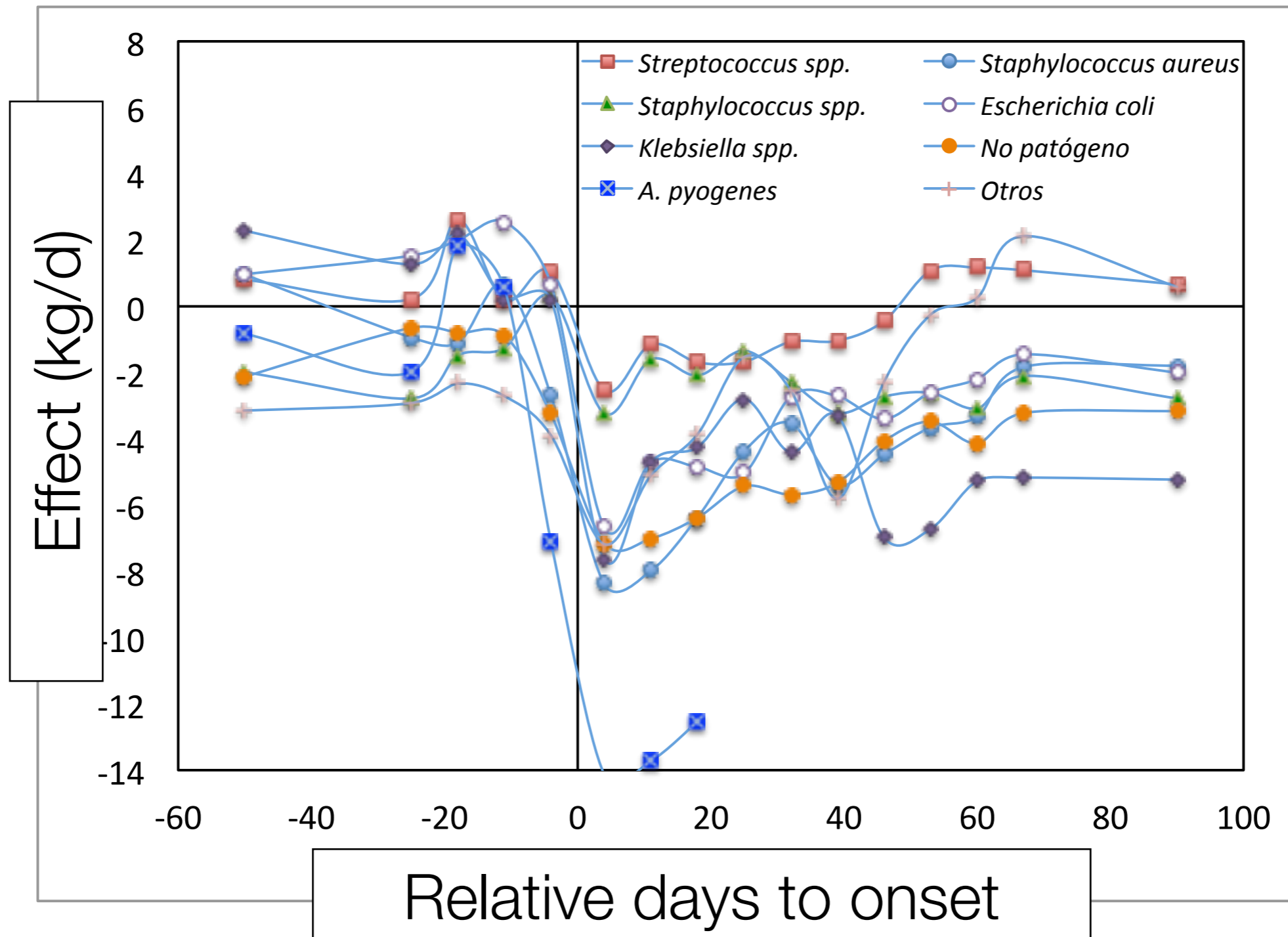
Highly variable

10 cases:

- 5 cases: 375 kg (average)
- 4 cases: Little loss
- 1 case: 1,000 kg (high)

