Non-genetic factors that affect quality grade

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Alternate title

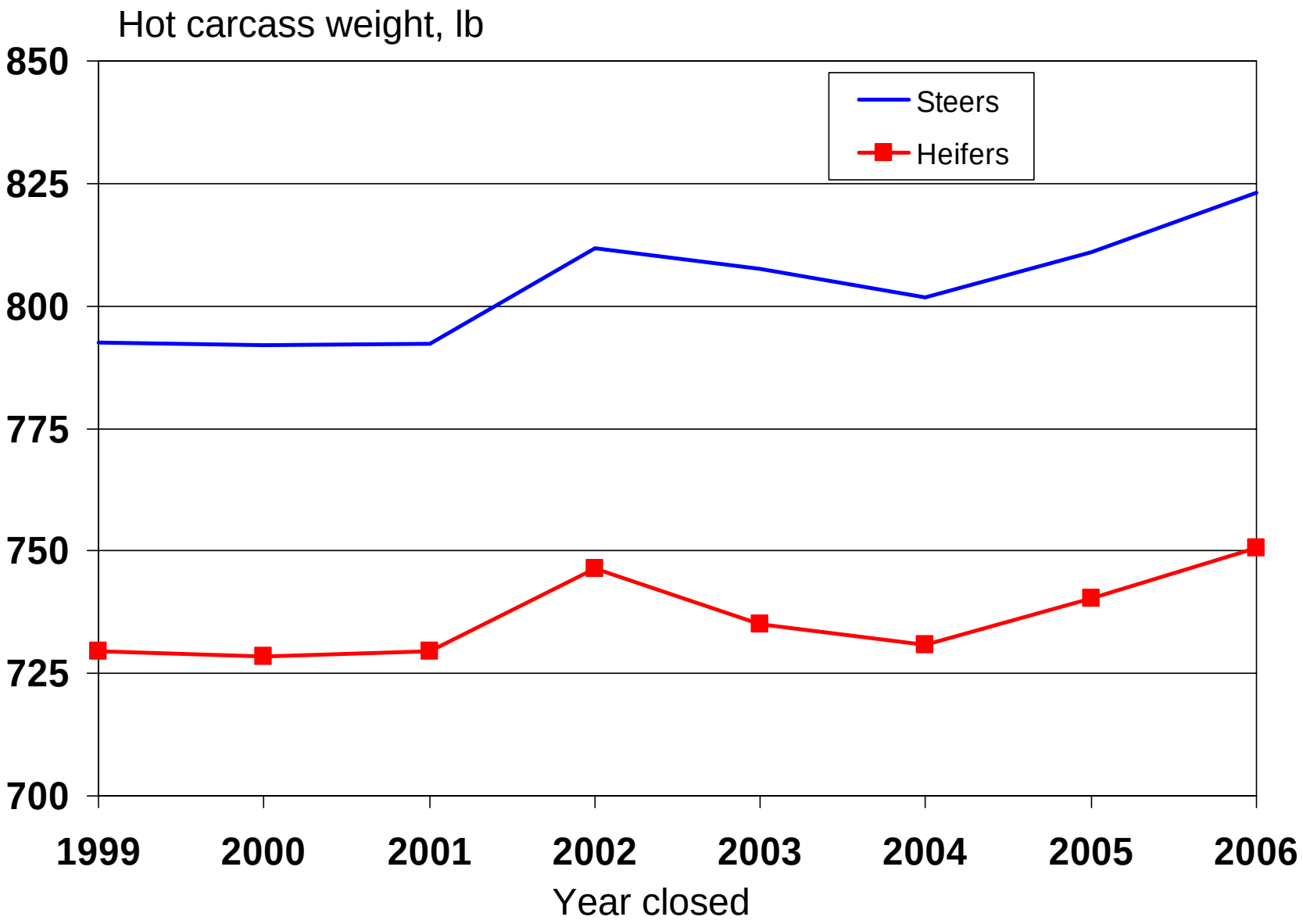
Why won’t these *&#!@##** cattle grade?!

ARS questions

Background

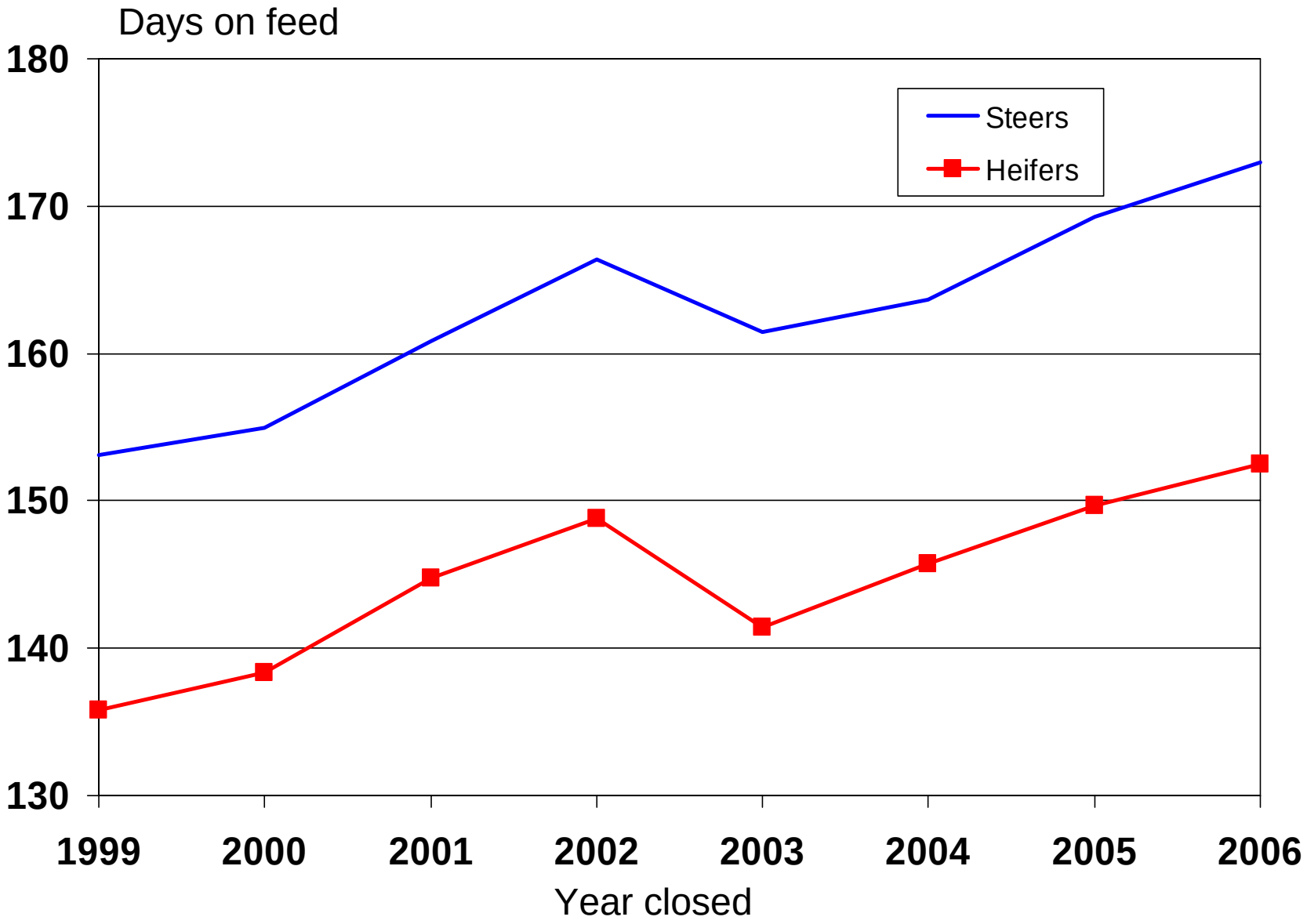
- Research and population data
- VetLife Benchmark Performance Program
  - Service for our customers
  - 40% of US fed cattle
  - Carcass data on most of them
  - Cash and grid cattle
  - Common feeding areas

