

Information Avoidance: Does Ignorance Keep Us Uniformed About Antimicrobial Resistance?

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Motivation

- AMR is one of the most serious threats to both animal and human healthcare systems and the global economy.
- The estimated annual direct cost of AMR to the U.S. healthcare system is approximately \$20 billion, with additional indirect costs as high as \$35 billion per year. Around 2 million people are infected with AMR bacteria each year in the U.S. resulting in 23,000 deaths.
- Educating the public about AMR related issues is a priority for the World Health Organization.
- However, little is known about the public's knowledge of, and attitudes towards, the use of antimicrobials in livestock production and AMR.



Research Objectives

1. Examine the public's knowledge of, attitudes towards, and acceptance of the use of antimicrobials in livestock production as well as their understanding of, and attitudes towards, AMR.
 - Which factors affect acceptance of antimicrobial use in livestock production? We distinguish between use intended to *promote growth* and to *prevent, control and treat* disease.
2. Assess how subjective (self-assessed) and objective (measured) knowledge of AMR and use of antimicrobials in livestock production relate to information avoidance behavior.



Survey

- Conducted in May & June 2018.
- Administered by IRi, a leading online survey firm.
- A random sample of 1,030 U.S. residents, representative of the U.S. population, participated in the survey.
- The online survey was divided into two sections to address the two broad study objectives.



Consumer acceptance of antibiotic use in livestock production

- Level of acceptance of antibiotic use.
 - To treat infections in food animals.
 - To control infections in food animals.
 - To prevent infections in food animals.
 - To promote growth in food animals.
- 5 point scale 1=total unacceptable to 5=perfectly acceptable



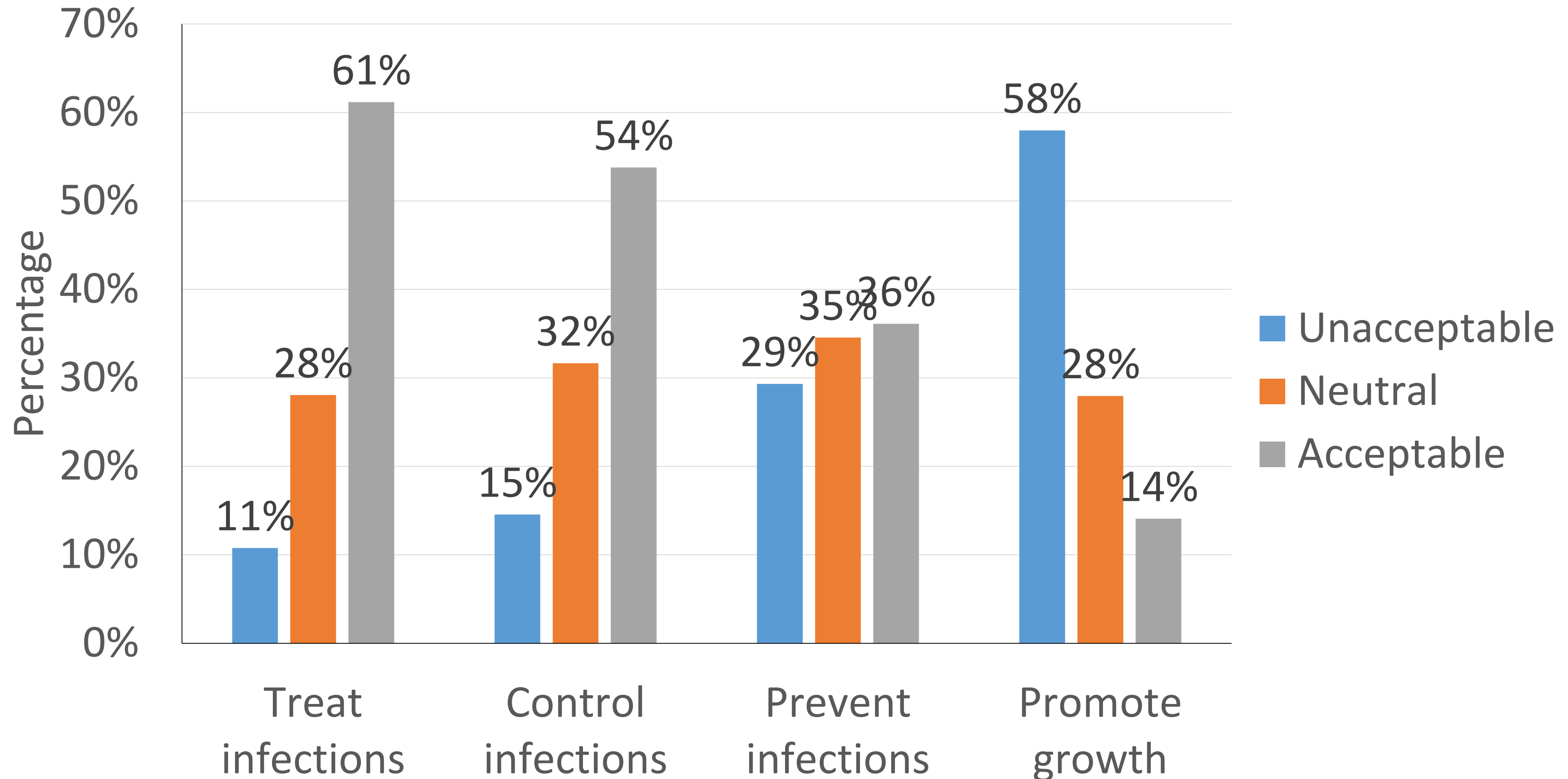
SLIDO Questions

Acceptance of Use of Antibiotics in Food Animals

- 1) Please mark the level of acceptance you feel consumers would have for the use of antibiotics to **treat** infections in food animals
 - a. Unacceptable
 - b. Neither acceptable nor unacceptable
 - c. Acceptable
- 2) Please mark the level of acceptance you feel consumers would have for the use of antibiotics to **prevent** infections in food animals
 - a. Unacceptable
 - b. Neither acceptable nor unacceptable
 - c. Acceptable
- 3) Please mark the level of acceptance you feel consumers would have for the use of antibiotics to **control** the spread of an illness among food animals.
 - a. Unacceptable
 - b. Neither acceptable nor unacceptable
 - c. Acceptable
- 4) Please mark the level of acceptance you feel consumers would have for the use of antibiotics to **promote** growth in food animals
 - a. Unacceptable
 - b. Neither acceptable nor unacceptable
 - c. Acceptable



