

# Demand for Antibiotic Treatment in Dairying

David A. Hennessy, Yanan Jia, Hongli Feng

All Dept. of Agriculture, Food & Resource Economics

Michigan State University

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# Motivation

- Antibiotics have been widely applied in animal agriculture, for
  - A. Growth promotion
  - B. Disease prevention
  - C. Disease treatment
- Through much of world, efforts to reduce applications. US FDA Veterinary Feed Directive has sought to eliminate Purpose A and reduce B-C
- In dairying, A is not an issue and C is the major issue for mastitis purposes

Source: [//www.youtube.com/watch?v=1lZF8mSRq4Q](https://www.youtube.com/watch?v=1lZF8mSRq4Q)



# Purpose

- Our focus is managerial economics of farm-level antibiotics choices. Research reveals
  - strong pressures on human medicine doctors to over-prescribe antibiotics (e.g., Linder et al. 2017)
  - As with others, evidence that farmers may, through rational inattention or irrationality, mismanage their inputs (e.g., Perry et al. 2017) and risk protection (Du et al. 2017)
- We seek to understand whether opportunities exist for behavioral (non-traditional) economics approaches to reduce antibiotics demand on dairy farms

# Graphical Perspective

Antibiotics  
quantity  
used



Actual (????), due to decisionmaking  
and related issues

— Privately best accounting only for farm profit

— Socially best, accounting for risk to human medicines

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# Survey

THE 5<sup>TH</sup> INTERNATIONAL



Source: <https://hoards.com/article-20125-calf-feeding-changes-are-on-the-way.html>

- Lake State Dairy Farm Business Viability Survey sent to farmers in Wisconsin, Minnesota + Michigan. Paper and web versions, March-September 2017, 21% response rate
- Section on antibiotics asks
  - how used,
  - what costs,
  - willingness to pay for treatment



MI	MN	WI	Total
118	171	392	688

# How used

THE 5<sup>TH</sup> INTERNATIONAL



## Do you have written protocols?

Size	<100 cows	100-499 cows	500+ cows	Organic	Total
Yes	50.4%	74.4%	88.2%	51.9%	60.9%
No	49.6%	25.6%	11.8%	48.1%	39.1%
Total	355	153	76	52	636

## Function

Uses	Treat current infection	Prevention
87.7%	70.3%	62.7%

**AMR**  
ANTIMICROBIAL  
AGENTS AND  
RESISTANCE

# Nature of Losses

## Mean loss per cow per year if can't use

Small	\$1,834
Medium	\$462
Large	\$454
Average	\$1,252

## Median cost per case

Diagnosis	\$5
Therapeutics	\$30
Non-saleable milk	\$80
Veterinary service	\$15
Labor	\$15
Death loss	\$34
Lost future milk	\$200
Premature culling	\$200
Lost future reproduction	\$100

Data comparable to Rollin et al

Therapeutics as share <5%

# Willingness to Pay for Antibiotics Treatment

Cow not performing optimally.  
 You isolate.  
 There is a probability she can be cured by antibiotics and a loss avoided if she is.  
 What are you WTP?

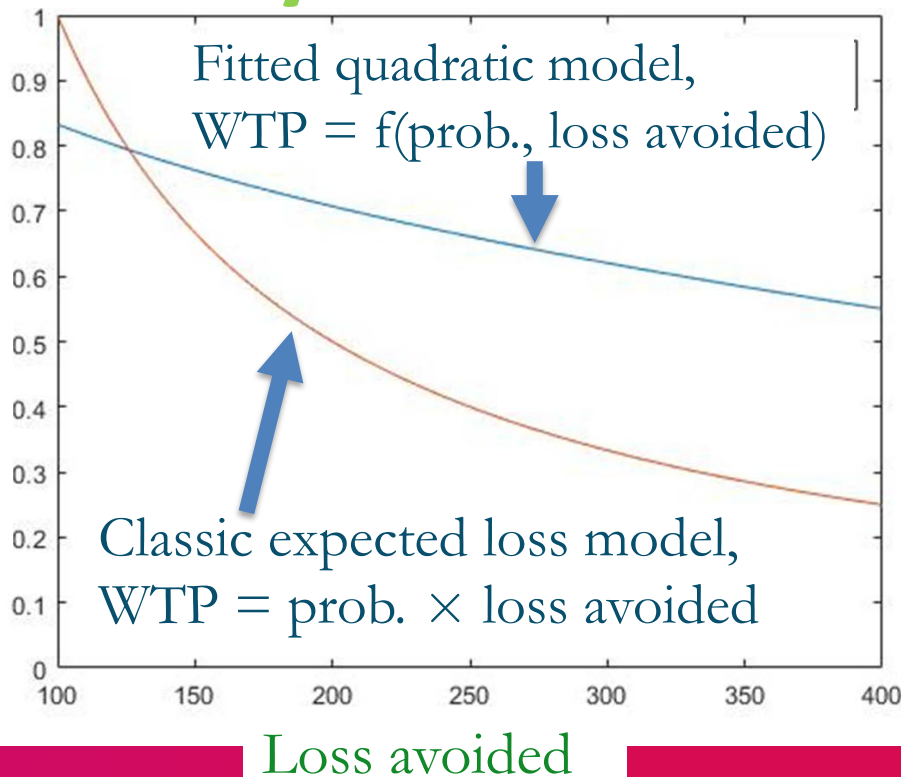
	Loss				
Probability		\$100	\$150	\$200	\$250
	0.40	\$103	\$127	\$117	\$102
	0.55	\$137	\$131	\$122	\$138
	0.70	\$154	\$153	\$166	\$196
	0.85	\$169	\$172	\$196	\$198

Only WTP not significantly larger than expected loss avoided



# Fitted Model, what do farmers worry about?

Probability



\*Figure shows how probability and loss avoided trade off to keep WTP at \$100.

\*Fitted curve shallower than expected loss curve

\*Farmers are more keen to increase probability of loss avoided than to increase magnitude of loss avoided

# Further Evidence

Please identify most & least IMPORTANT factors for your operation in regard to managing mastitis	% most	% least
Increasing prob. treatment successful	59.8	12.8
Managing treatment cost	7.0	64.3
Reducing loss if cow infected & treatment effective	33.1	22.9
Total	513	507

# Four Policy Points

- Direct question suggests tax on antibiotics use would be ineffective. Cost very small compared with other costs. Bureaucracy + linking with vet time likely more effective
- WTP model suggests increasing loss avoided (e.g., with premium for better quality milk) may not increase demand for antibiotics much when compared with more effective antibiotics
- Farmers keen to reduce risk of loss but not so cost focused may over-apply, even from private optimum stand-point (diagram)
- Farmers may be WTP for better diagnostics to increase probability of success and this need not increase demand for antibiotics

# References

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