Hot carcass weight by year

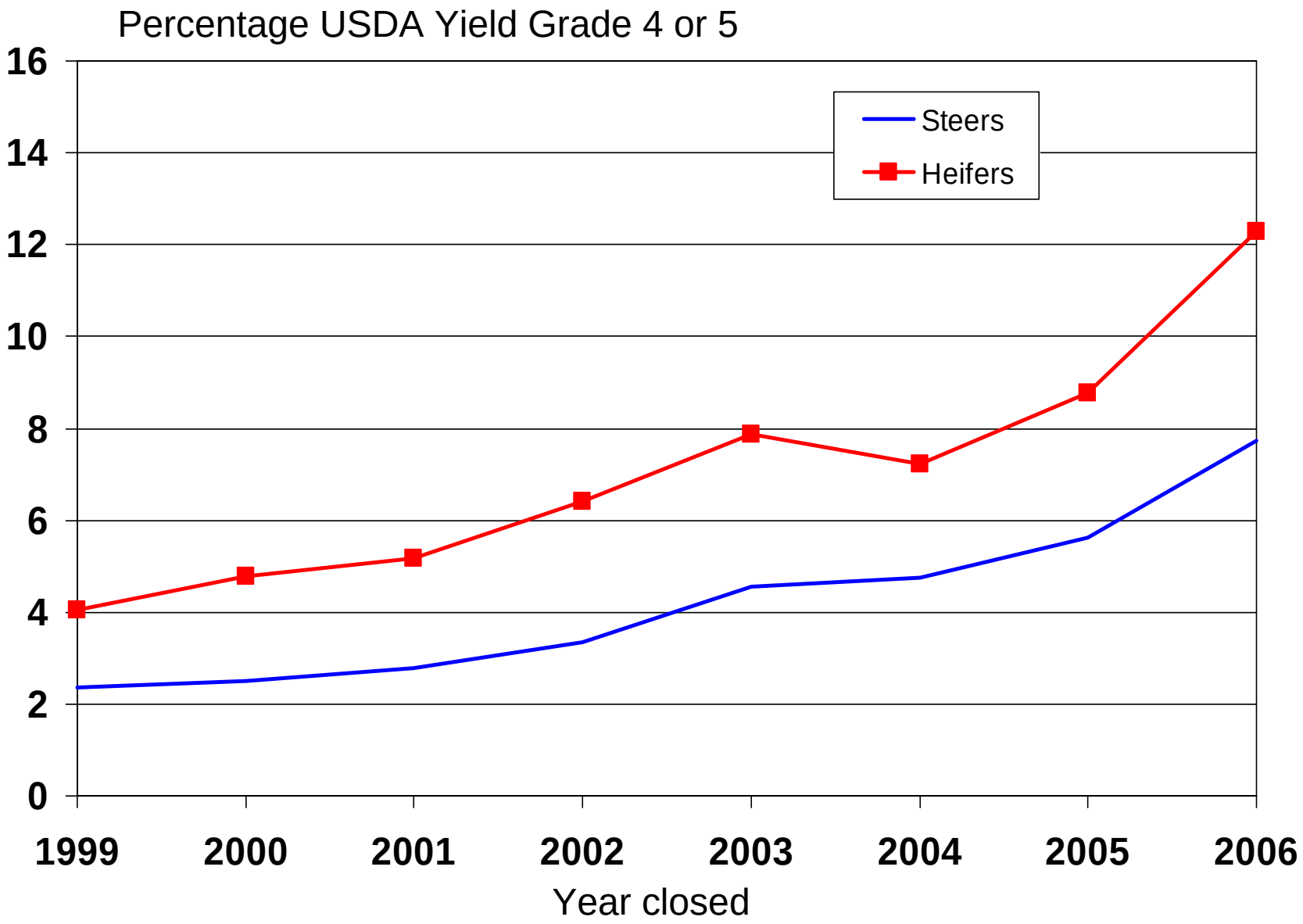


Days on feed by year

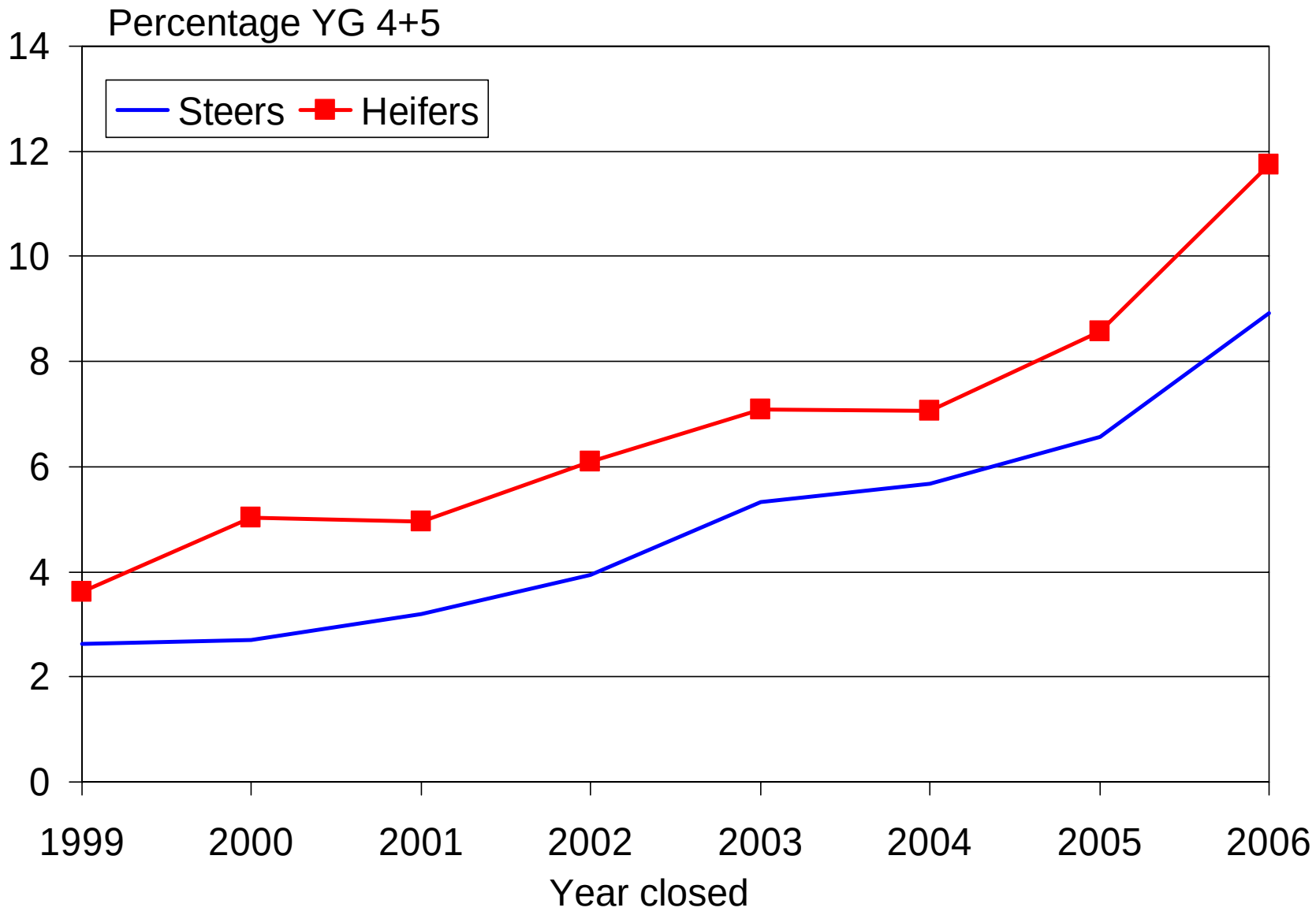
700-749 lb steers or heifers



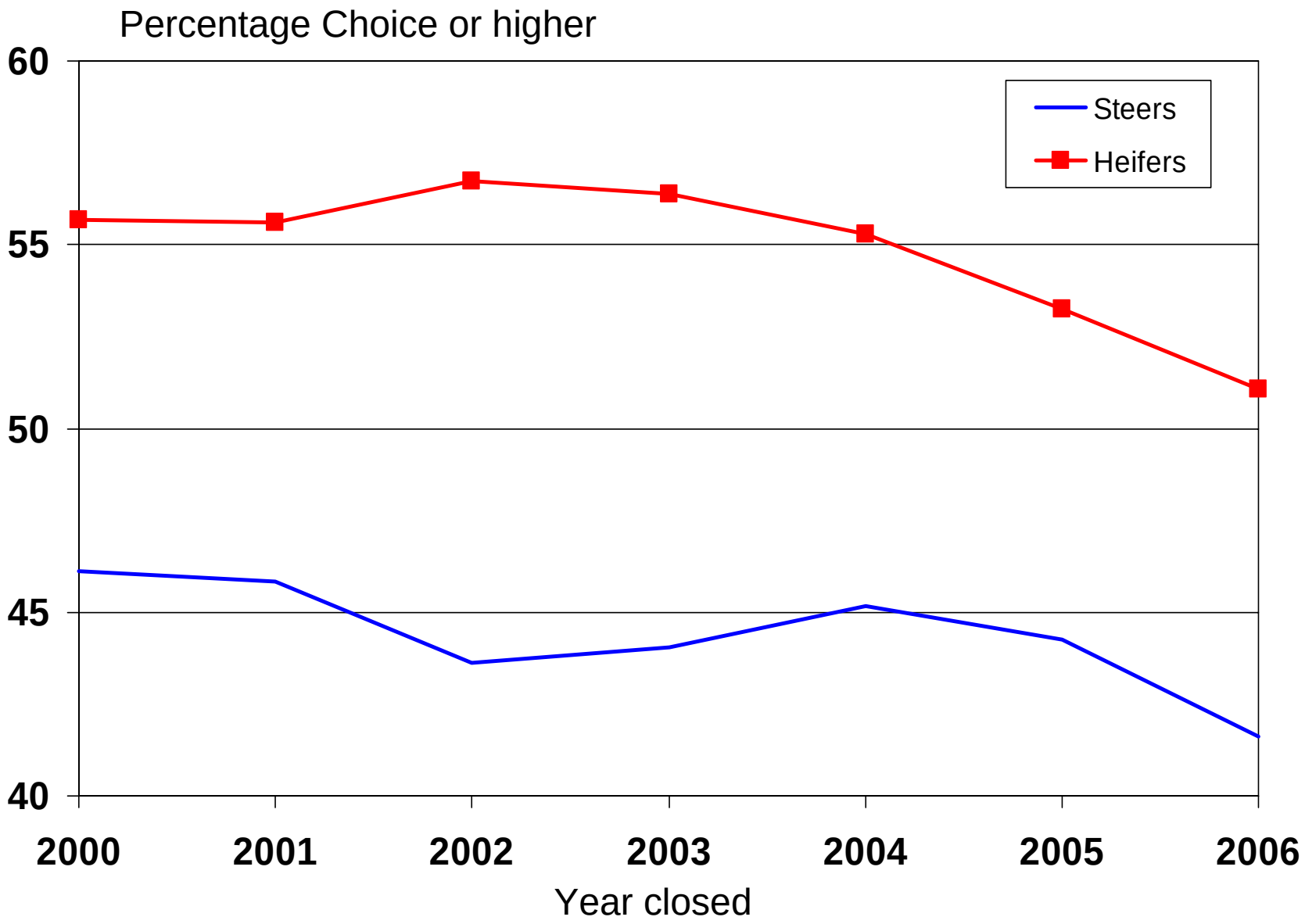
Percentage YG 4+5 by year



YG 4+5: 700 lb steers or heifers with lot grade between 40 and 69% Choice



Percentage Choice by year



Non-genetic factors affecting quality grade: categories

- Demographic factors
  - Sex, weight, age, geography
- Pre-feedyard nutrition and health
- Feedyard nutrition and health
- Endpoint selection