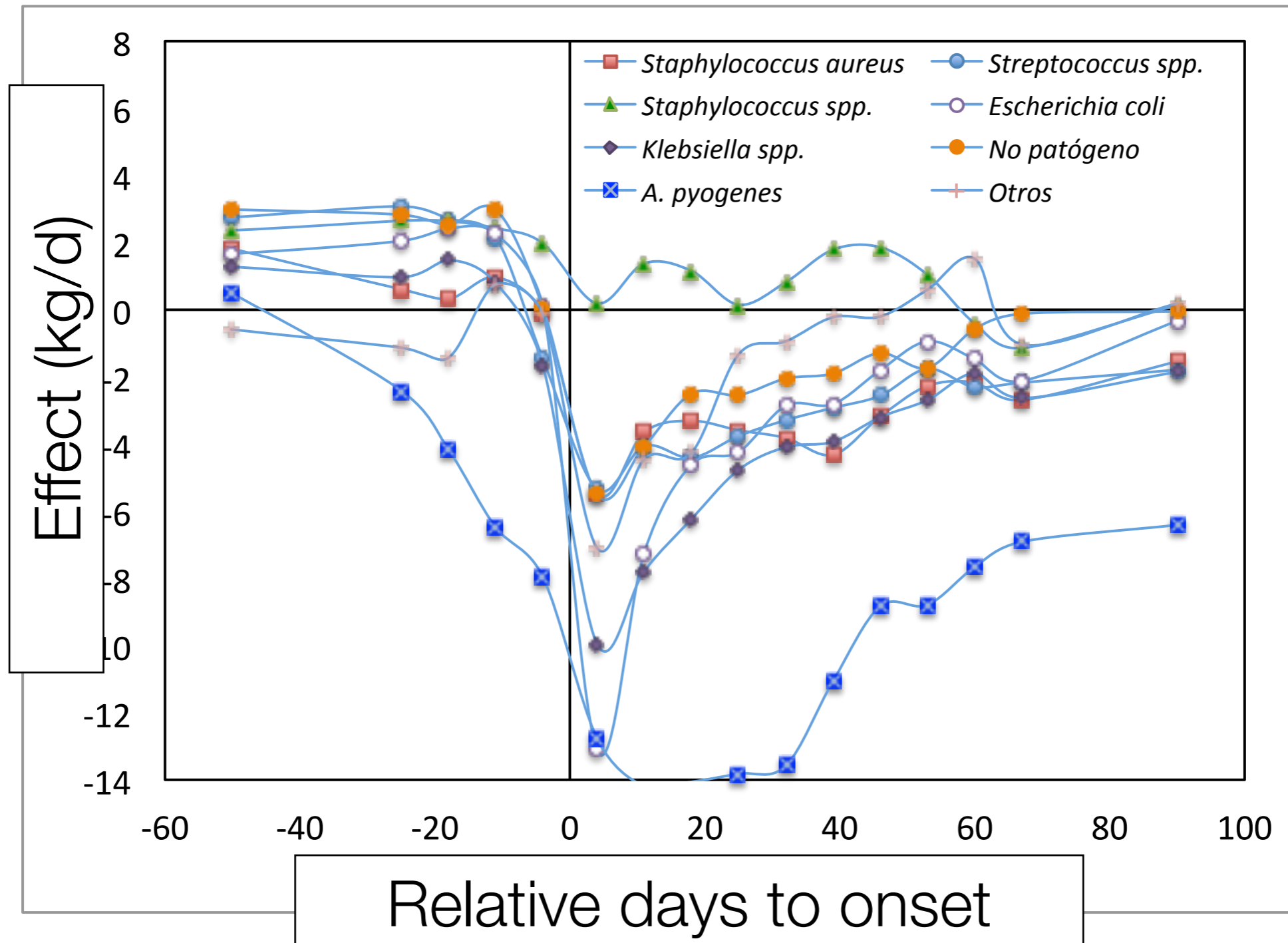
Milk loss

Clinical mastitis: First lactation



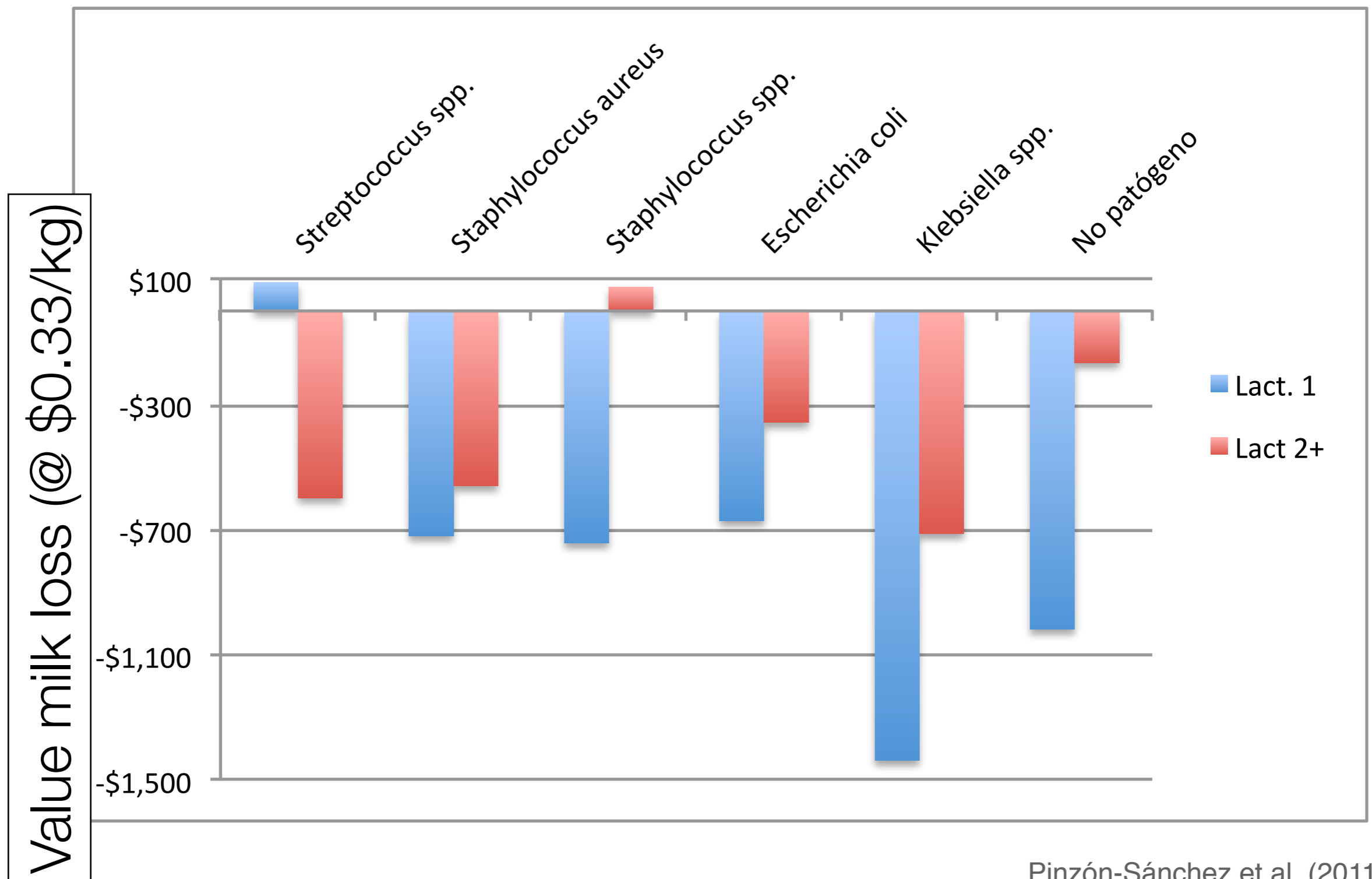
Milk loss

Clinical mastitis: 2nd and later lactations



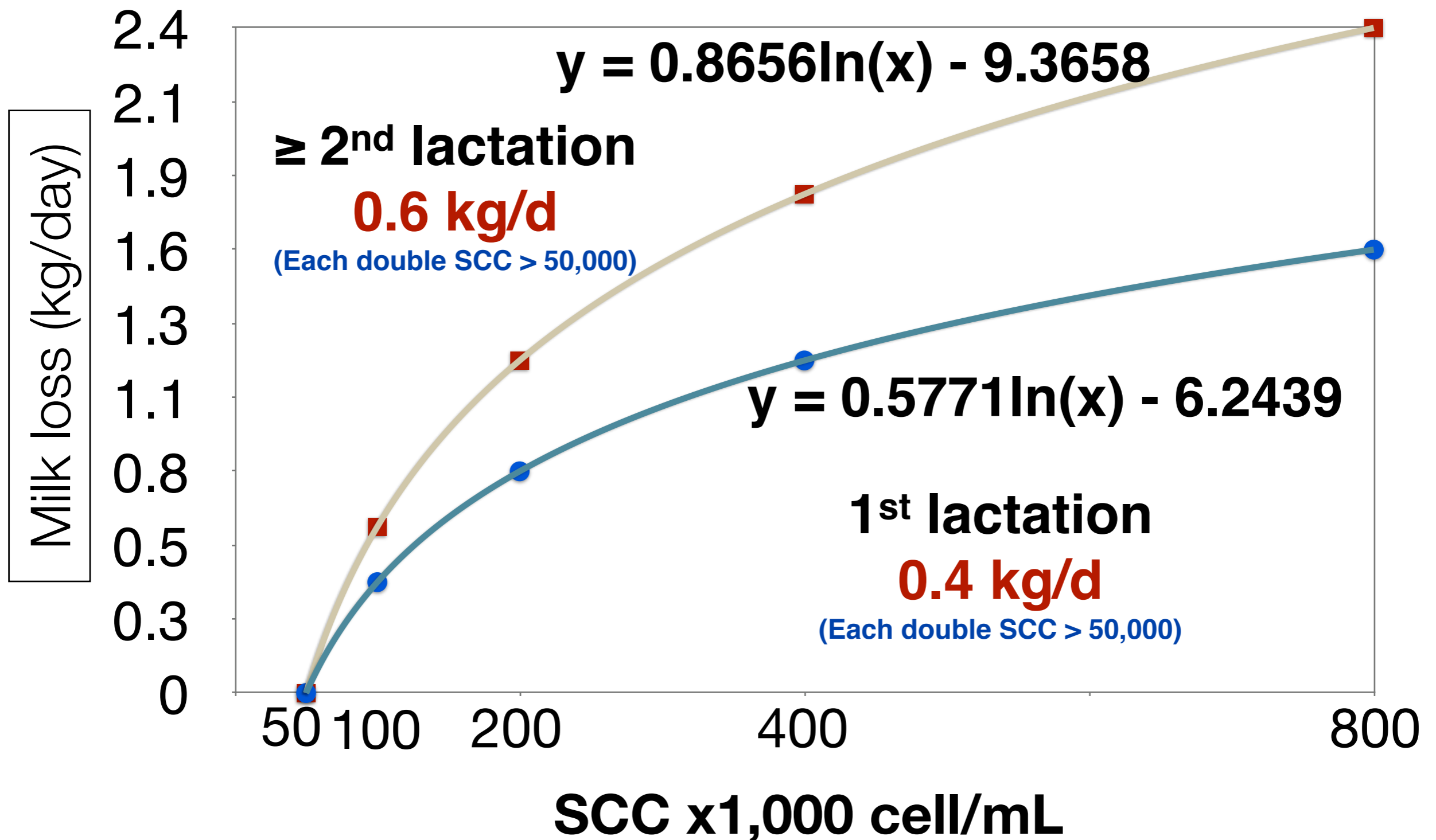
Milk loss

Clinical mastitis: 30 to 305 d