Acceptance of Antibiotic Use in Food Animals



Factors Impacting Acceptance of Antibiotic Use in Food Animals

- Econometric Model:
 - Assess level of acceptance of 4 reasons of antibiotic use
 - Dependent Variables:
 - To prevent, control and treat disease and to promote growth
 - Independent variables:
 - Subjective & objective knowledge, consumption behavior, WTP for food safety attributes, personal antibiotic use history, attitudes towards animal welfare & AMR, and demographic characteristics



Subjective Knowledge of Antibiotic use and AMR

- Self-assessed knowledge:
 - 4 point scale from “no knowledge” to “a great deal of knowledge”
- How much do you know about the following?
 1. Use of antibiotics in livestock production
 2. Antibiotic resistance in humans
 3. Drug resistance
 4. Antibiotic resistance in animals
 5. Antibiotic resistant bacteria
 6. Superbugs



SLIDO Question – Subjective Knowledge

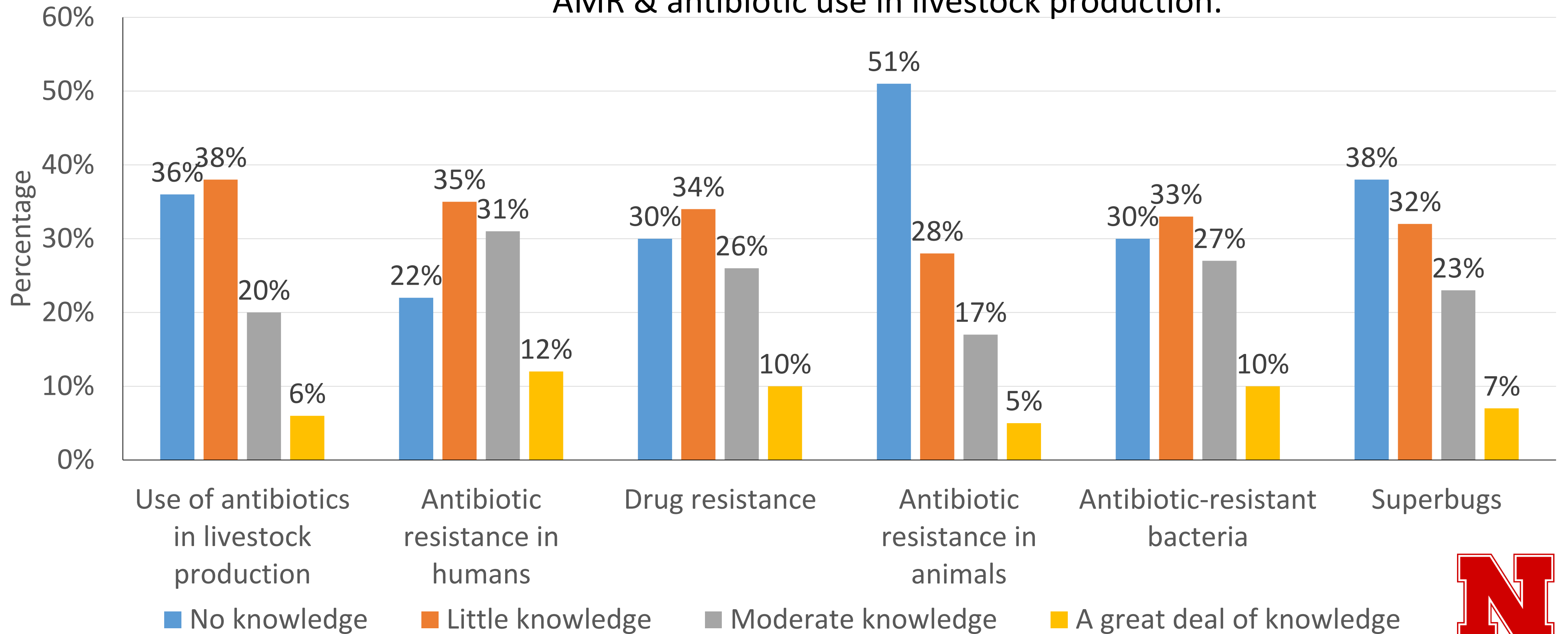
Subjective & Objective Knowledge

- 1) What percentage of consumers, do you believe, rated themselves as having no knowledge or little knowledge about AMR and antibiotic use in livestock production?
 - a. Less than 25%
 - b. 25% - 49%
 - c. 50% - 75%
 - d. Over 75%



Subjective Knowledge Question

On average, **67%** self-identified with little or no knowledge of AMR & antibiotic use in livestock production.



Objective Knowledge of Antibiotic use and AMR

Antibiotic use in livestock production:

1. Antibiotics are common drugs useful in treating bacterial infections in humans
2. Antibiotics are common drugs useful in treating viral infections in humans.
3. Antibiotics are common drugs useful in treating any kind of pain or inflammation.
4. Antibiotics are common drugs useful in treating bacterial infections in food animals.
5. Antibiotics are common drugs useful in treating viral infections in food animals.

AMR:

6. Antibiotic resistance occurs when bacteria become resistant to antibiotics and antibiotics no longer work as well.
7. Overuse and misuse of antibiotics accelerate antibiotic resistance.
8. The overuse and misuse of antibiotics in animals do not cause antibiotic resistance in humans because the antibiotics that are used to treat animals are different than those used to treat humans.
9. Antibiotic resistance existed before human development of antibiotics.
10. Antibiotic resistance has been found in every environment studied, including many not impacted by food animal or human antibiotic use.