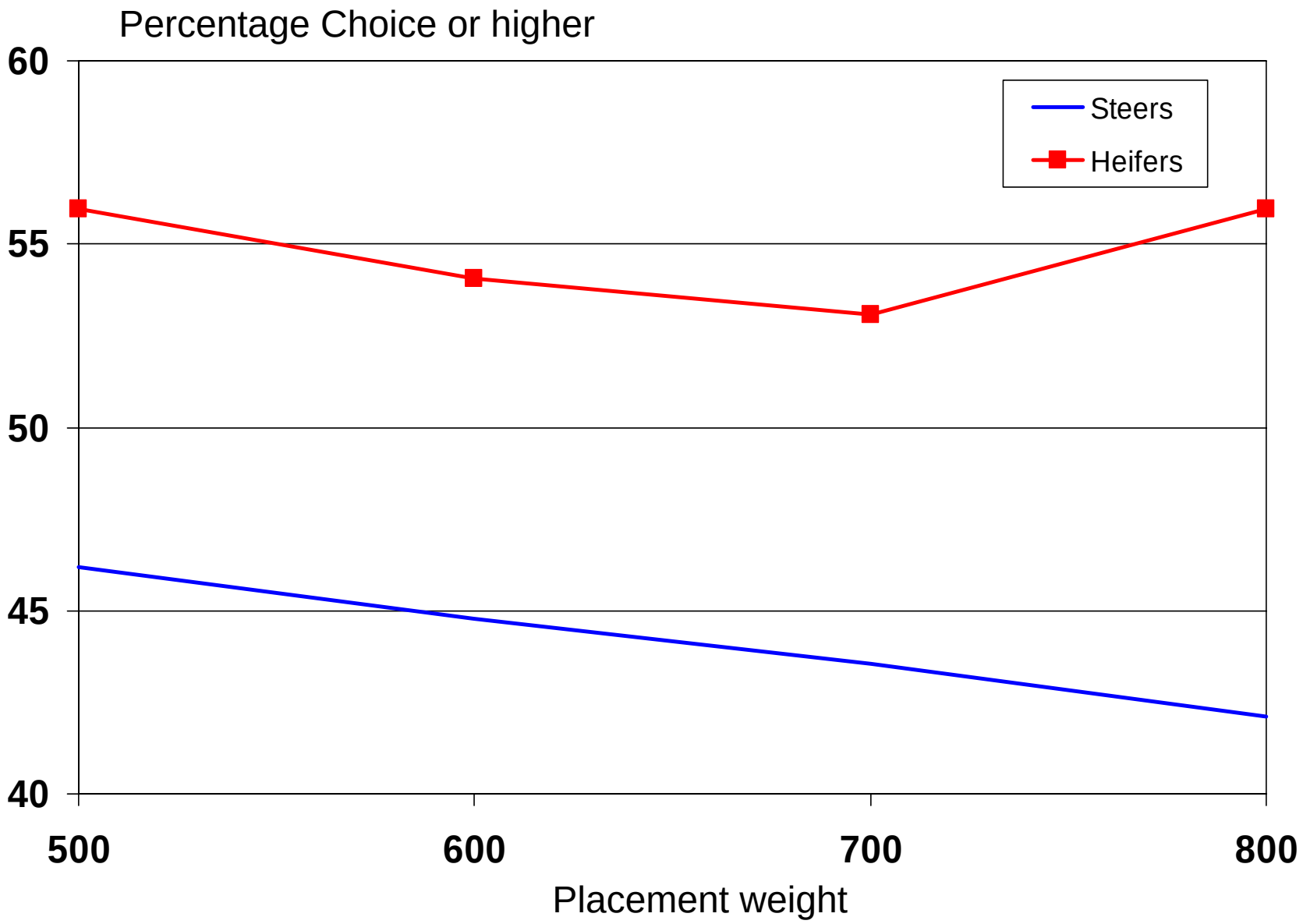
Non-genetic factors affecting quality grade: categories

- Demographic factors
  - Sex
  - Weight
  - Age
  - Geography

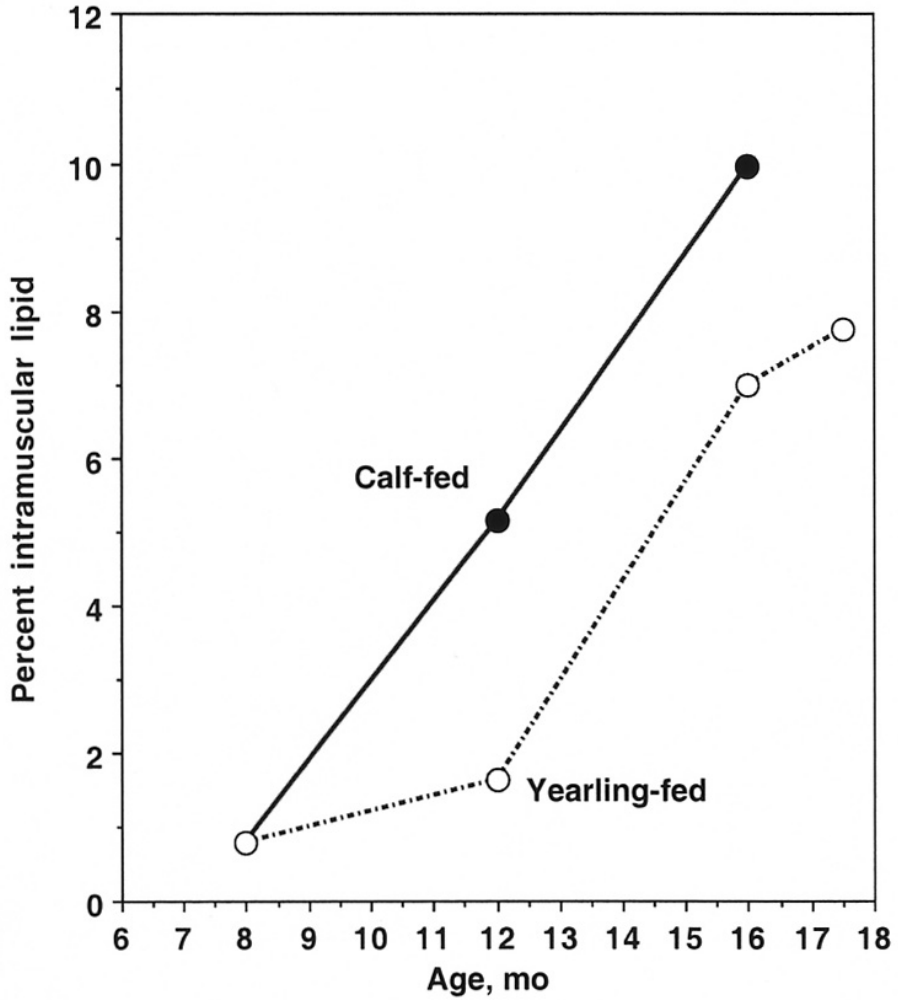
Carcass averages: steers and heifers

	Steers	Heifers	
Dressing percentage, %	64.1	64.2	*
Hot carcass wt, lb	803	734	
Premium QG, %	4.8	8.1	*
Choice or higher, %	42.8	54.0	*
Penalty QG, %	6.3	4.6	*
YG 1 or 2, %	64.5	57.2	
YG 4 or 5, %	4.0	6.7	
Dark cutters, %	0.5	0.7	
Light, %	0.6	1.6	
Heavy, %	3.8	0.5	*