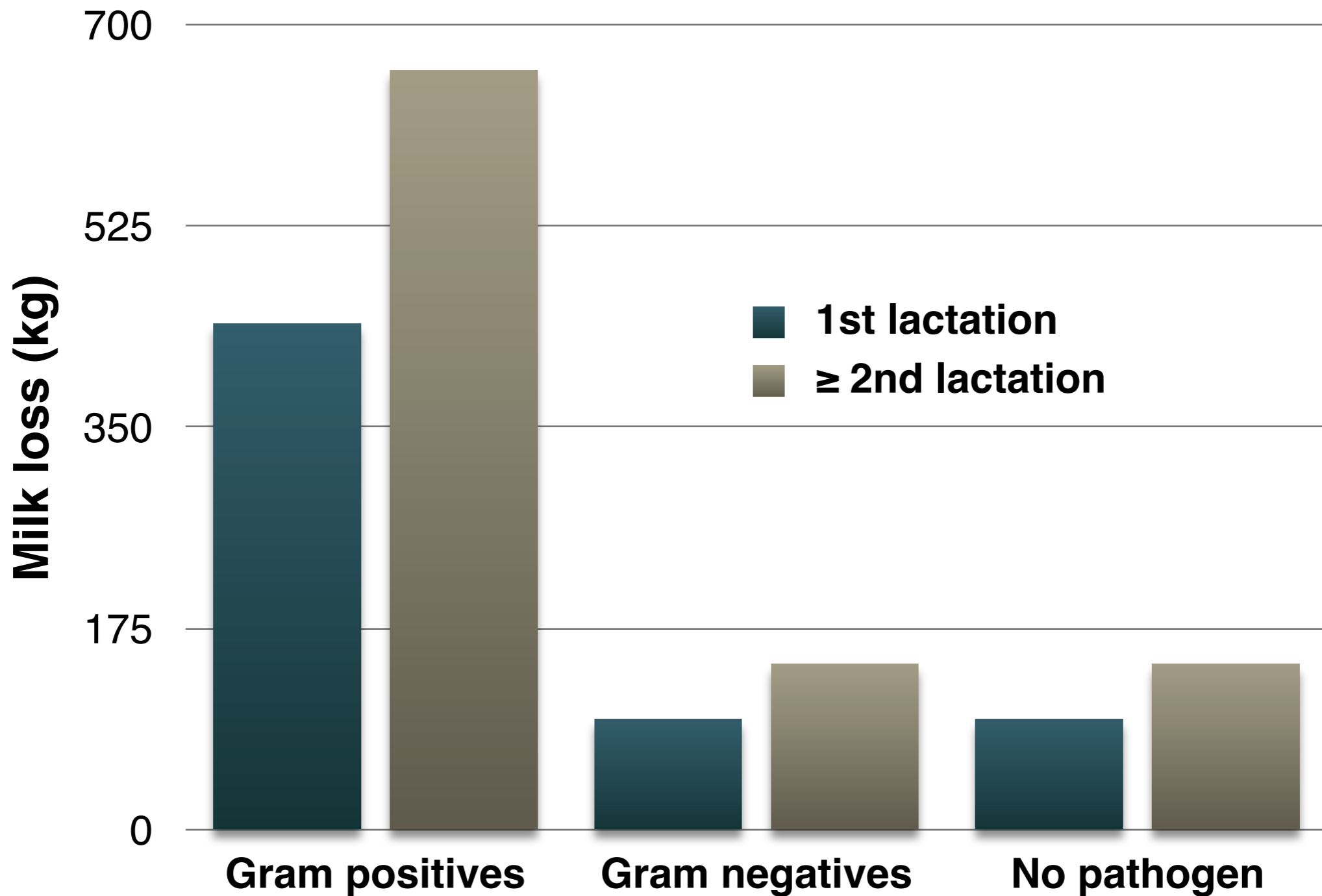
Milk loss

Subclinical mastitis (in addition to clinical)



Milk loss

Subclinical for SCC=800K cell/mL

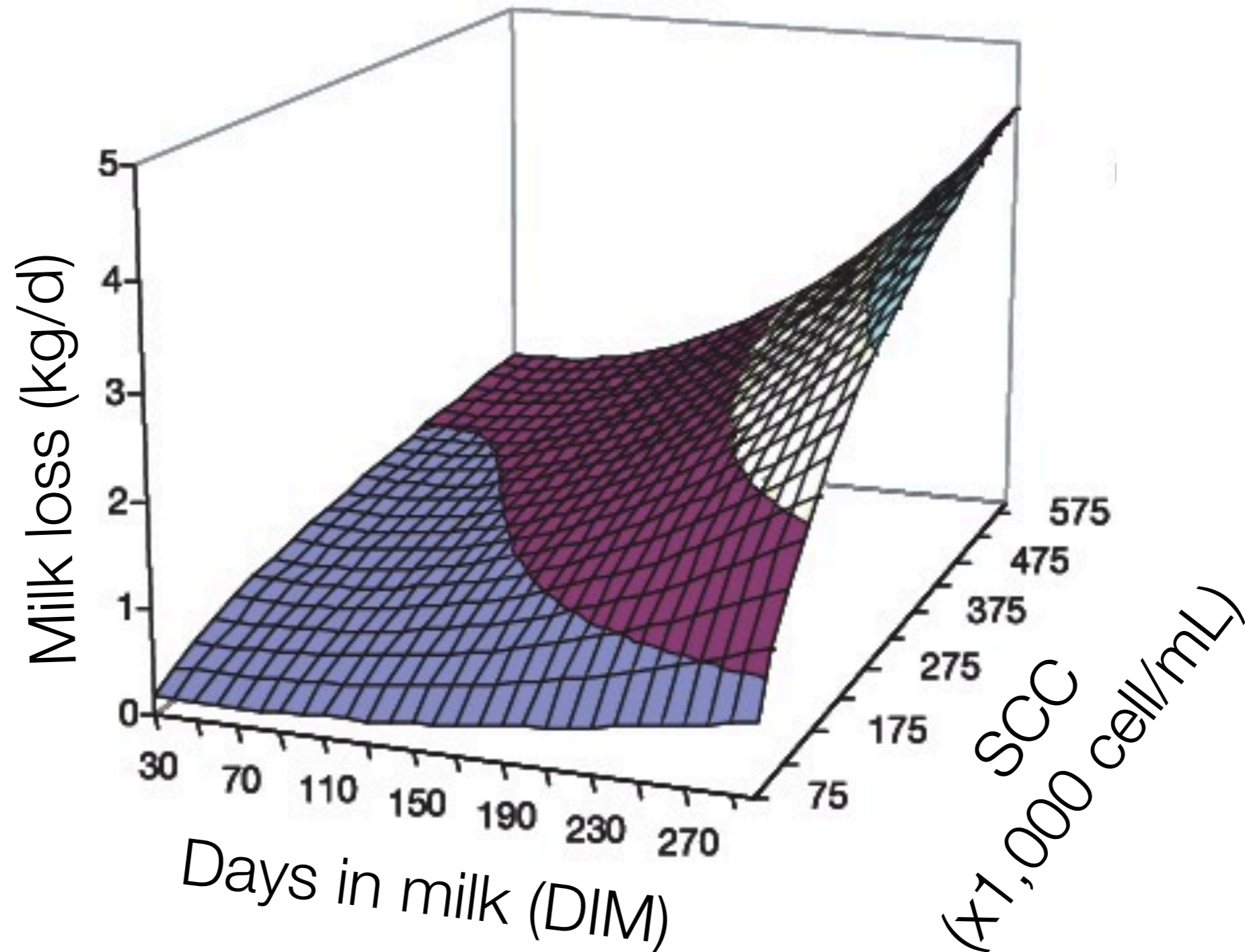


30-305 d,
Pinzón-Sánchez et al., 2011

30-90 d (de Hass et al., 2004)

Milk loss

Relationship SCC & DIM (vs. 50K cell/mL)