SLIDO Question – Objective Knowledge

- 2) What do you believe is the average score of consumer's actual measured knowledge of AMR and antibiotic use in livestock production?
- a. Less than 25%
 - b. 25% - 49%
 - c. 50% - 75%
 - d. Over 75%



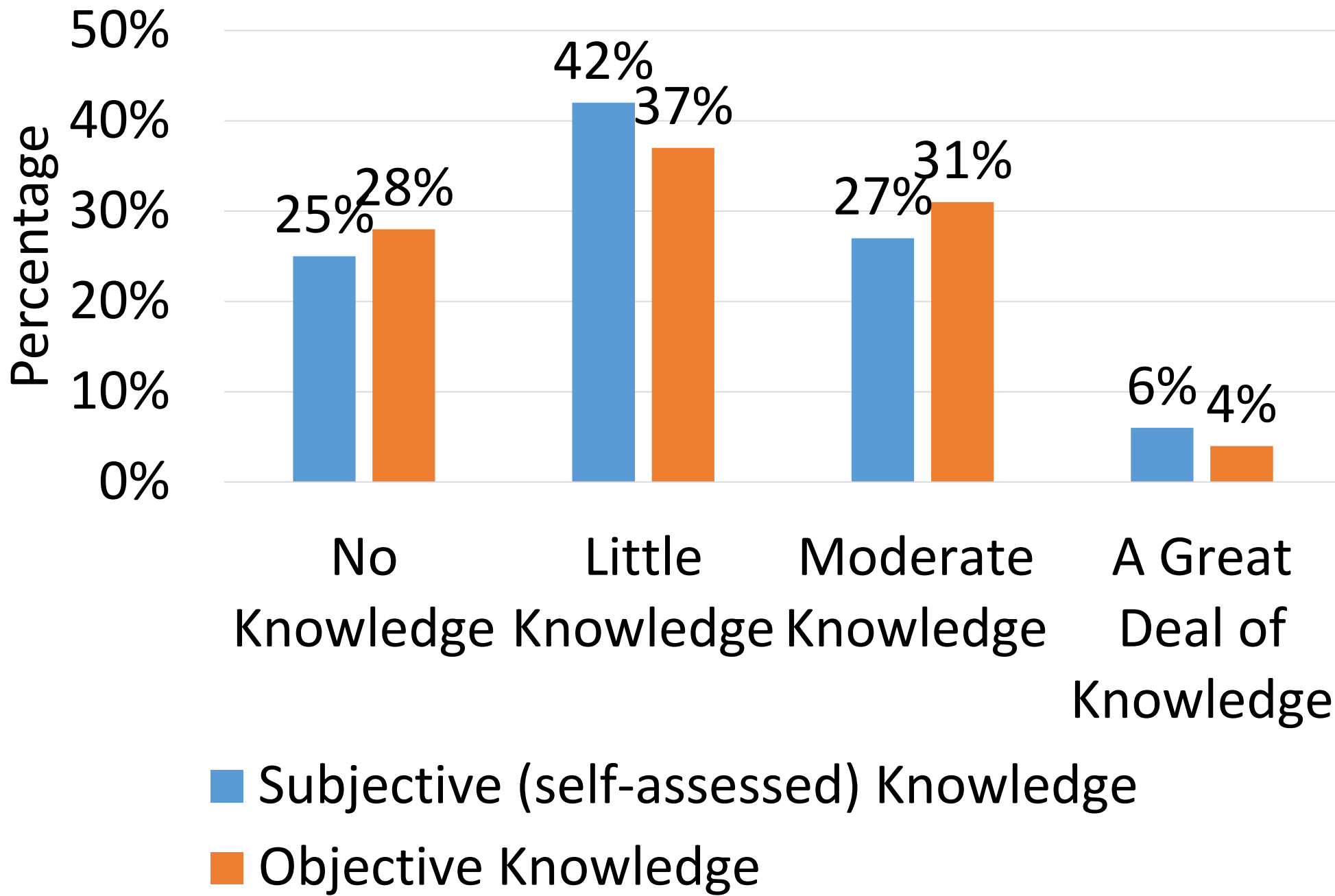
Objective Knowledge

Average score = 40%	Correct Answer	% of participants answering correctly
Antibiotics are common drugs useful in treating bacterial infections in humans	True	75%
Antibiotics are common drugs useful in treating any kind of pain or inflammation.	False	53%
Antibiotics are common drugs useful in treating bacterial infections in food animals.	True	49%
Antibiotics are common drugs useful in treating viral infections in food animals.	False	31%
<u>AMR:</u>		
Antibiotic resistance occurs when bacteria become resistant to antibiotics and antibiotics no longer work as well.	True	69%
Overuse and misuse of antibiotics accelerate antibiotic resistance.	True	70%
Antibiotic resistance existed before human development of antibiotics.	True	100%
Antibiotic resistance existed before human development of antibiotics.	True	19%