Percentage Choice by placement weight



IM fat of calves vs. yearlings

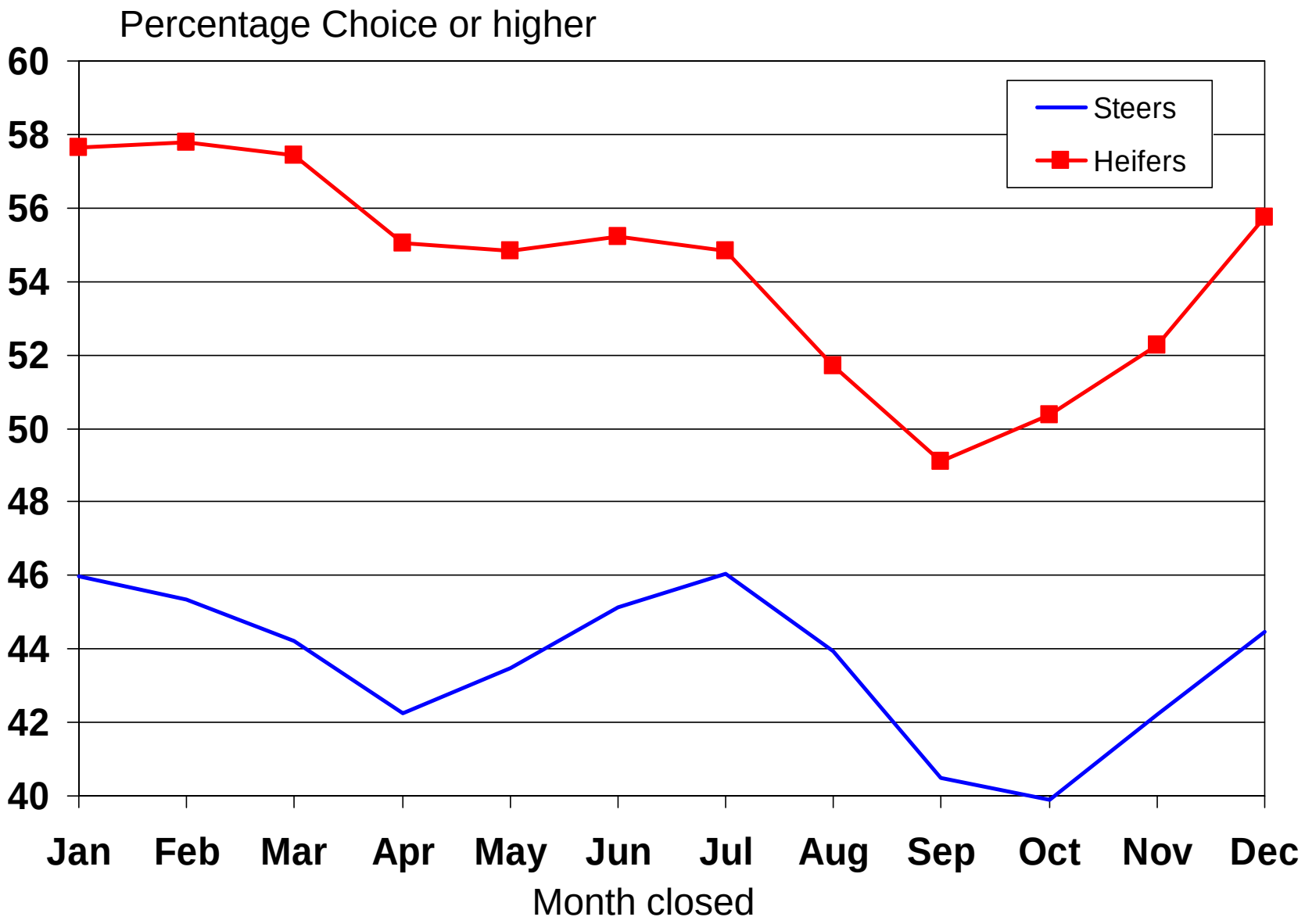


Unpublished data courtesy of Stephen Smith, Texas A&M University

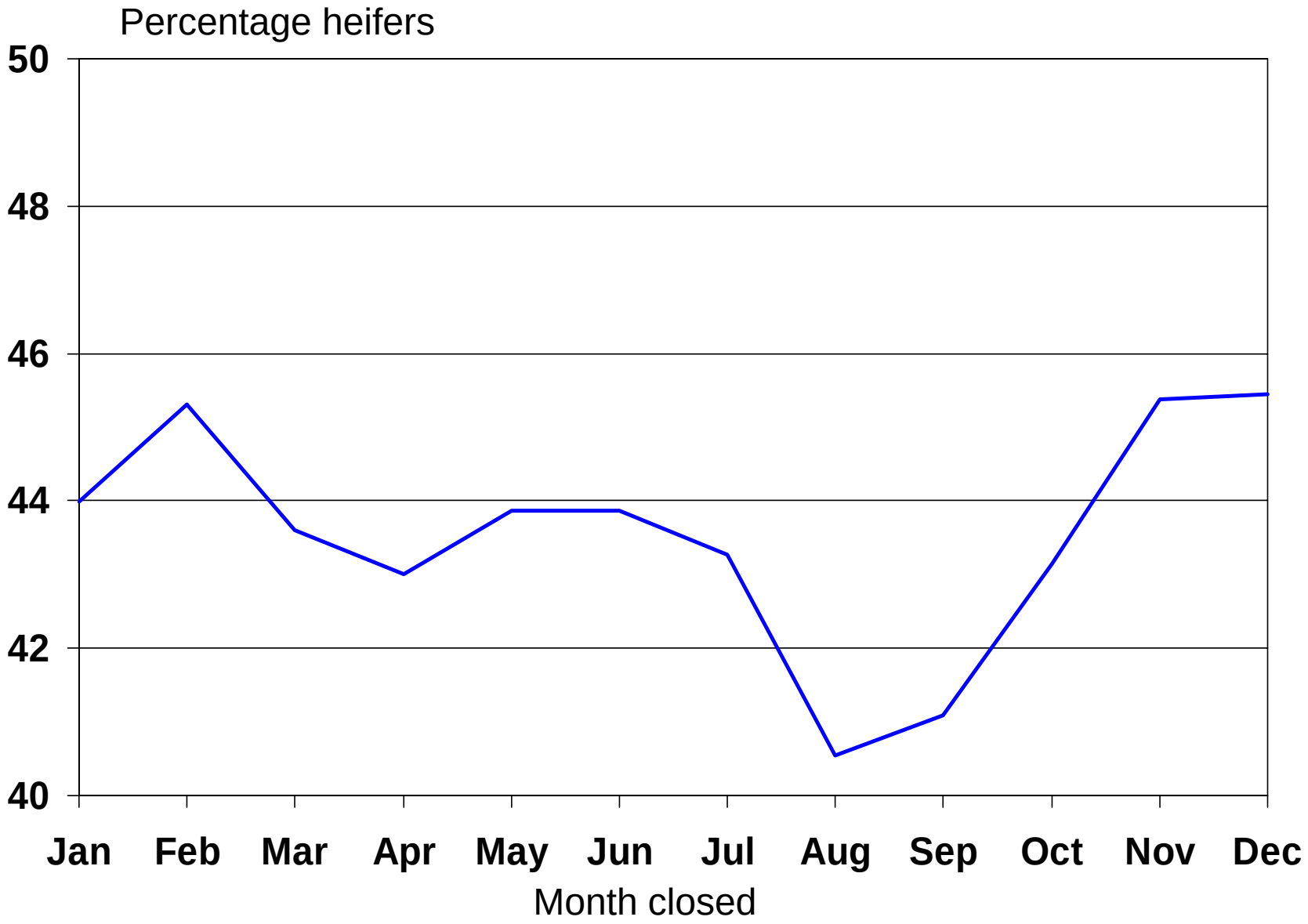
Regional grade differences

Sex	Region	HCW	DP	C+P
Heifers	Central Plains	744	64.1	53.0
Steers	Central Plains	815	64.0	41.4
Heifers	High Plains	732	64.2	53.0
Steers	High Plains	806	64.2	41.9
Heifers	Midwest	759	63.6	64.1
Steers	Midwest	838	63.7	55.7
Heifers	North Plains	760	63.7	59.0
Steers	North Plains	817	63.7	49.6

Percentage Choice by month harvested



Percentage heifers by month harvested



Why seasonality?

- Placement demographics?
  - Weight — No
  - Sex group — Yes
  - Age — Probably not
- Photoperiod? — Yes
- Heat? — Maybe
- Vitamin A a/o D? — Probably