Milk price lost

Penalty or price premium losses

Very specific

Region

Market

Economic context

Negotiations



Thresholds

Combined effect of clinical and subclinical mastitis

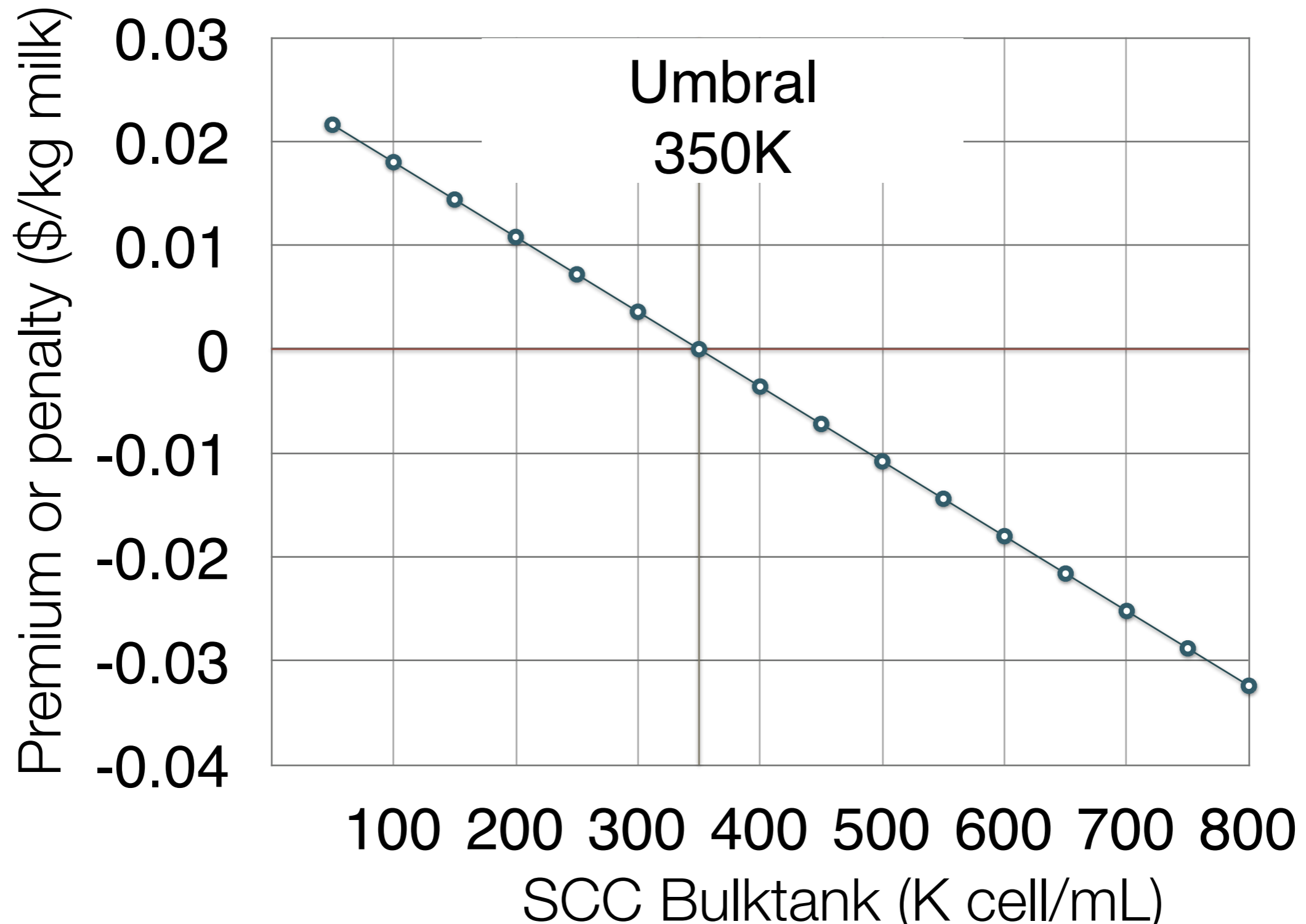
Bulk tank

Herd weighted average

Dilution effect

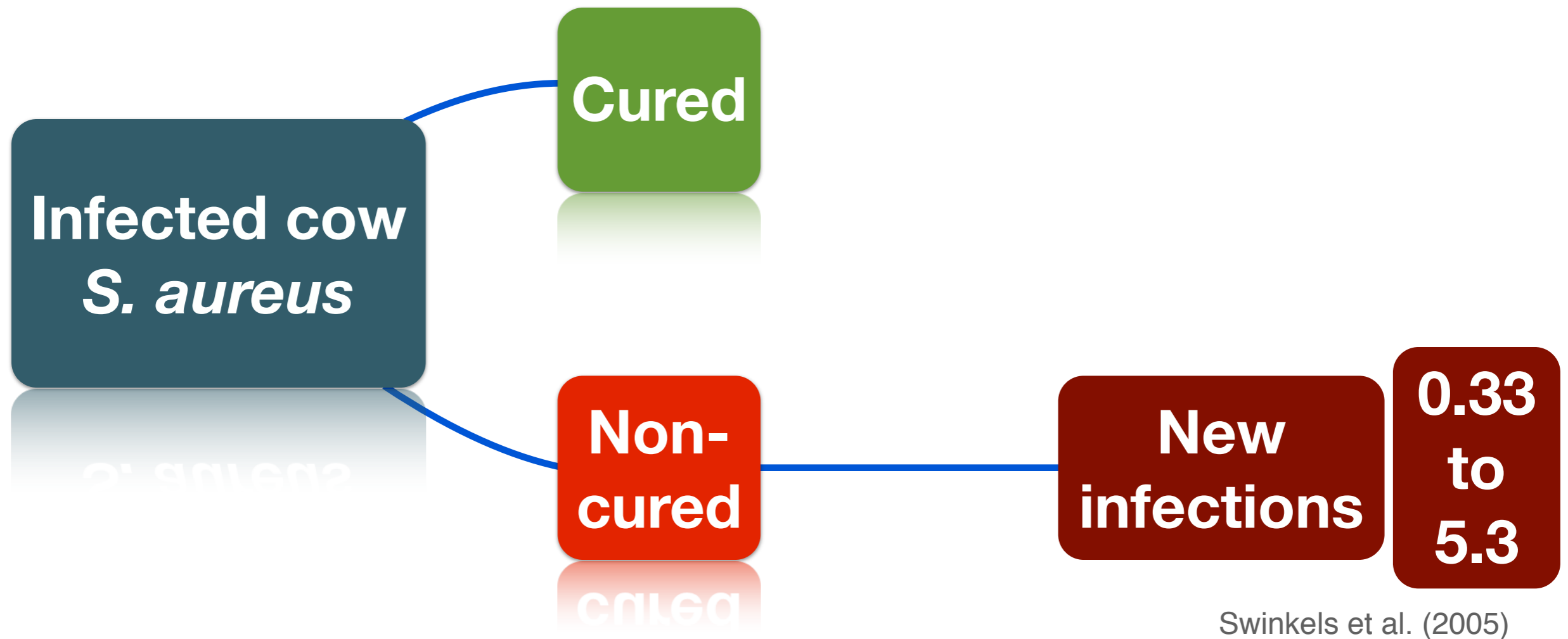
Milk price lost

Price premium or penalty (Wisconsin)



Transmission cost

Staphylococcus aureus



Other contagious pathogens

- ***Strep. agalactiae***
- ***Streptococcus dysgalactiae***
- ***Corynebacterium bovis***
- ***Mycoplasma bovis***

Harmon (1996)

Pinzón-Sánchez et al. (2011): 0.25

Recurrence cost

Increased risk of additional cases

Risk factors

Lactation

Pathogen

Cure

Possible levels

13% 1st lactation

23% 2nd+ lactation

Pinzón-Sánchez et al. (2011)

±20%

Hoe and Ruegg (2005)

Cure

According to etiology



Lost udder cost

Increased risk because of mastitis

Risk factor

Recurrence

Possible levels

10% recurrent cases

Milk loss

15% additional milk loss



Early culling risk

Culling risk is increased

Higher risk

Early in lactation

Dry period

Udder damaged

Clinical case



Higher risk

1.5 to 5% more risk after a clinical case

Early culling risk

Culling risk is increased

Higher early culling risk, %	Affection	Reference
1.5 - 4.0	Clinical mastitis	Beaudeau et al. (1994; 1995)
1.9 - 3.0	Clinical mastitis	Gröhn et al. (1998)
1.4 - 2.6	Clinical mastitis	Rajala-Schultz et al. (1999)
1.2 - 2.7	Elevated SCC	Beaudeau et al. (1995)

Early culling cost

Complex calculation

Economic value of affected cow

Compared with a replacement

State of the cow

Lactation

Days in milk

Days in pregnancy



Important factors

Cow productivity

Genetics of replacement

Other factors

Herd characteristics

Market/economic

conditions

Early culling cost

Tool: The economic value of a dairy cow

WISCONSIN UNIVERSITY OF WISCONSIN-MADISON
The Economic Value of a Dairy Cow
Victor E. Cabrera, Department of Dairy Science
UW Extension University of Wisconsin-Extension

Overview Single Cow Analysis Herd Analysis US English US Metric UK

INPUTS - Edit Values in This Block

Evaluated Cow Variables

Current Lactation	2
Current Months after Calving	1
Current Months in Pregnancy	0
Expected Milk Production Rest of Lactation, %	100
Expected Milk Production Next Lactations, %	100

Replacement Cow Variable

Expected genetic improvement, % additional milk	0
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Herd Production and Reproduction Variables