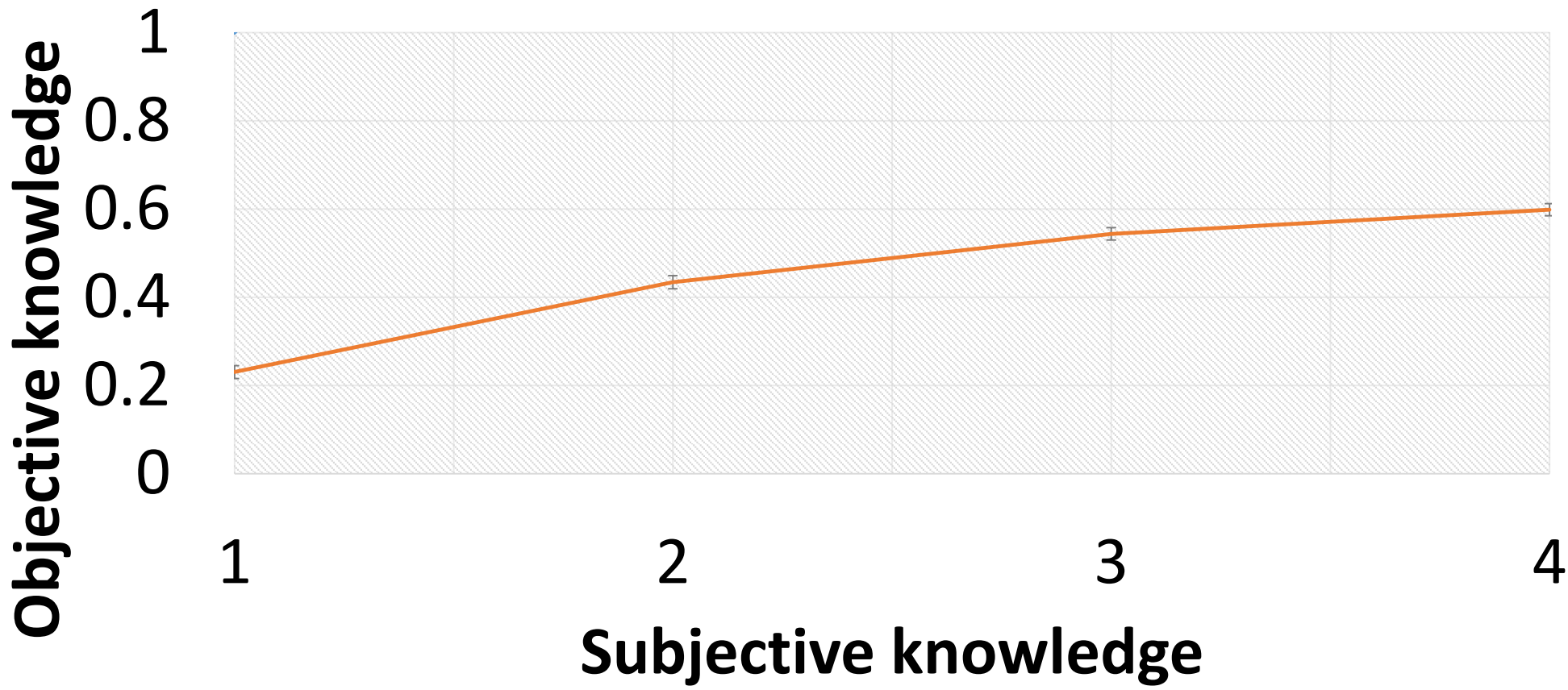


Subjective and Objective Knowledge of AMR

Knowledge of antibiotic use and AMR

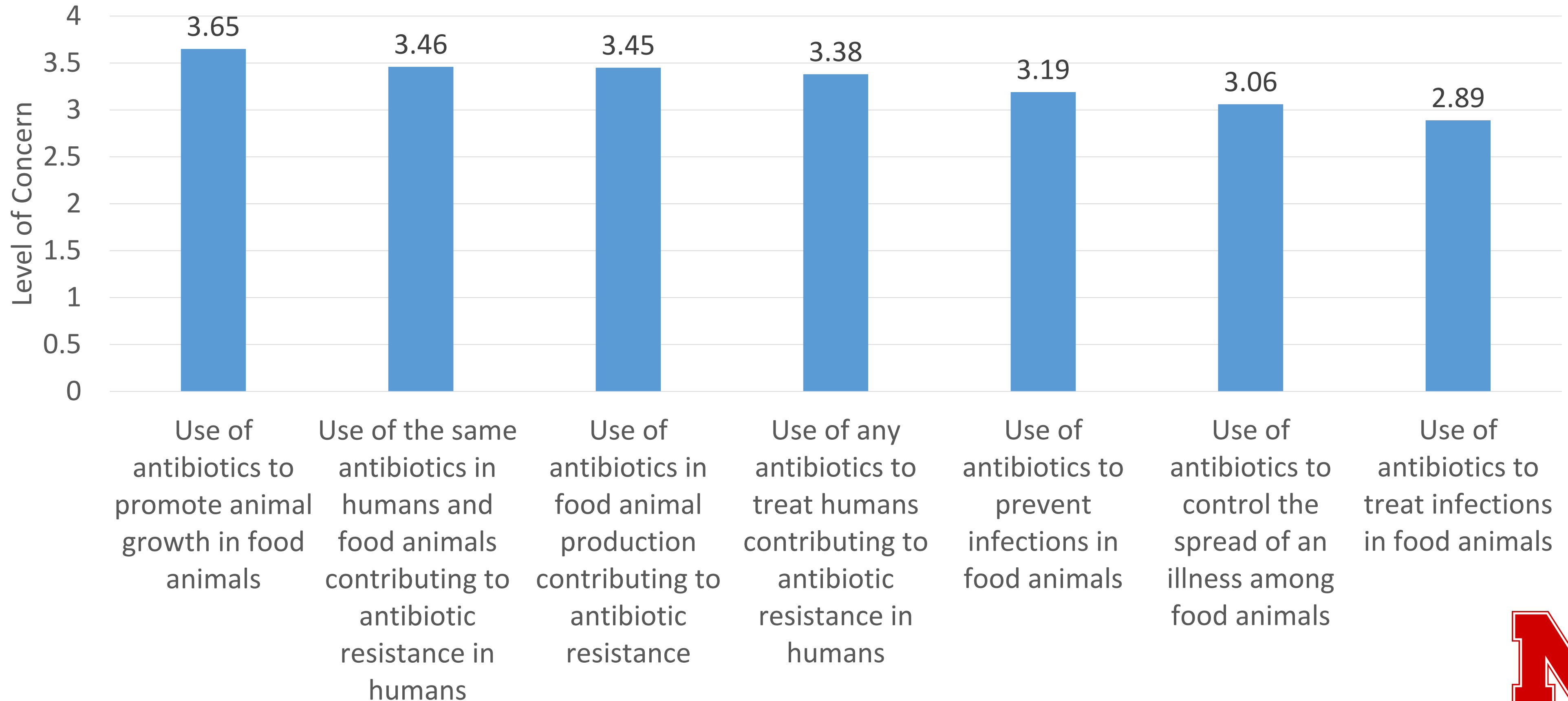


Positive relationship between subjective and objective knowledge of antibiotic use and AMR



Descriptive Statistics of Control Variables

Level of Concern (1= not at all concerned to 5 = extremely concerned)



Factors Impacting Acceptance of Antibiotic Use in Food Animals

- Key Results

- The greater the objective knowledge of antibiotic use and AMR
 - More likely to accept antibiotic use to **treat & control** disease
 - Less likely to accept antibiotic use to **prevent** disease & **promote growth**
- Those with high level of concern about AMR & antibiotic use in livestock production were less likely to accept antibiotic use in food animals.
- Those who believed that antibiotic use improves (reduces) animal welfare were more (less) likely to accept antibiotic use in food animals.
- Female participants and participants who were highly concerned about AMR were less likely to accept any form of antibiotic use in livestock production.