Non-genetic factors affecting quality grade: categories

- Pre-feedyard nutrition and health

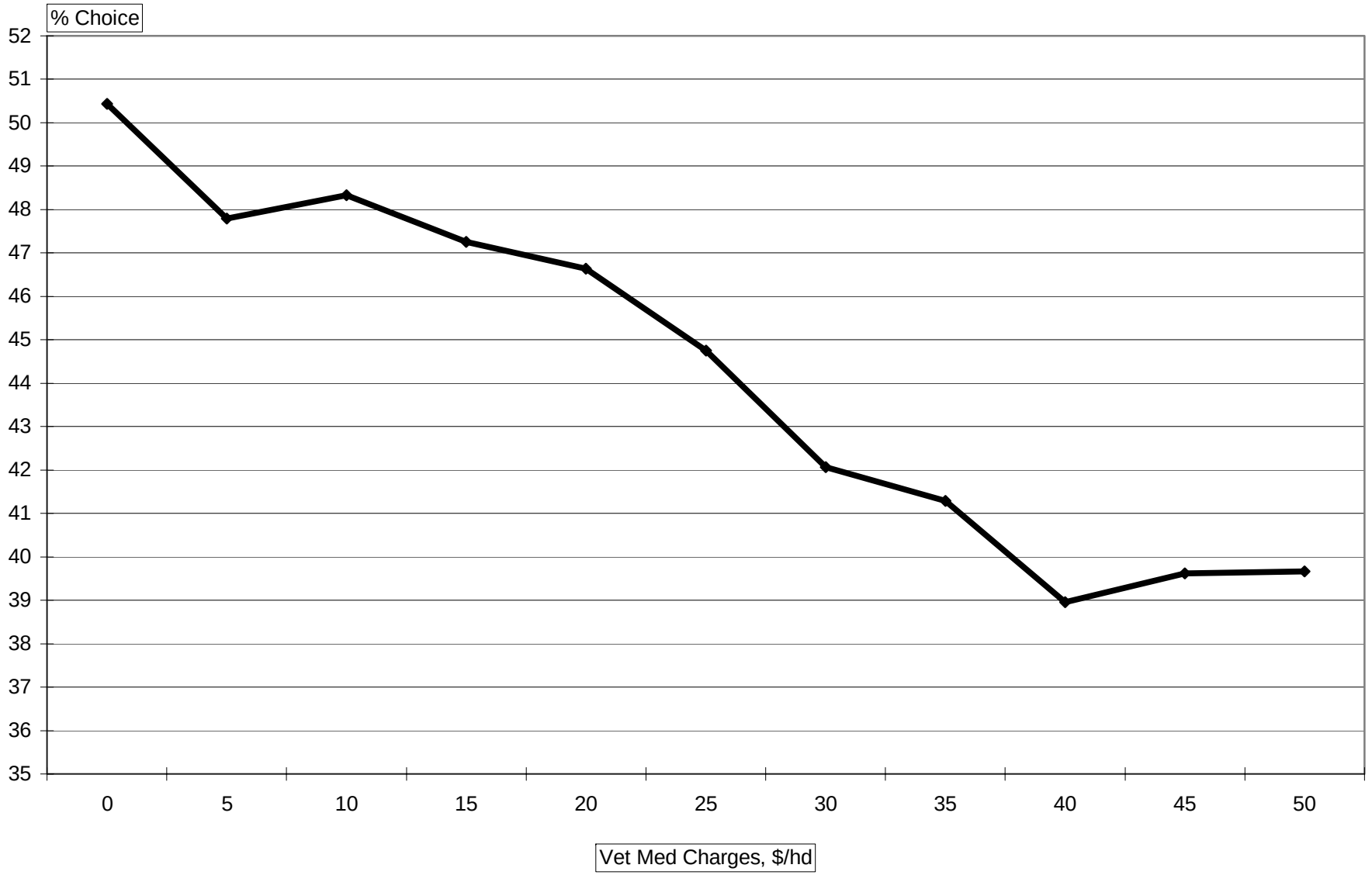
Incoming feedyard risk assessment

500-599 lb steers

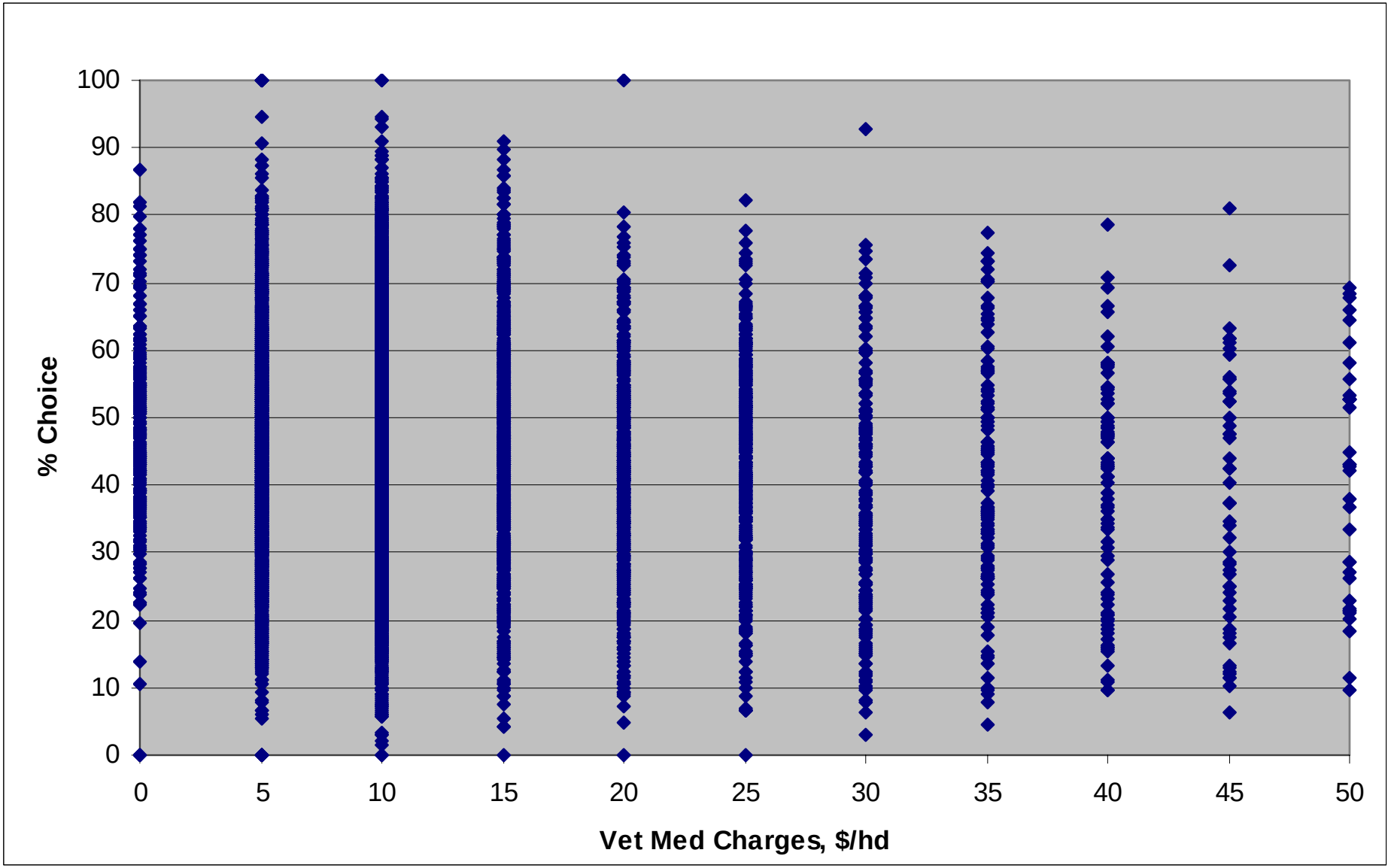
Risk level	Low	Moderate	High
Dress	64.0	63.9	64.0
HCW	755	766	772
Prime, %	1.2	0.6	0.6
Choice, %	50.9	46.1	43.4
Death loss	1.89	1.95	4.32
Ab Pct	35.1	53.7	138.6

% Choice by Vet Med Charges: light steers

Region	(All)	Inwt100 Index	(All)	Sex	(All)	CloseYear	(All)



Variability in % Choice by Vet Med Charges: light steers



North American Drought Monitor

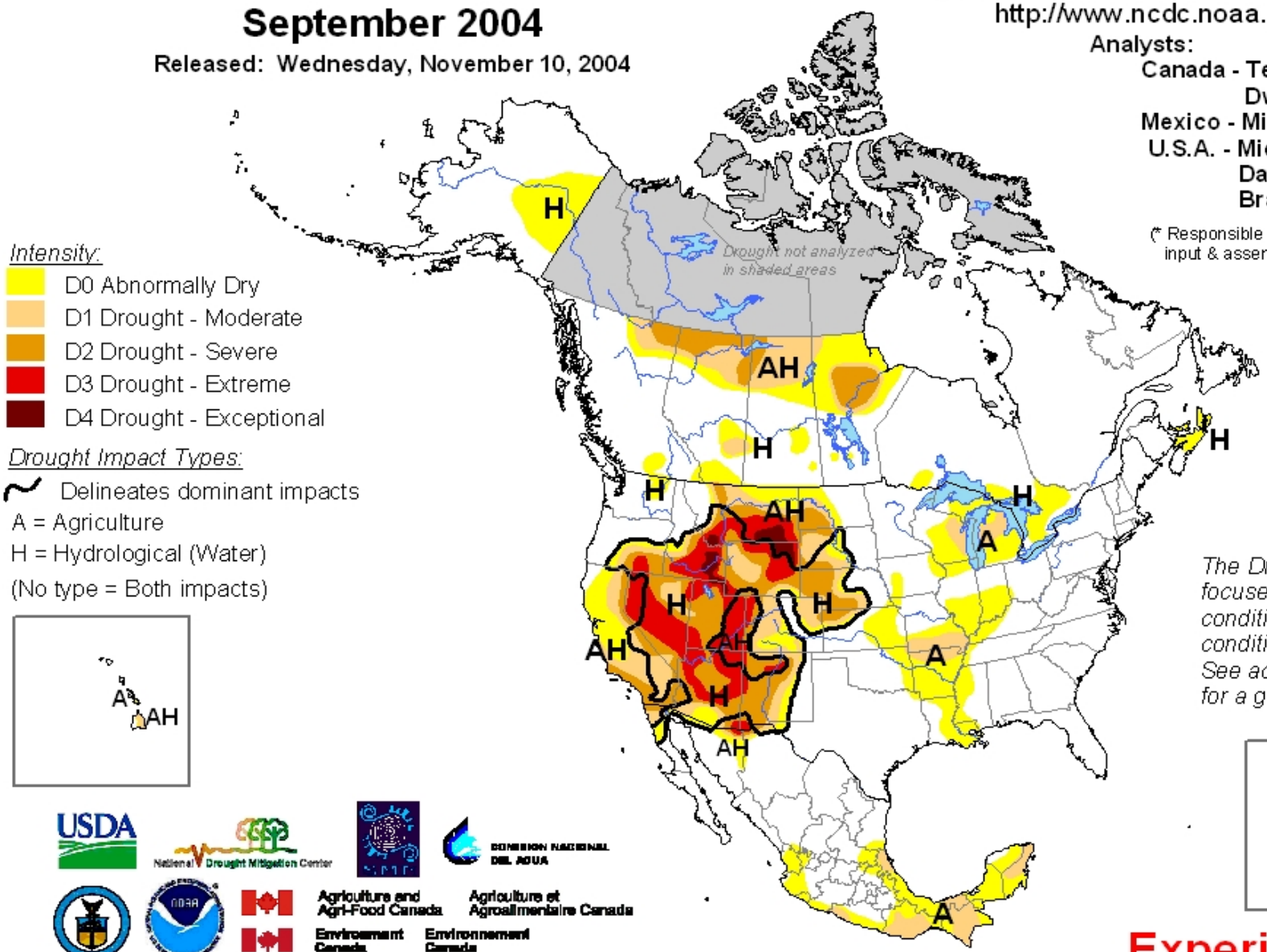
September 2004

Released: Wednesday, November 10, 2004

http://www.ncdc.noaa.gov/nadm.html

Analysts:
Canada - Ted O'Brien
Dwayne Chobanik
Mexico - Miguel Cortez
U.S.A. - Michael J. Hayes
David Miskus*
Brad Rippey*

(* Responsible for collecting analysts input & assembling the NA-DM map)



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

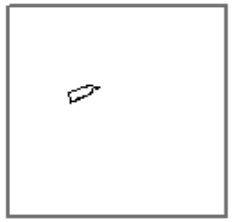
Delineates dominant impacts

A = Agriculture

H = Hydrological (Water)

(No type = Both impacts)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text for a general summary.