Herd Turnover Ratio, %/year	35
Rolling Herd Average, lb/cow per year	24,000
21-d Pregnancy Rate, %	18
Reproduction Cost, \$/cow per month	20
Last Month After Calving to Breed a Cow	10
Do-not-Breed Cow Minimum Milk, lb/day	50
Pregnancy Loss after 35 Days Pregnant, %	22.6
Average Cow Body Weight, lb	1306

Herd Economic Variables

Replacement Cost, \$/cow	1300
Salvage Value, \$/lb live weight	0.38
Calf Value, \$/calf	100
Milk Price, \$/cwt	15.88
Milk Butterfat, %	3.5
Feed Cost Lactating Cows, \$/lb dry matter	0.1
Feed Cost Dry Cows, \$/lb dry matter	0.08
Interest Rate, %/year	6

Analyze

OUTPUTS - Interactive Results

Value of the Cow, \$ 897

Compared Against a Replacement, \$

Milk Sales, \$	535
Feed Cost, \$	-238
Calf Value, \$	-2
Non-reproductive Cull, \$	-85
Mortality Cost, \$	-16
Reproductive Cull, \$	4
Reproduction Costs, \$	-5
Replacement Transaction, \$	704

Herd Structure at Steady State

Days in milk	224
Days to Conception	122
Percent of Pregnant	52
Reproductive Culling, %	8
Mortality, %	3
1st Lactation, %	43
2nd Lactation, %	27
> 3rd Lactation, %	30

Economics of an Average Cow, \$/year

Net Return, \$	1969
Milk Sales, \$	3806
Feed Cost, \$	-1522
Calf Sales, \$	60
Non-Reprod. Culling Cost, \$	-198
Mortality Cost, \$	-38
Reproductive Culling Cost, \$	-59
Reproductive Cost, \$	-80

Example:
Cost of culling
this 2nd lactation,
1 MIM, open cow
is **\$897**

Mortality risk

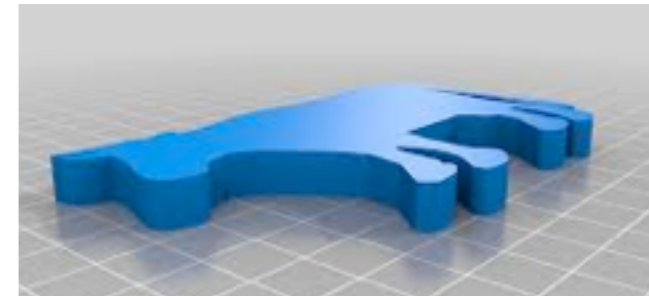
Mortality risk is increased

Mortality risk increased in Holsteins

0.22% (W France)

0.19% (N Ireland)

Seegers et al. (2003)



Risk according to pathogens

Gram negatives = +3 times

Bradley & Green (2001)

E. coli = +74%

Klebsiella sp. = +8%

S. aureus = +8%

Hazlett et al. (1984)

Mortality cost

Calculating the cost of mortality

Mortality cost

Value of cow before dying +
Value of meat



Example:

Mortality cost of a 3rd
lactation, 5 MIM, 1 MIP
is $\$627 + \$494 = \$1,121$

Mastitis and reproduction

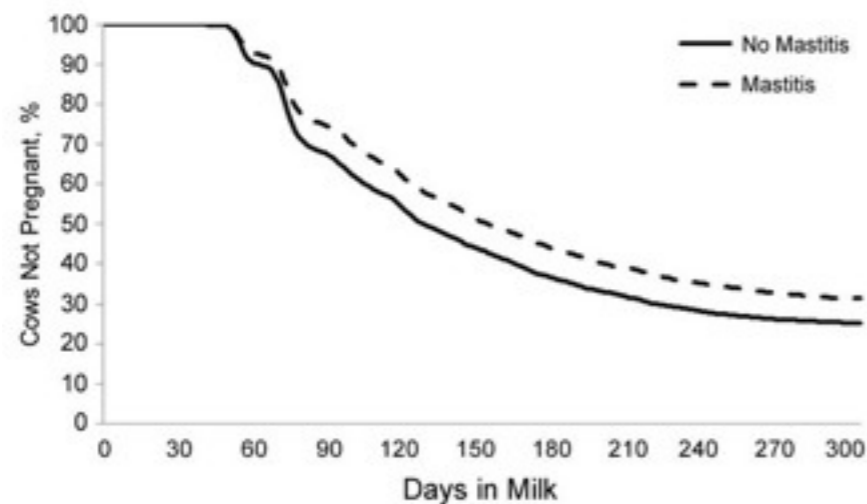
Reproductive physiology

Prolonged service time

Energy balance

Fever

Blockage GnRH-LH



Reduced conception risk

Poorer quality oocytes

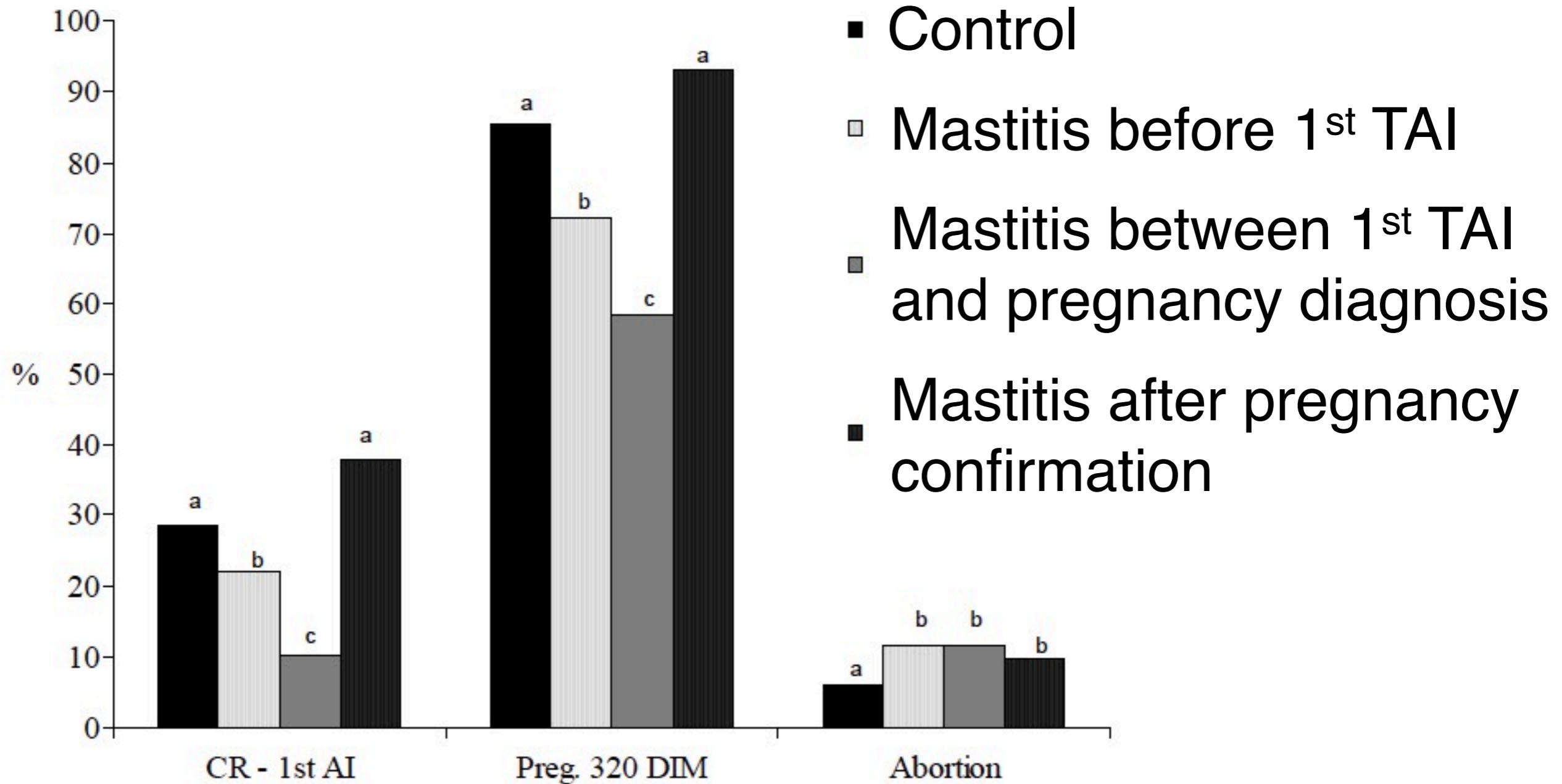
Fever

Toxins

Pregnancy losses

Mastitis and reproduction

Reduced conception rate



Mastitis and reproduction

Impacts (mastitis after 1st service)