*Assessing the role of subjective
and objective knowledge in
AMR information avoidance
behavior.*



Video Selection
Length: 3 mins 35 secs

Antimicrobial Resistance: The
Role of Food and Agriculture

https://youtu.be/d3YXW_gWNz4

Nature White Noise: Rain and
Thunderstorm Sounds for
Relaxation



SLIDO Questions

Video Questions

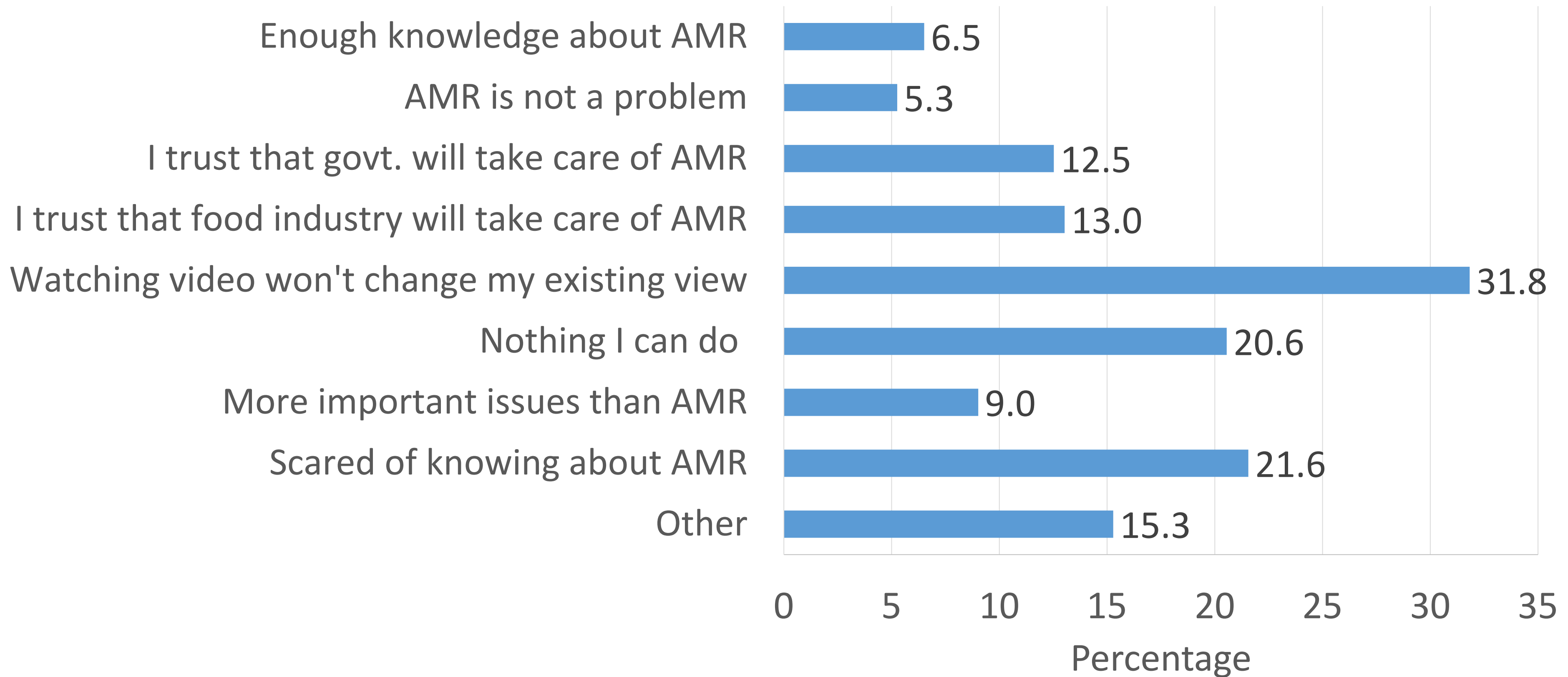
- 1) Please select one of the following two videos.
 - a. Antimicrobial Resistance: The Role of Food and Agriculture
 - b. Nature White Noise: Rain and Thunderstorm Sounds for Relaxation

- 2) What percentage of consumers, do you believe, chose to avoid obtaining information on AMR and instead watched the white noise video?
 - a. Less than 25%
 - b. 25% - 49%
 - c. 50% - 75%
 - d. Over 75%

- 3) Which of the following statements do you believe is the top reason as to why consumers chose to not watch the Antimicrobial Resistance Video:
 - a. I know enough about antimicrobial resistance.
 - b. I believe that antimicrobial resistance is not a problem.
 - c. I trust that the government will take care of antimicrobial resistance.
 - d. I trust that the livestock and poultry industry will take care of antimicrobial resistance.
 - e. Watching a video is not going to change my views on antimicrobial resistance.
 - f. I would rather not know more about antimicrobial resistance because there is nothing I can do about it.
 - g. There are more important issues than antimicrobial resistance.
 - h. I fear that knowing more about antimicrobial resistance will make me feel anxious.



~40% of respondents avoided AMR video



Information & Economics

- Information is valuable & improves decision-making.
- Rational agents don't avoid valid information.
 - Unless ignorance is a strategic behavior.
- Consumers value & seek information and willing to pay for even useless information (Eliaz & Schotter, 2007).
- Growing literature that people avoid information even when information is free and could improve decision-making (Golman et. al 2017).



