Using ARMS Data for Analyses of Antibiotics Use in Livestock

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ERS Work On Antibiotic Use in Livestock

- Collect original survey data through ARMS
- Produce economic research based on that data
  - Extent of use; what types of farms use antibiotics for growth & prevention; impact of use on production outcomes, with controls for other factors;
- Monitor and summarize other data and economic research on the topic

ARMS: The Agricultural Resource Management Survey

- An annual survey of U.S. farms
  - Jointly administered by ERS and NASS
  - Covers farm and farm household finances, field practices and production
  - Designed to be representative of US agriculture
- USDA's primary source of farm financial data
  - Farm income reporting; and commodity costs & returns
  - About 22,000 full responses each year
  - Not a panel: new farms each year

ARMS is a Complex Survey: Multiple Phases and Multiple Questionnaire Versions

- In most years, special ARMS questionnaire versions are directed to producers of 2 crop & 1 livestock commodity
- Provides baseline for ERS annual costs and returns estimates for that commodity
- Includes detail on expenses, technologies and practices for the commodity enterprise
  - Sample consists of commercial producers in States accounting for at least 90 percent of production
  - We add antibiotics questions to livestock versions

ARMS Livestock Versions

- Hogs: 1998, 2004*, 2009*, 2015*
- Dairy: 1995, 2000, 2005, 2010, 2016
- Broilers: 2006* and 2011*
- Cow-calf: 1996 and 2008
  - * includes antibiotics use questions
- Questionnaires posted at ERS ARMS website:
  - http://www.ers.usda.gov/Data/ARMS/app/questionnaires.aspx?x=foh

ARMS Antibiotics Use Questions

- Antibiotics provided in feed or water?
  - For what purpose? (hog version)
    - What stage? (hog version)
- Other production practices & technologies...
  - That may be related to antibiotics decisions
- In a survey primarily focused on whole-farm and commodity finances

Why Use ARMS For Antibiotics Research?

- A large representative sample of producers
- Can link antibiotic use questions
  - to production and financial outcomes...
  - to use of other practices and inputs...
  - to farm, enterprise, and operator attributes.

ARMS Respondents Are Farm Operators

- Contract growers may not know what's in the feed
  - Because integrators (contractors) provide them with feed
  - We include a "don't know" option in questionnaire
    - "Don't know" is common response
  - We separately contact integrators for average feed costs

Findings: Antibiotics Use in Hogs

Table 6: Proportion of Hog Producers and Hogs Using Antibiotics, by Type of Hog, and Purpose of Use, 2009

	Percentage of operations that use antibiotics for…				
Type of hog	**Growth promotion**	**Disease prevention**	**Either growth promotion or disease prevention**	**Disease treatment**	**Any use**
Finishing hogs					
Operations					
Yes	30%	44%	50%	44%	61%
Don't know	16%	14%	14%	13%	12%
Head sold or removed					
Yes	40%	51%	59%	61%	74%
Don't know	22%	20%	20%	18%	17%

Source: Authors' calculations from ARMS Hogs 2009 data.

Findings: Antibiotic Use in Broilers

(From 2011 ARMS Broiler Version)

Table 10. Antibiotics use, production outcomes, and production practices in broiler grow-out facilities

	Operation foregoes antibiotics for growth promotion or disease prevention	
	No/DK	Yes
Number of farms	7,727	7,163
Production outcome		
Average annual production (# birds)	523,579	529,596
Flock mortality rate (%)	3.66	3.83
Feed conversion (lbs. of feed per pound of weight)	1.89	1.91
Production practice	**Farms responding that they did have production practice (%)**	
Water treated to control salmonella after feed withdrawn	23	33
No animal byproducts in feed	18	27
Test flocks for avian influenza	51	60
Test flocks for salmonella	35	50
Test flocks for campylobacter	15	25
Breeding flocks vaccinated for salmonella	25	36
Vehicles cleaned & disinfected before loading birds	27	37
Litter in houses windrowed and dried between flocks	29	36
Litter in houses treated to reduce ammonia	65	73

Findings: Impacts on Production Outcomes

- While controlling for size, inputs, & technologies
- For hog finishing and broiler grow-out operations
  - Focus on growth promotion & disease prevention uses

- Routine feeding is associated with small increases in production, given other factors
  - 1-3 percent
  - But, not statistically different from zero

ARMS and NAHMS Compared

- Each covers a periodic rotation of commodities
  - With samples that are representative of commercial producers and production
  - NAHMS covers very small-scale producers, separately.
  - Each elicits qualitative information on antibiotic drug use.

ARMS and NAHMS Compared

- NAHMS has a primary focus on animal health
  - More detailed questions on whether, how, and why specific types of drugs are used, and links to other animal health practices.
- ARMS has a primary focus on farm finance and production
  - Less detailed antibiotics questions, with links to production practices as well as production and financial outcomes.

ARMS & NAHMS Complementarities

- Different primary goals
  - Respondent burden from combining would be high, because the questionnaires would be very long
  - High burden reduces response
- Agencies cooperate & share data
  - Research products at each agency draw on both databases

Beyond NAHMS & ARMS. What's Needed?

- Annual estimates, by species and stage of production
- Qualitative measures: animals receiving antibiotics, by purpose, by type of drug
- Coverage of integrators, to avoid "don't know"
- Quantitative measures: how much of which drugs?

Questions?

- Published ERS research
- Journal articles:
  - McBride, Key, Mathews. 2008. “Subtherapeutic antibiotics and productivity in US hog production”, *Rev. of Agricultural Economics* 30: 270-288.
  - Key, McBride. 2014. “Sub-therapeutic antibiotics and the efficiency of U.S. hog farms,” Am. J. Agricultural Econ. 96(3): 831-850.
  - MacDonald, Wang. 2011 “Foregoing sub-therapeutic antibiotics: the impact on broiler grow-out operations”, *Applied Econ. Perspectives and Policy* 33 (2011): 79-98.