Decreased

Conception rate to 1st
service

28.7 vs. 10.2%

Increased

Services per conception

2.59 vs. 3.05

Prolonged

Interval from calving to
conception

139.7 vs. 189.4

Higher likelihood

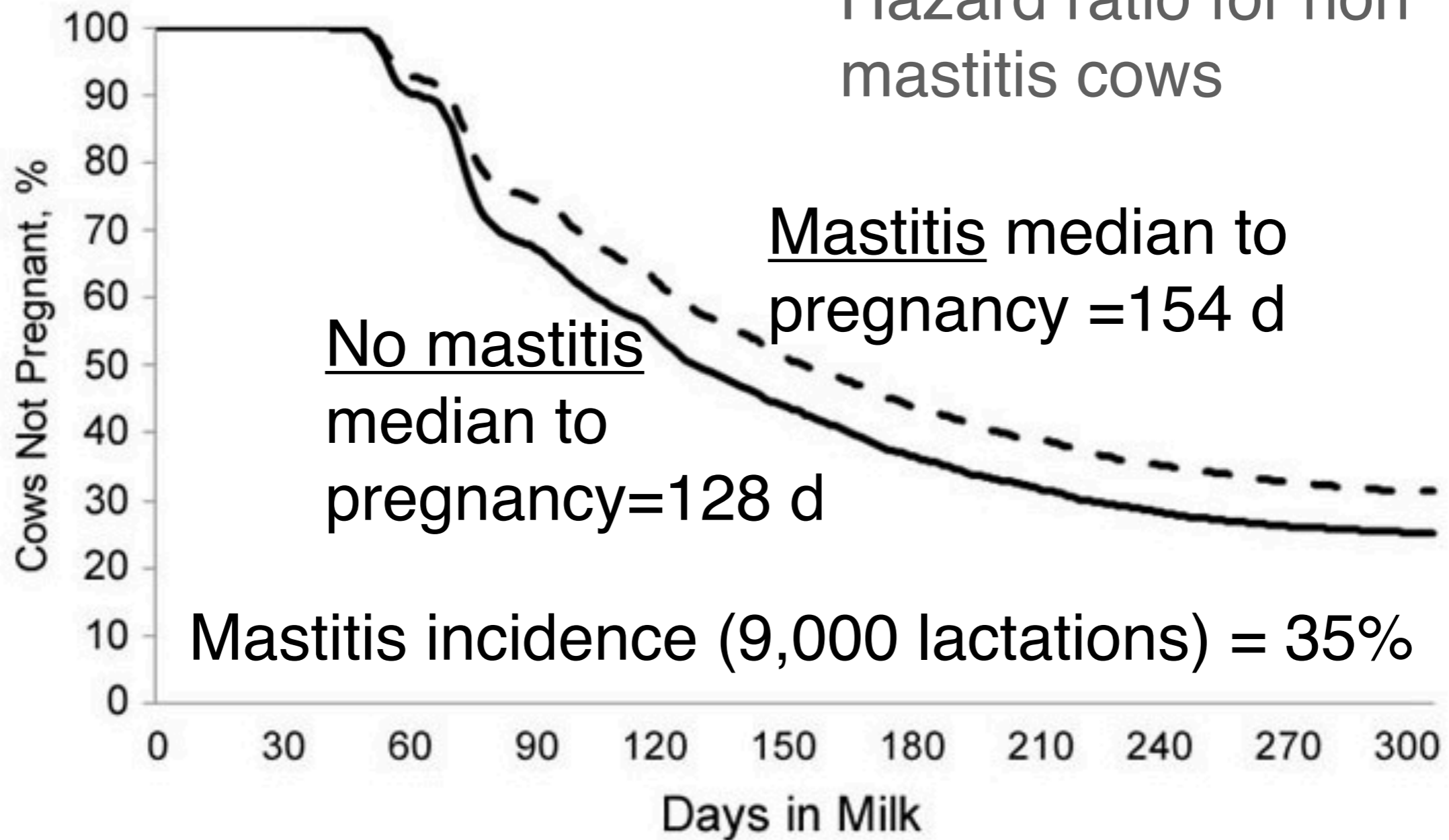
Abortion

5.8 vs. 11.6%

Mastitis and reproduction

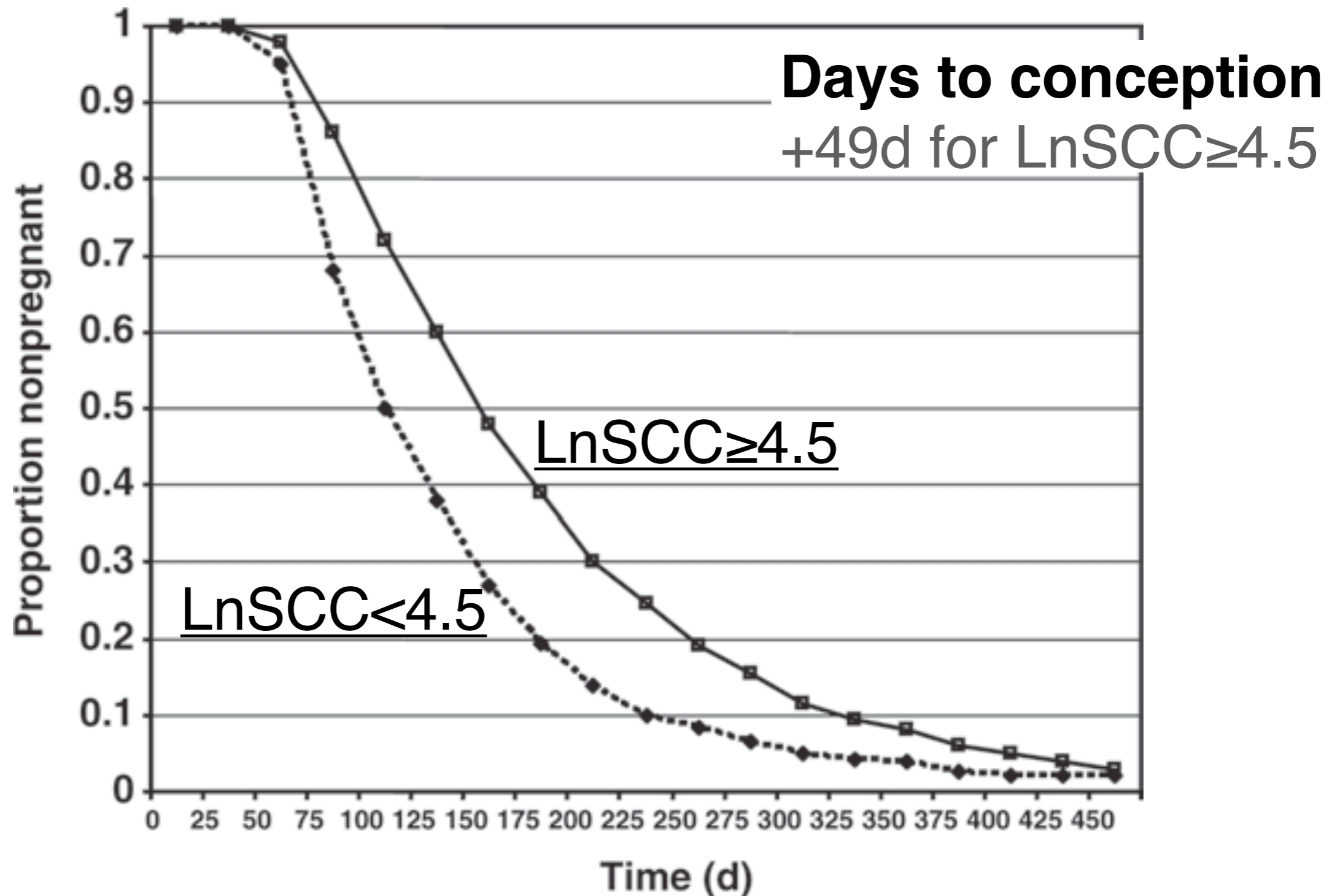
Survival curve

1.25 (25% higher)
Hazard ratio for non
mastitis cows



Mastitis and reproduction

Survival curve



Mastitis and reproduction

Logistic regression

	Odds ratio	
	Conception at 1 st service	Abortion risk
LnSCC < 4.5	1	1
LnSCC ≥ 4.5	0.83	1.22