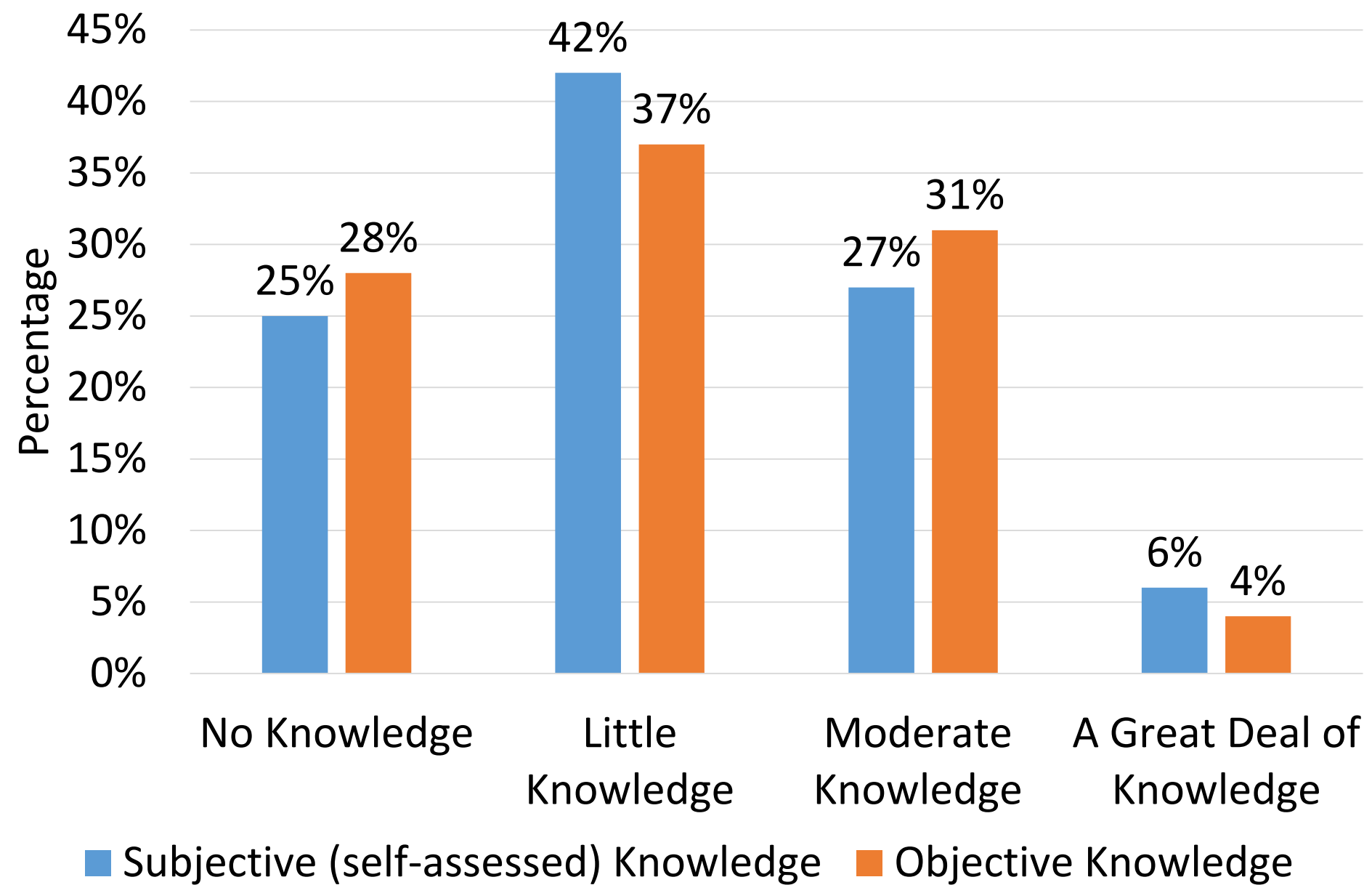
Information Avoidance

- A situation in which people choose not to obtain information that is available and free.
- Previous literature on information avoidance shows responses to potentially uncomfortable information is highly variable
- Objective: Examine the role of consumers' subjective and objective knowledge of AMR and antibiotic use in livestock production on the decision to access or avoid information related to AMR.

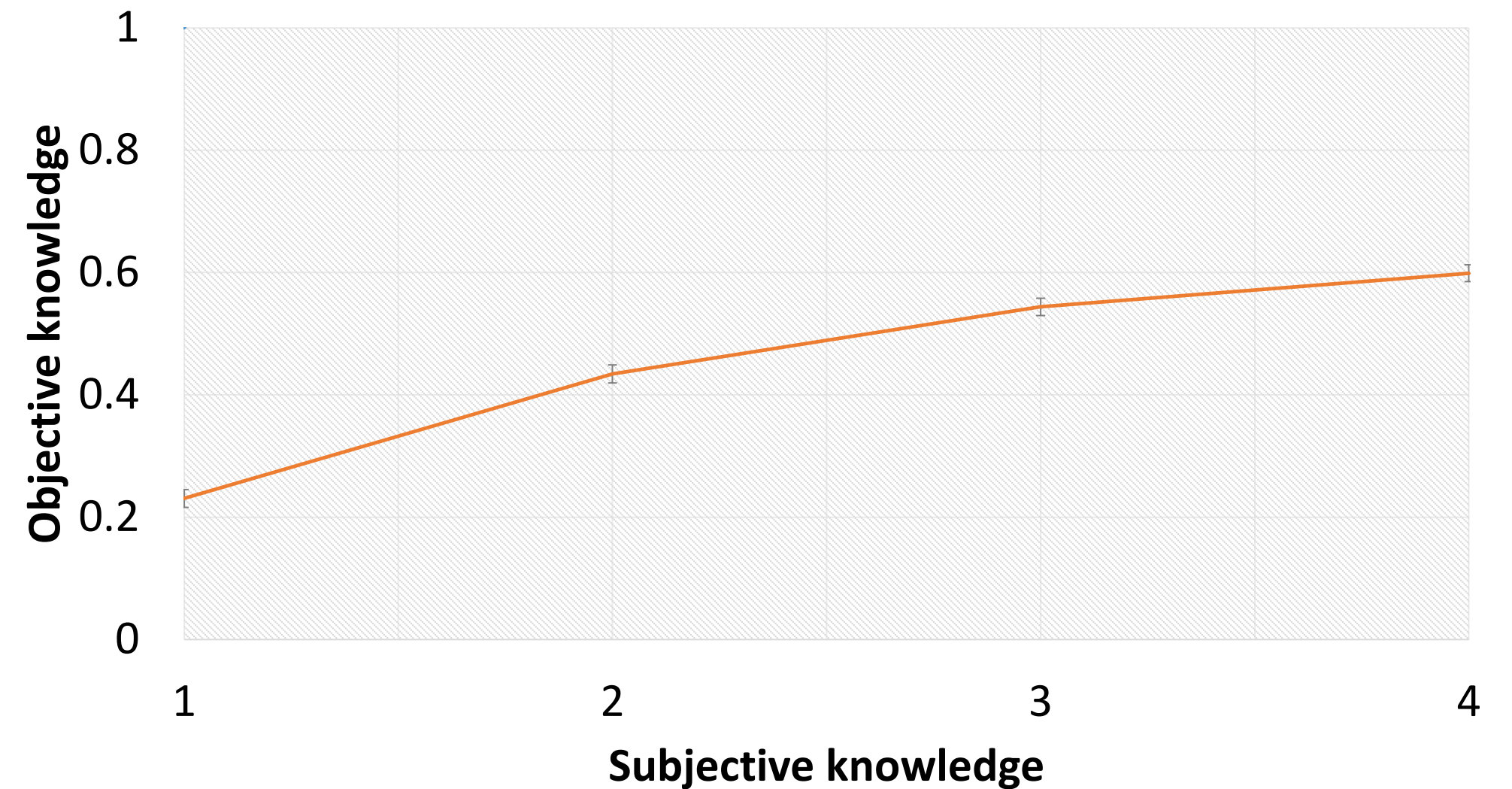


Subjective and Objective Knowledge of AMR

Knowledge of antibiotic use and AMR



Positive relationship between subjective and objective knowledge of antibiotic use and AMR