USDA

National Drought Mitigation Center

CONAGUA COMISIÓN NACIONAL DEL AGUA

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

Environment Canada / Environnement Canada

Experimental

North American Drought Monitor

October 31, 2006

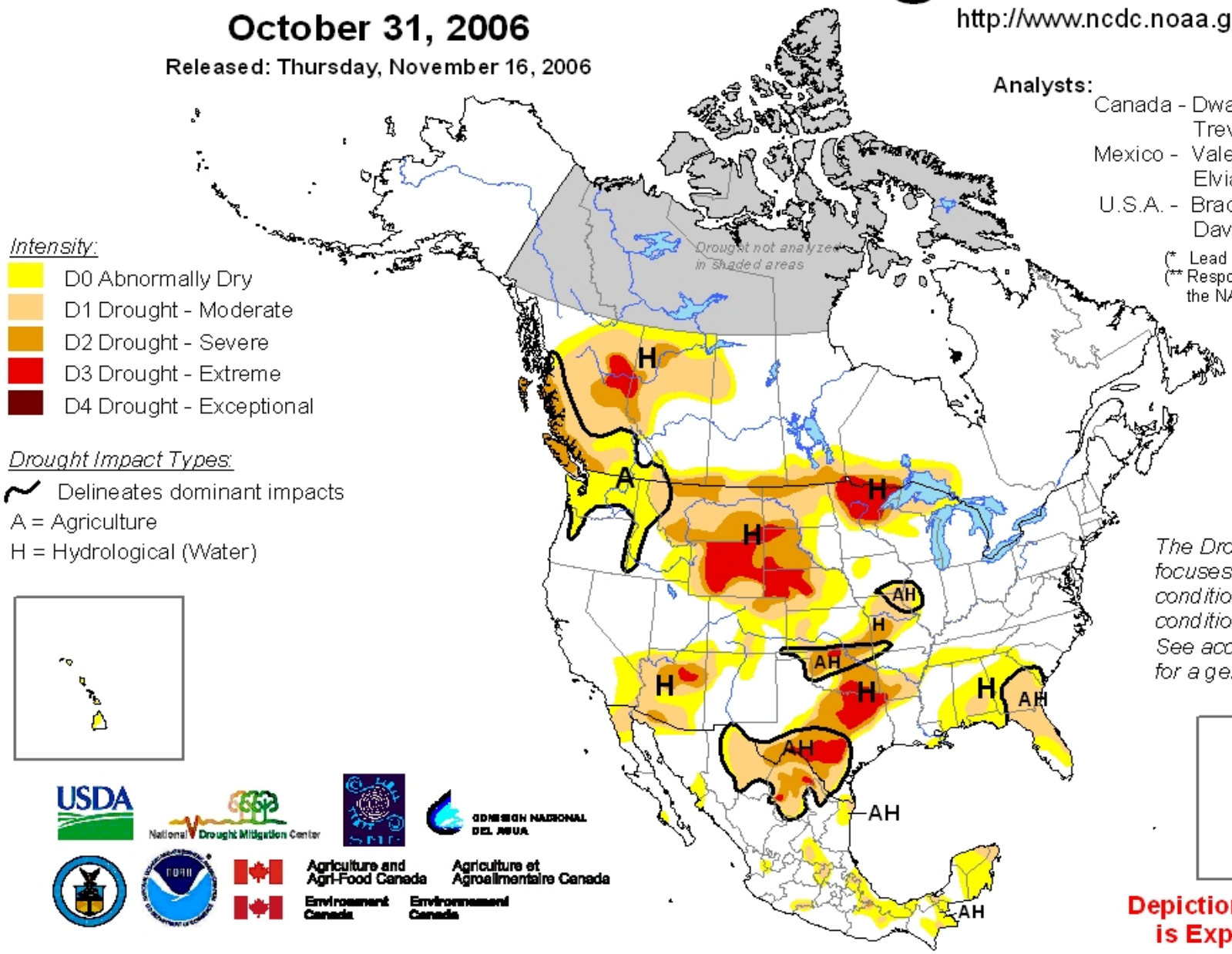
http://www.ncdc.noaa.gov/nadm.html

Released: Thursday, November 16, 2006

Analysts:

Canada - Dwayne Chobanik**
Trevor Hadwen
Mexico - Valentina Davydova
Elvia Delgado
U.S.A. - Brad Rippey*
David Miskus**

(* Lead author)
(** Responsible for assembling the NA-DM map)



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Depiction for Canada is Experimental

USDA
National Drought Mitigation Center
CONAGUA NATIONAL DEL AGUA
Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada
Environment Canada
Environnement Canada

Words to live by:

"When it comes to quality grade, if the cattle have potential for compensatory growth, you're screwed!"

Robbi Pritchard, Ph.D.

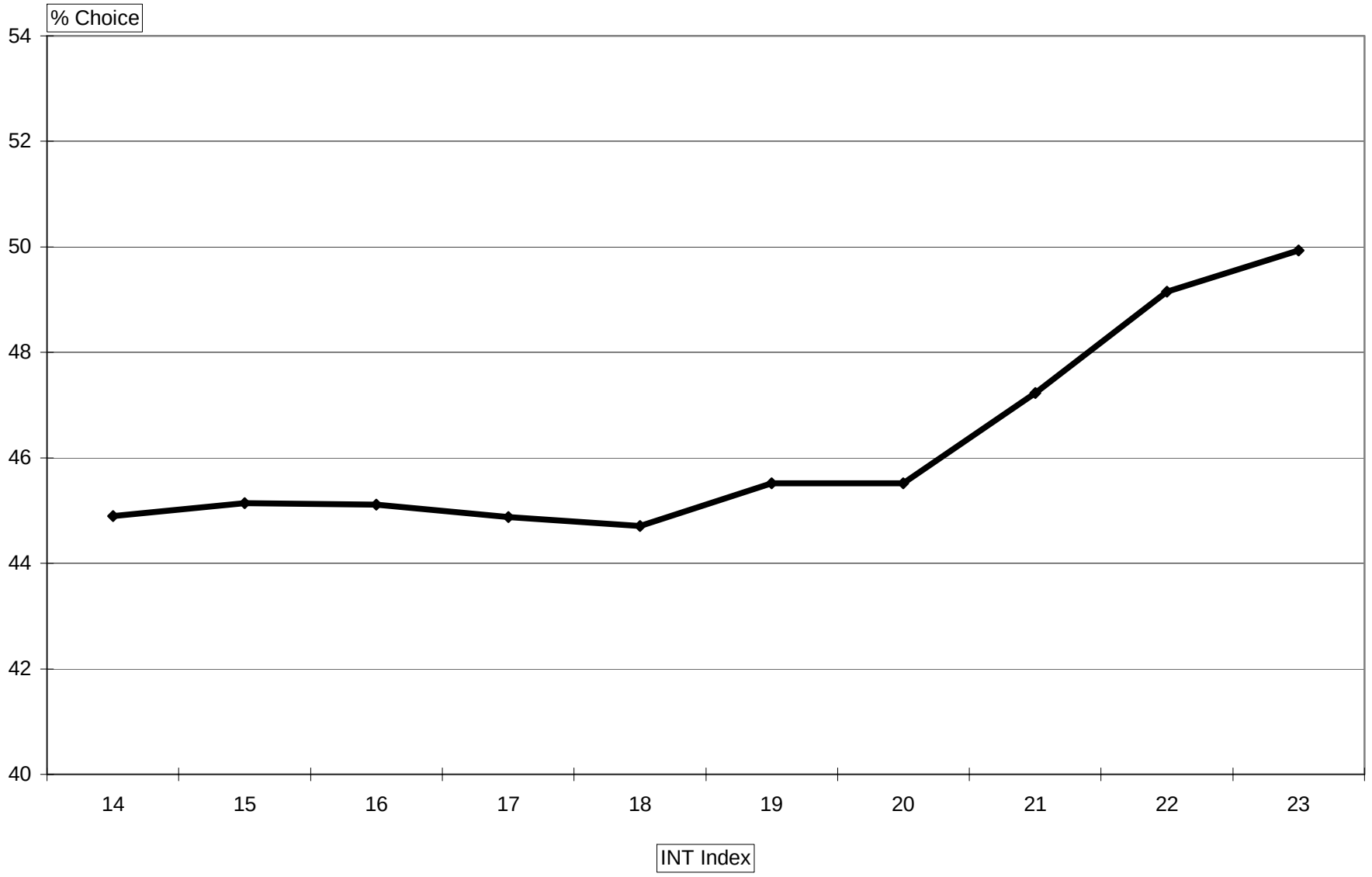
South Dakota State University

Non-genetic factors affecting quality grade: categories

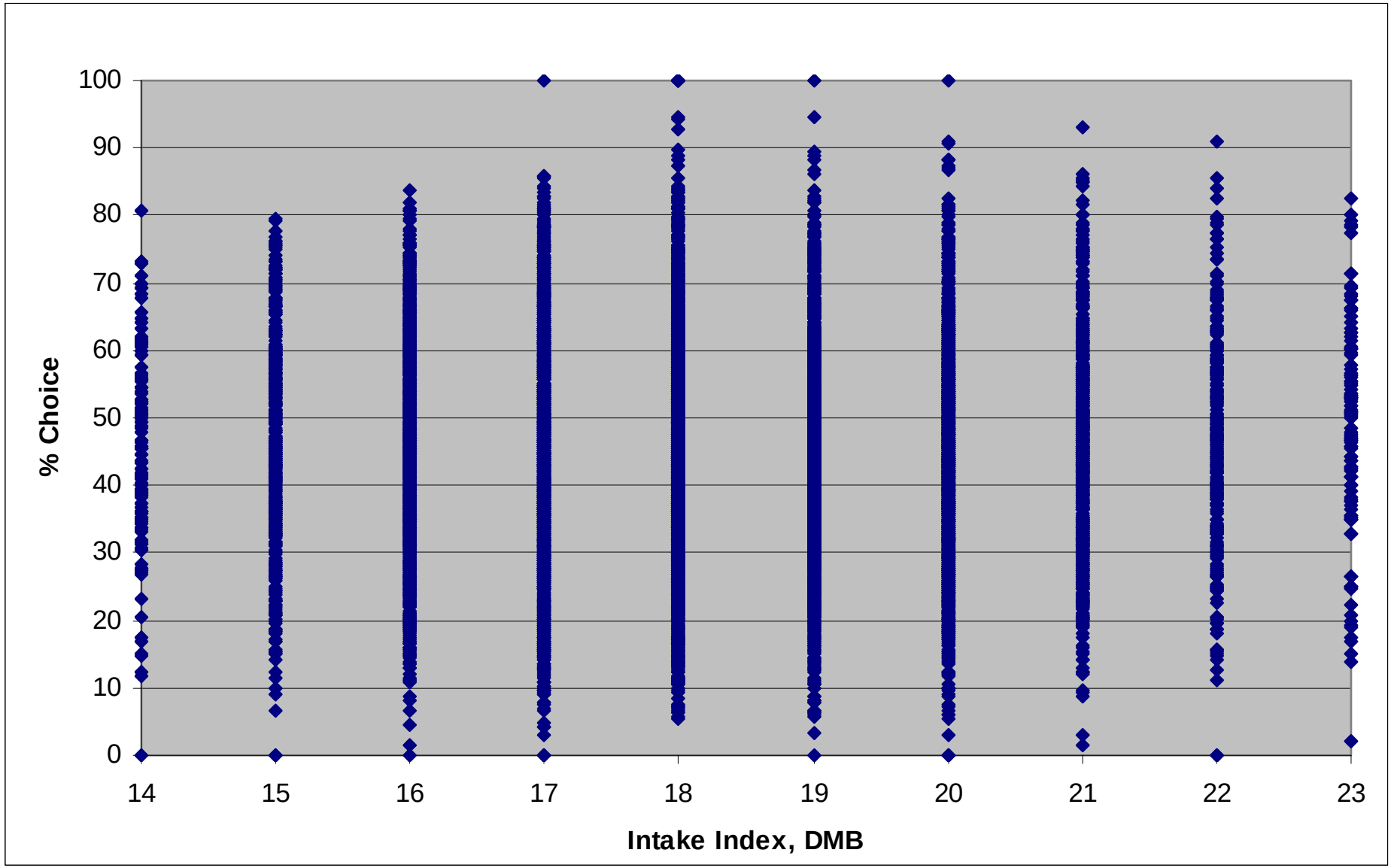
- Feedyard nutrition and health

% Choice by Intake: light steers

Region	(All)	CloseYear	2006	Inwt100 Index	(All)	Sex	(All)