Subclinical mastitis

Significant impact on reproductive performance by increased calving to first service, calving to conception, and services per conception

Decreased fertility cost

Tool: The economic value of a dairy cow

Decreased net return

Response to decreased
21-d pregnancy rate

Economics of an Average Cow, \$/year

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Herd Production and Reproduction Variables

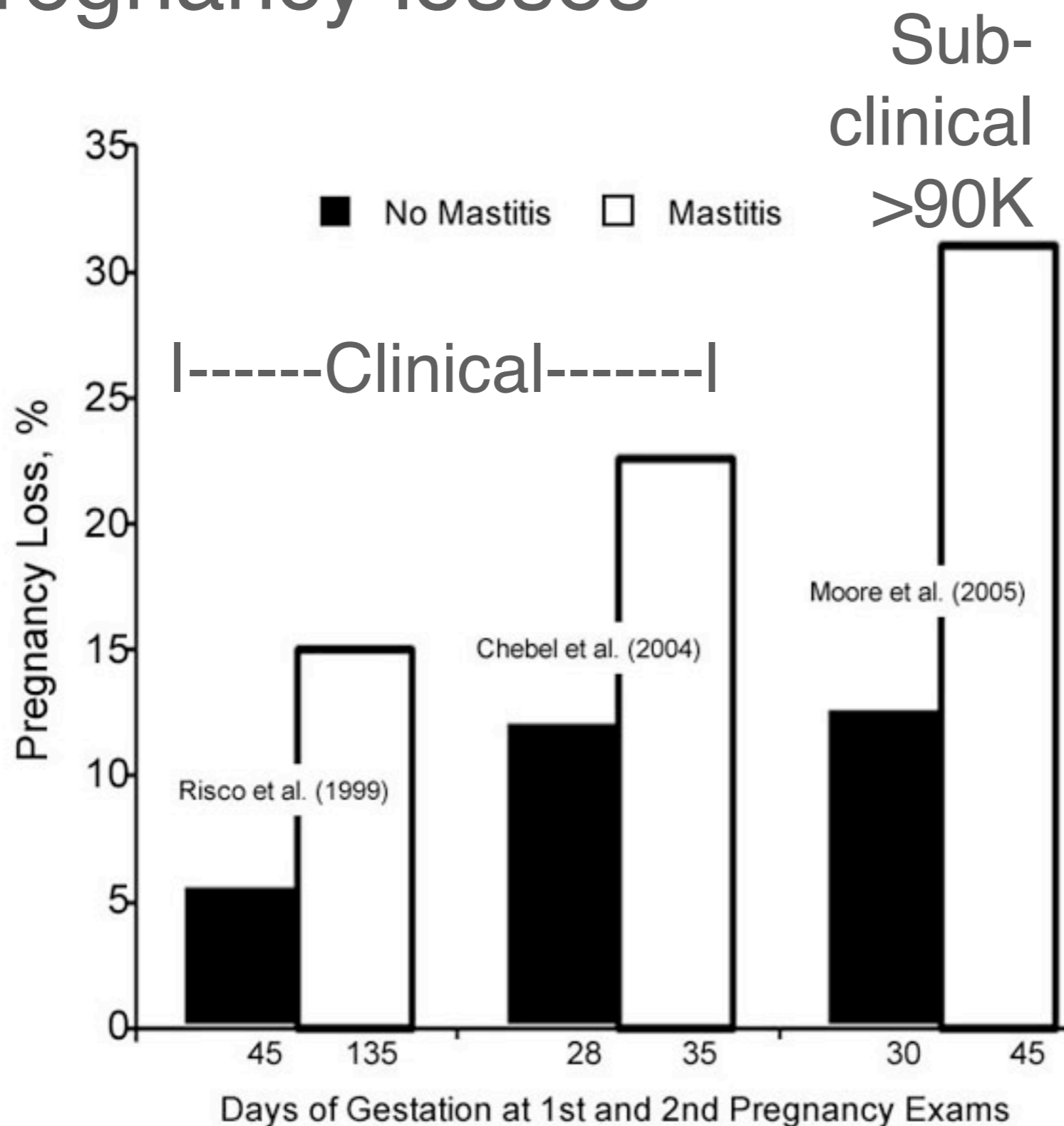
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Example

Decreased 21-d PR from
18 to 14% = \$1,969 - \$1,924
= **\$45/cow per year lost**

Mastitis and reproduction

Pregnancy losses

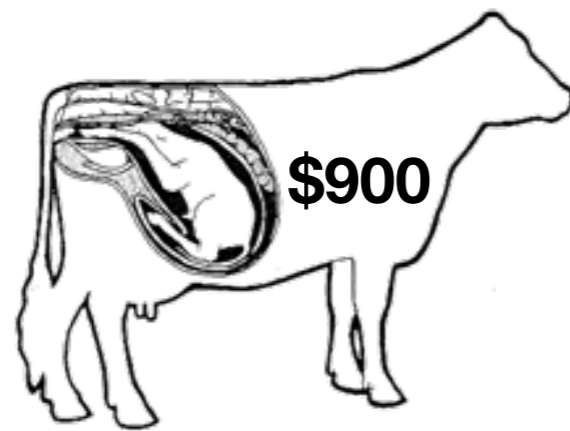


Mastitis causes pregnancy losses

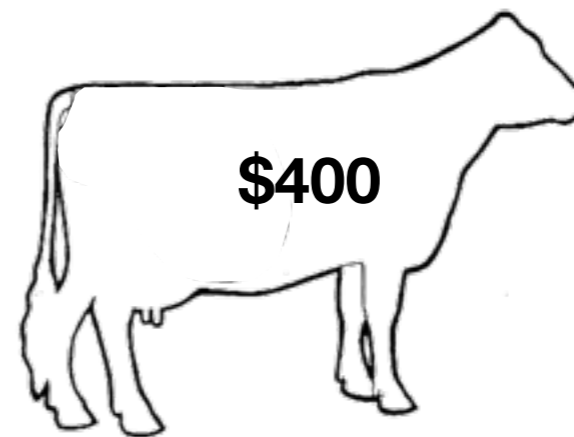
Cows diagnosed with mastitis before pregnancy diagnoses have a higher risk of pregnancy loss later in gestation

Pregnancy loss cost

Tool: The economic value of a dairy cow



Vs.