Role of Subjective and Objective Knowledge

Table 1: Logit Model- Dependent variable- Dummy (1 if avoid AMR information; 0 otherwise)

Independent variables	Marginal Effects
<u>Participants' Knowledge of AMR & Antibiotic Use in Livestock production</u>	
No or little subjective knowledge (1,0) (two categories: no or little know=1, otherwise 0)	0.080** (0.035)
Objective knowledge	-0.271*** (0.062)
Control Variables (i.e., consumption habit, WTP premium for food safety attributes, level of concern about AMR, belief, history of antibiotic use, preference, views on animal welfare, and demographic characteristics)	X

• Note: *** significant at 1% and ** significant at 5%.



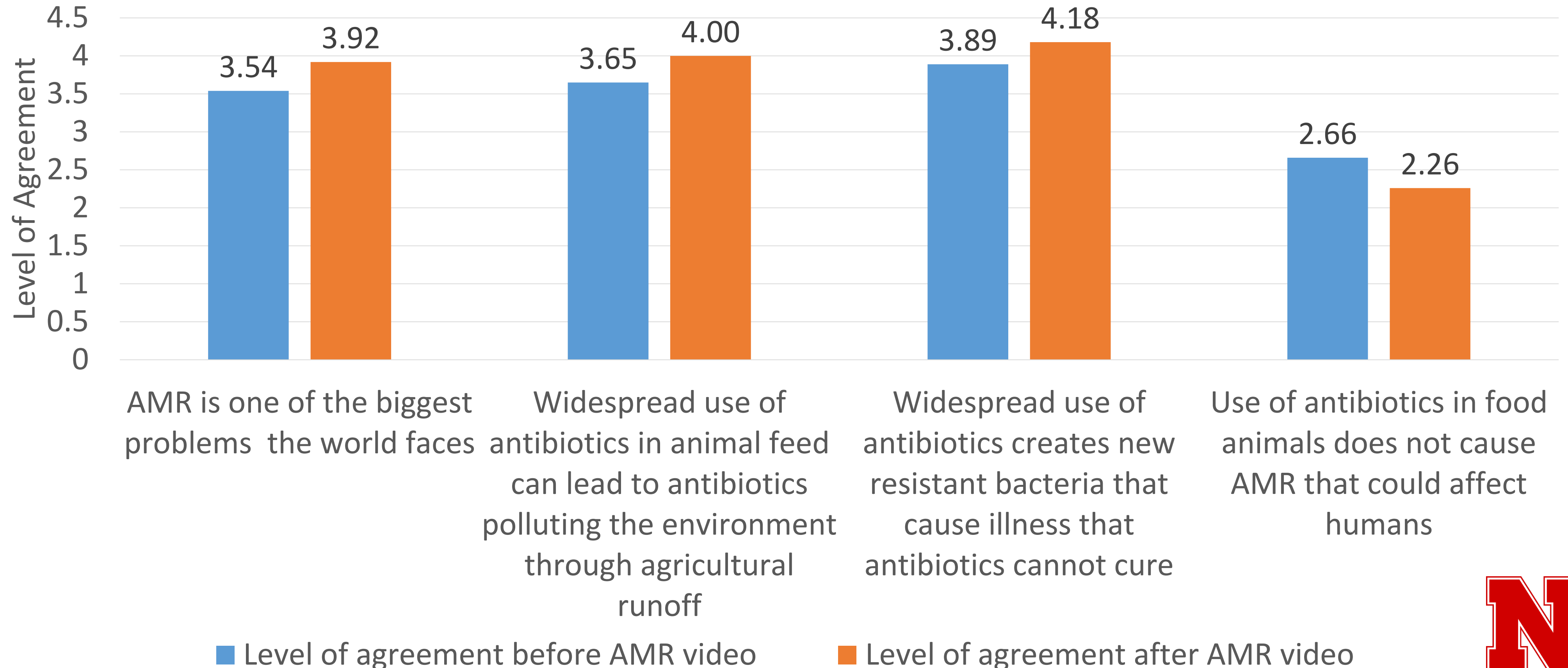
Effects of Information on Perceptions & Understanding of AMR

- Participants re-answered 4 questions related to perceptions and understanding of AMR after videos
- 631 out of 1030 respondents chose to watch AMR video
- Panel Data Analysis (Random Effects)



Perceptions and Understanding of AMR

Scale of 1 = strongly disagree to 5= strongly agree)



Effects of Information on Perceptions & Understanding of AMR Based on Knowledge

Independent variables	Marginal Effects
Information (1,0)	0.322***
<i><u>Participants' Knowledge of AMR & Antibiotic Use in Livestock production</u></i>	
Little or no subjective knowledge (1,0)	-0.162***
Little or no subjective knowledge x information	0.197***
Objective knowledge	0.848***
Objective knowledge x information	-0.213***
Control Variables (i.e., consumption habit, WTP premium for food safety attributes, level of concern about AMR, belief, history of antibiotic use, preference, views on animal welfare, and demographic characteristics)	X

Note: *** significant at 1% and ** significant at 5%.



Overall, Key Results

- Participants with higher objective knowledge are more likely to accept antibiotic use to treat and control disease but less likely to accept antibiotic use to prevent disease and promote growth.
- Positive relationship between participants' subjective and objective knowledge of AMR and antibiotic use.
- Respondents with little or no knowledge of AMR were more likely to avoid AMR information compared to more knowledgeable respondents.
- Of participants who chose to watch the AMR video, those with little or no knowledge changed their views the most.