Variability in % Choice by Intake: light steers



Grain Processing

- Intake regulated by grain processing method
  - Increased intake observed with coarser processing
  - Differences in conversion result from intake, not gain
- Increased Metabolizable Energy
  - Increases KPH and subcutaneous fat
  - No other differences in carcass traits
- Cattle slaughtered at equal endpoints show no differences in marbling, despite grain processing method

Ethanol co-products

- At low yield grade endpoints (low energy or lean cattle) co-products reduce marbling at any inclusion level.
- At an endpoint of yield grade 3, co-products have no effect on marbling up to 20% inclusion rate.
- At high yield grade endpoints (high days on feed, early-maturing cattle or heifers) co-products increase marbling at low to intermediate inclusion rates.

Reinhardt and DiCostanzo (2006)

Ethanol co-products

- Very difficult research to interpret
- Strong statements are dangerous due to plant-to plant and other sources of variability

What about implants and other growth promotants?

Percentage change vs. negative control
Published implant research

	ADG	Choice+
Number of comparisons	579	356
All steers or heifers	116.2	-10.8
Steers, no TBA	114.4	-8.7
Steers, TBA	120.2	-14.3
Steers, TBA < 200 mg	119.2	-4.3
Heifers, no TBA	110.2	-3.1
Heifers, TBA	112.2	-4.6

Implant programs by year:

have they changed in recent history?

	Two years beginning with…			
	1999	2001	2003	2005
Implant doses	1.85	1.96	2.09	1.96
TBA doses	1.13	1.21	1.28	1.29
Implant score	3.15	3.08	3.11	3.06
Days on feed	154	169	164	170
Days/dose	83.5	86.4	78.3	86.8

Effects of melengestrol acetate

	ADG	F/G	HCW	Choice+
Control	2.95	6.52	674	65.3
Treated	3.18	6.24	692	69.9

Mean results from 13 studies

Effects of ractopamine hydrochloride on mean marbling score

	Control	Treated	SEM	P
Steers	495.8	495.4	3.6	NS
Heifers	503.7	501.1	6.4	NS

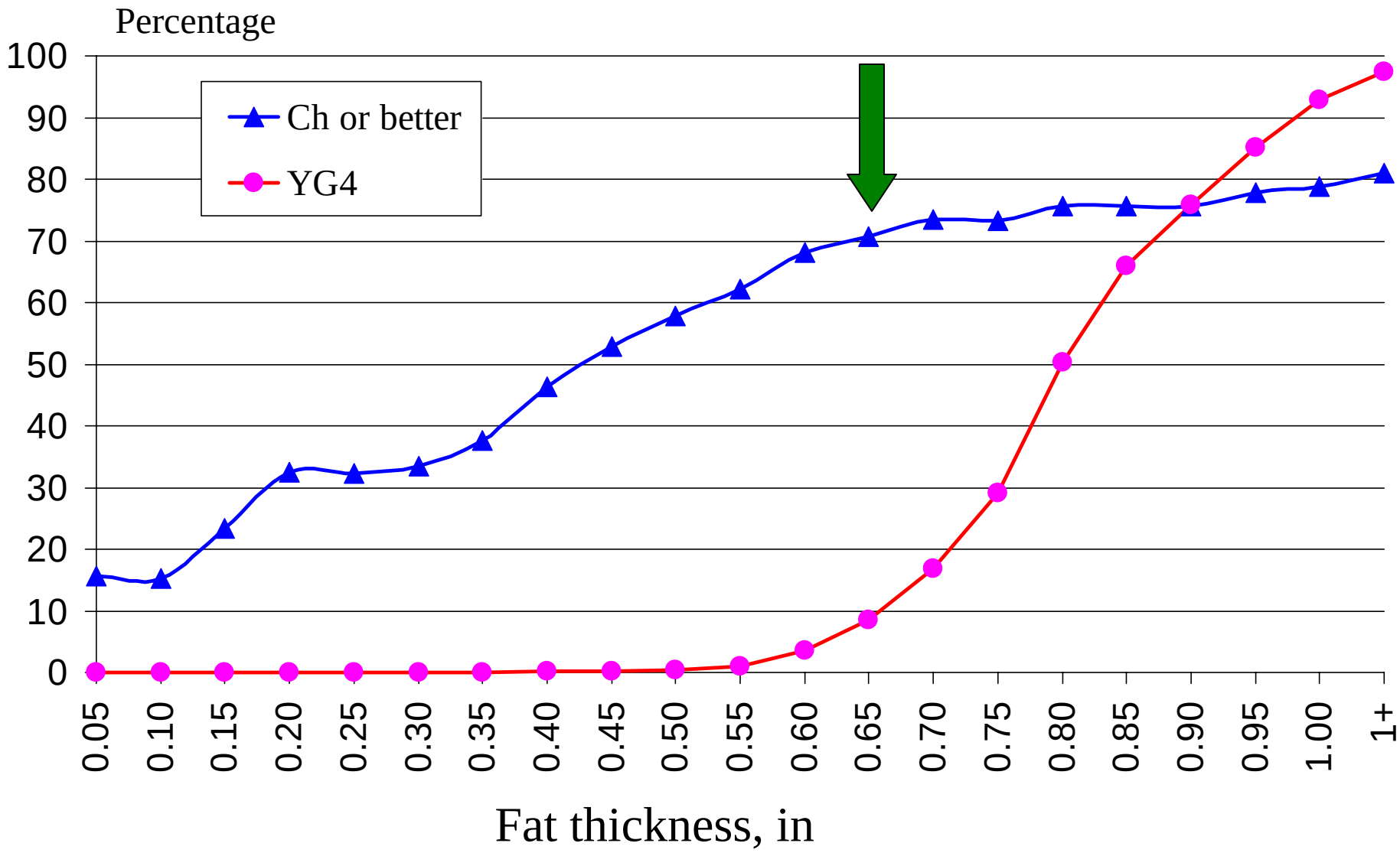
Compiled study results courtesy of Elanco Animal Health