Abortion cost

Decreased cow value of cow when pregnant vs. when open

Example

Cow value of \$900 when pregnant - cow value of \$400 when open = **\$500**

Diseases and mastitis

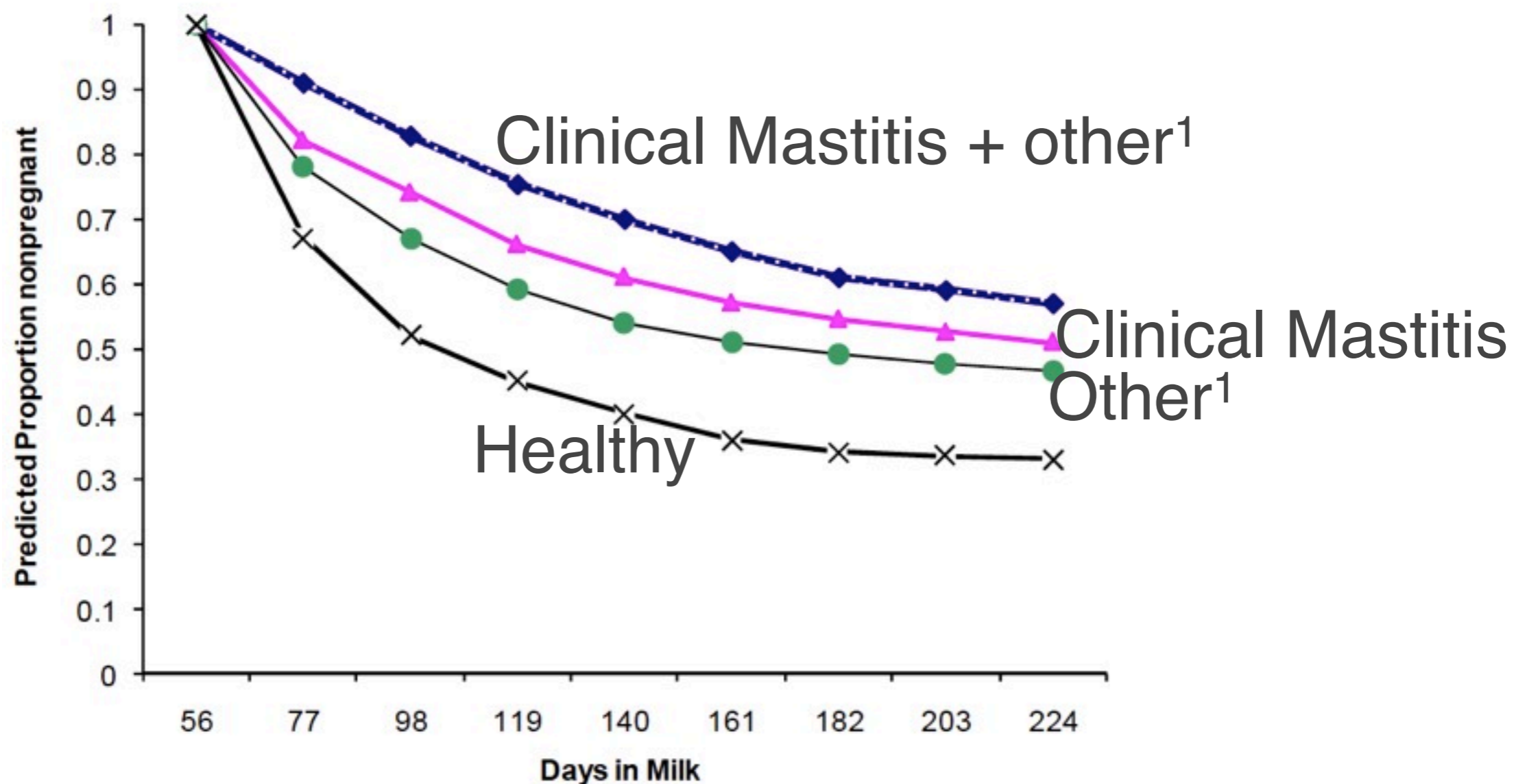
Mastitis alone and other diseases

	Clinical Mastitis + other¹	Clinical Mastitis	Other¹	Healthy
n	54	154	187	572
Days to first breeding	73	66	65	67
Services per conception	2.8 ^a	2.1 ^{ab}	1.9 ^{abc}	1.6 ^c
Days open	155 ^a	140 ^a	97 ^b	88 ^b

¹Other=ovarian cyst, retained placenta, left displaced abomasum, ketosis, milk fever, metritis, pyometra.

Diseases and fertility

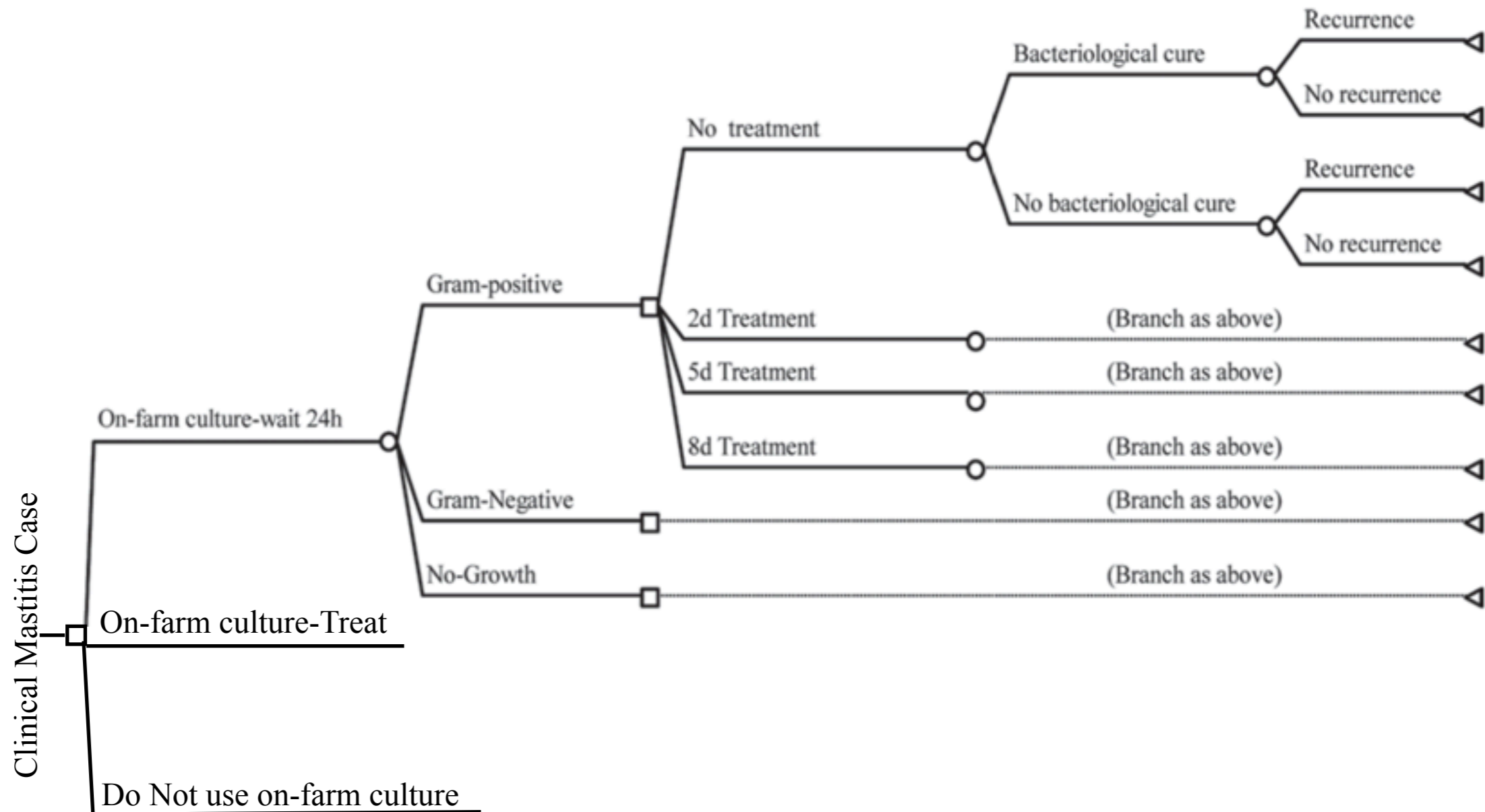
Mastitis alone and other diseases



¹Other=ovarian cyst, retained placenta, left displaced abomasum, ketosis, milk fever, metritis, pyometra.

Mastitis decision tree

Example of data processing and analysis



Mastitis decision tree

Optimal culture and treatment (all in US\$)

Culture		Treatment	Primiparous		Multiparous	
			↑ Conta- -gious	↑ Coli- forms	↑ Conta- -gious	↑ Coli- forms
On-farm culture, wait 24-hr	Gram+	2 d	-363	-222	-517	-401
	Gram-	None	-379	-323	-290	-255
	No growth	None	-383	-384	-160	-158
On-farm culture, treat	Gram+	1 d more	-354	-213	-505	-388
	Gram-	Stop	-385	-330	-296	-262
	No growth	Stop	-390	-390	-167	-165
No on- farm culture		None		-314		-261
		2 d	-361		-420	

Web-based decision support tools

The UW-Dairy Management Website

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Dairy Management site is designed to support dairy farming decision-making focusing on model-based scientific research. The ultimate goal is to provide user-friendly computerized decision support systems to help dairy farms improve their economic performance. Dr. Victor Cabrera focuses on model-based decision support in dairy cattle and in dairy farm production systems. Dr. Cabrera's primary interest is to improve cost-efficiency and profitability along with environmental stewardship in dairy farms by using simulation techniques, artificial intelligence, and expert systems. Dr. Cabrera's research and Extension programs involve interdisciplinary and participatory approaches towards the creation of user-friendly decision support systems. As an Extension Specialist, Dr. Cabrera works in close relationships with county-based Extension faculty, dairy producers, consultants, and related industry.

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Nice program for the 2014 International Cow Fertility Conference, Westport, Ireland. [fb.me/2hu6pvrQf](#)

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- UW-DairyRepro\$Plus: A Reproductive Analysis Tool that Includes Heat Detection Devices

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