Future Research

- How to encourage willfully uninformed individuals to access information about AMR?
 - Examine provision of different forms of AMR information (statistical vs. “story-based”) by different information sources (e.g., NGOs, gov’t institutions, activists).
- Consumer WTP for animal products associated with AMR-risk reducing practices/labels.
 - **Balanced responsible practices**



Participants Understanding of Antibiotic Use in Food Animals

Three questions:

- The use of antibiotics to (treat illness, prevent illness, or promote growth) in food animals is:
 - Prohibited
 - Allowed and regulated
 - Allowed and unregulated
 - I do not know



Participants Understanding of Antibiotic Use in Food Animals

Four Questions:

- What do you believe is the percentage of food animals that are given antibiotics (to treat an illness, prevent an illness, promote growth)?
 - More than 80%
 - 61 - 80%
 - 41 - 60%
 - 21 - 40%
 - Less than 21% but greater than zero
 - Zero
 - I do not know



Questions/Comments?

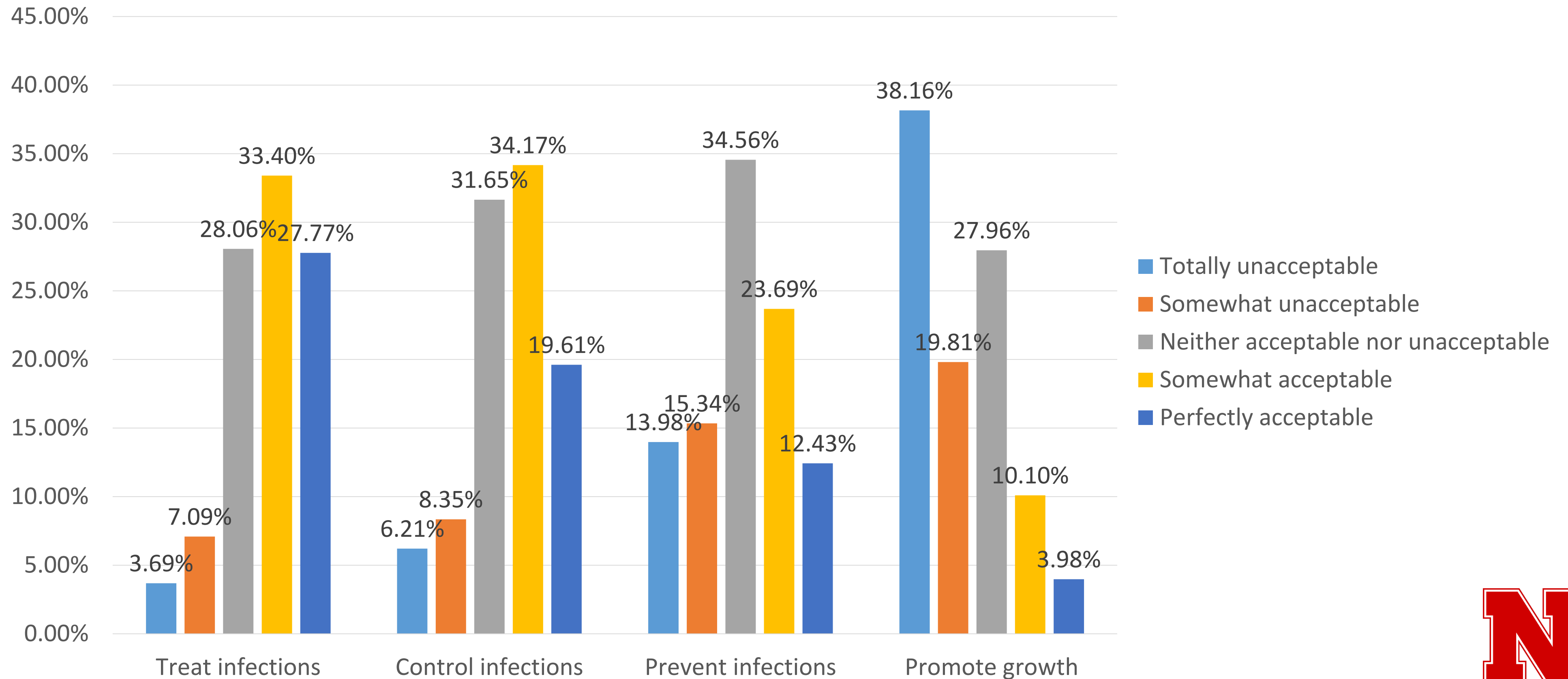


Photo taken by Troy Waltz

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Acceptance of Use of Antibiotics in Food Animals



Variables	Description	Mean (S.D.)
<u>Willingness to pay a premium for product attributes</u>		
Products that are produced under strict animal welfare standards	1= strongly disagree to 5= strongly agree	3.55 (1.07)
Meat from animals not treated with antibiotics to promote growth		3.38 (1.01)
<u>Perceptions and understanding of AMR</u>		
Antibiotic resistance is one of the biggest problems the world faces	Level of agreement with the statement,	3.42 (1.01)
Antibiotic resistance is an issue that could affect me or my family	1= strongly disagree to 5= strongly agree	3.91 (0.92)
Widespread use of antibiotics in animal feed can lead to antibiotics polluting the environment through agricultural runoff		3.55 (0.88)
Widespread use of antibiotics creates new resistant bacteria that cause illness that antibiotics cannot cure		3.77 (0.89)
Use of antibiotics in food animals does not cause AMR that could affect humans		2.77 (0.99)
<u>Animal welfare</u>		
Use of antibiotics to treat an illness in food animals improves animal welfare	Level of agreement with the statement,	3.39 (0.96)
Use of antibiotics in food animal production reduces animal welfare	1= strongly disagree to 5= strongly agree	3.23 (0.98)
Food safety is strongly dependent on the care provided to food animals		4.00 (0.87)



Variables	Description	Mean (S.D.)
<u><i>Frequency of Meat and fish consumption</i></u>		
	1= never consume to 5= daily consumption	
Beef		3.50 (0.94)
Chicken		3.81 (0.80)
Fish		3.11 (1.03)
Pork		3.10 (1.02)
<u><i>History of antibiotics use</i></u>		
Treated with antibiotics in previous year	1= yes; 0= no	42%
Antibiotic treatment didn't work-own	Treated with an antibiotic that didn't work, 1= yes; 0= no	27%
Antibiotic treatment didn't work - family		23%