Non-genetic factors affecting quality grade: categories

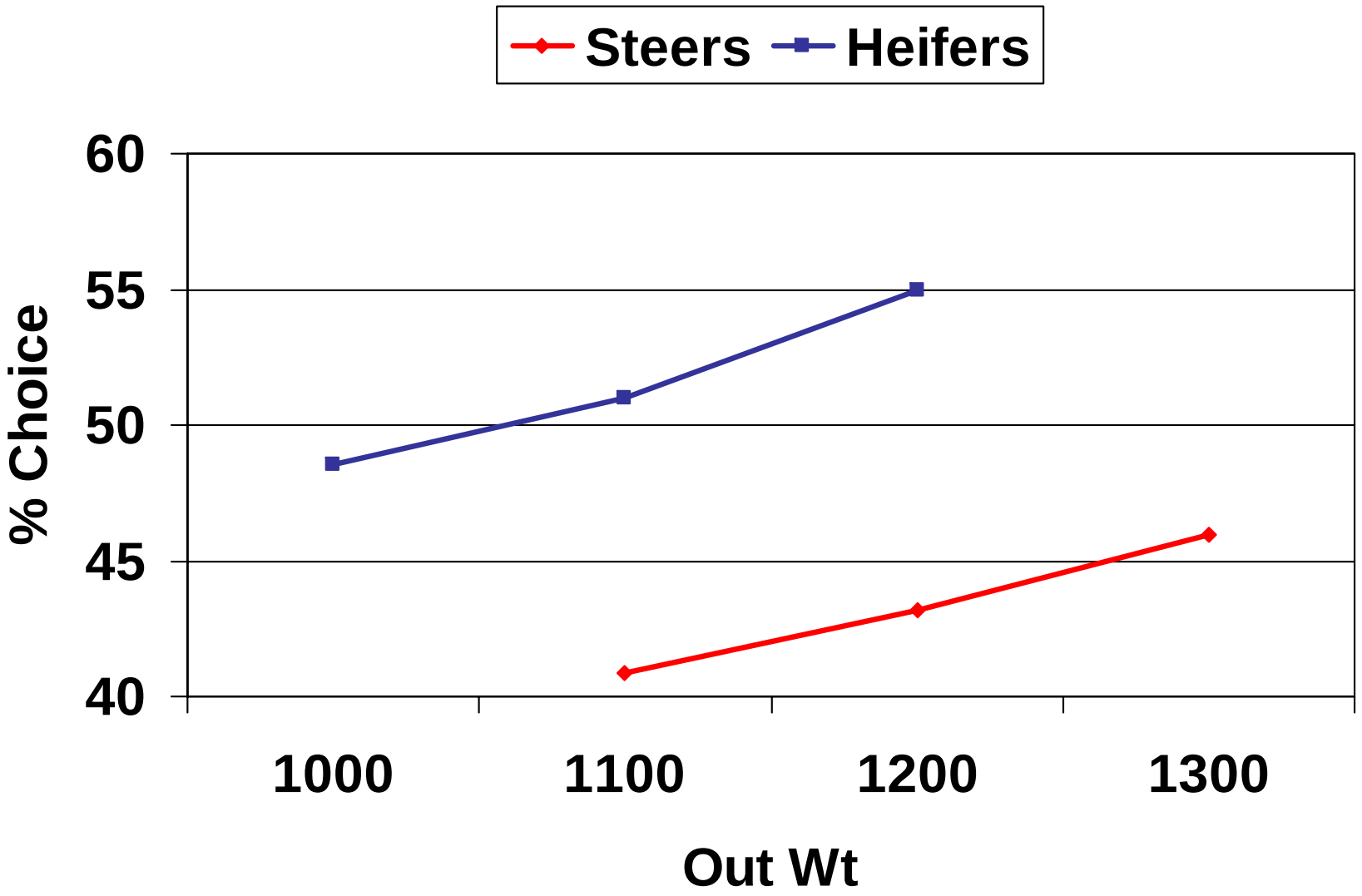
- Endpoint selection

Carcass grade by fat thickness

Lawrence et al., 2001



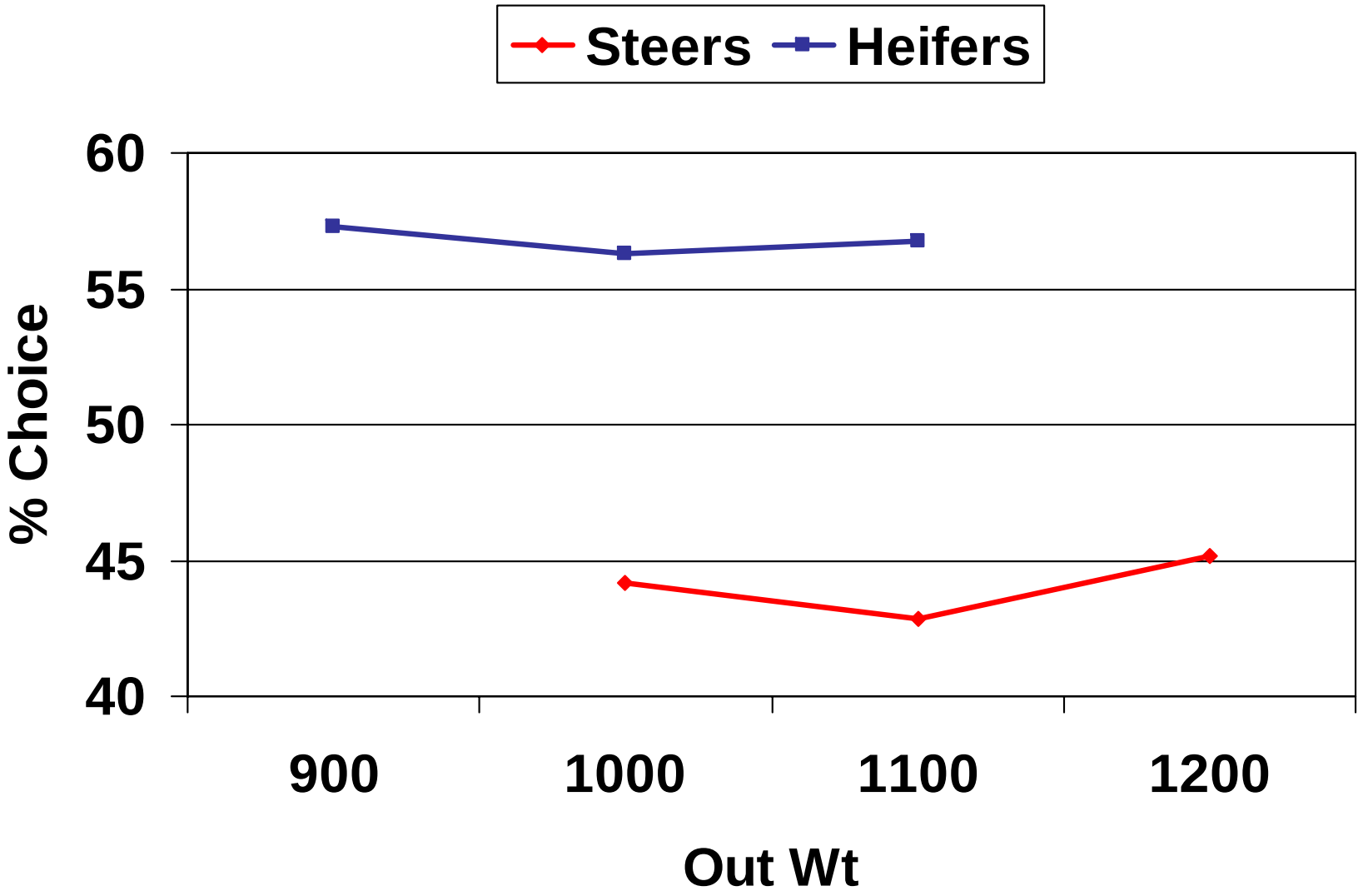
700 lb Initial Weight



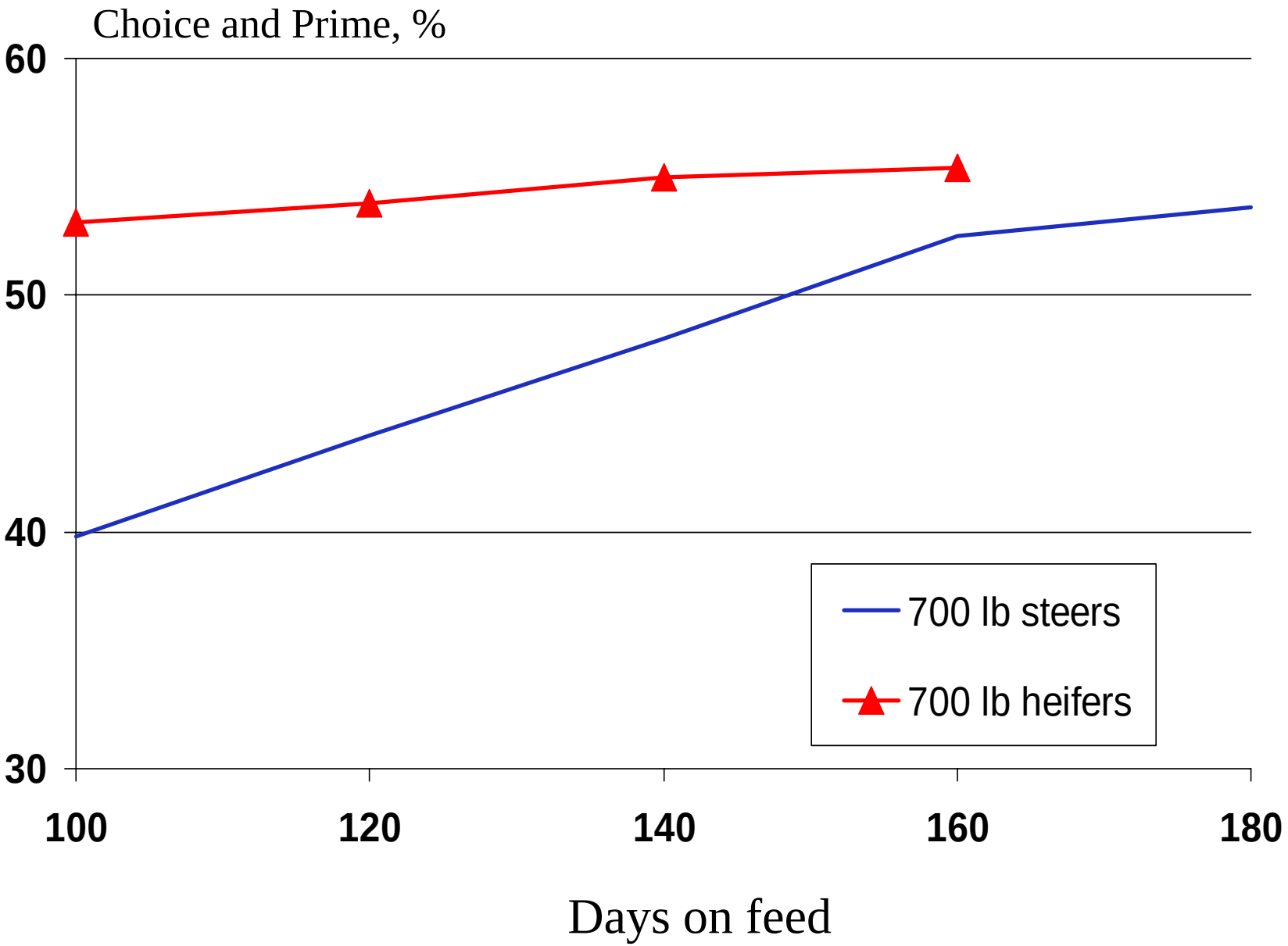
700 lb Initial Weight

400 lb Initial Weight

400 lb Initial Weight



Percentage Choice and Prime by DOF



Key points

- **<u>Key Point #1:</u>** Marbling deposition is a lifetime event, not just the late stage of the feedyard phase.

Non-differentiated cells within the muscle can be stimulated to become adipocytes, it appears that this process can be enhanced or blocked by nutritional factors.

Key points

- **<u>Key Point #2:</u>** Marbling is separate from subcutaneous fat. They are different tissues with different regulatory pathways.

Key points

- **<u>Key Point #3:</u>** Any nutritional insult, at any time in the life of the animal, will reduce marbling.

- P.S. This is true no matter how fat they ultimately get.

Three beer arguments

- Calves don’t grade
- Black = Angus = marbling
- Feedyards wreck grade
- Distillers grains wreck grade
- Packers don’t want cattle to grade
- Should we measure (report) marbling score or percentage Choice?

Summary: Biology

- Marbling deposition is a complex biological process with multiple controls, some of which are poorly understood
- Simply making cattle fatter is not a reliable strategy to increase marbling
- While marbling is related to numerous other traits, none appear strongly causative
- Numerous non-genetic factors affect quality grade

Summary: Industry

- Demographic factors affect quality grade but tend not to change over time
- Management can affect grade
  - Energy intake and feed ingredients
  - Implants and growth promotants
- Health and nutrition can affect grade, have pre-feedyard events compromised marbling?
- Premium and penalty grades need to be considered, not just percentage Choice

Take aways

- There are no obvious non-genetic trends that would have resulted in a significant increase or decrease in population quality grade. Drought is a possible exception.
- Tremendous variation indicates that almost any result is possible but almost no result is predictable